ESSAYS IN EXECUTIVE INCENTIVES

A Dissertation
Submitted to
the Temple University Graduate Board

In Partial Fulfillment
of the Requirements for the Degree
DOCTOR OF PHILOSOPHY

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Diploma Date August 2019

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ABSTRACT

My dissertation consists of three chapters which explores various aspects of executive incentives.

In the first chapter, I examine the relation between executive equity pay and stock returns. By compensating CEOs and CFOs differently, shareholders can create incentive conflicts between the firms' top two managers that potentially affects shareholder wealth. On the one hand, incentive conflict potentially benefits shareholders by improving information exchange and establishing checks and balances in decisions made jointly by the CEO and CFO but alternatively, can harm shareholders by increasing risk through impeding the decision-making processes. I examine the relation between CEO-CFO incentive conflict and stock returns. The analysis indicates that an investor who routinely buy firms with the least incentive conflict and shorts firms with the greatest incentive conflict between CEO and CFOs will outperform the market by 475 basis points per year. I investigate whether risk, firm performance, or market inefficiency explain the excess returns and provide evidence that shareholders demand higher returns for bearing risk associated with CEO-CFO incentive similarities.

Next, I explore the impact of executive incentives on bondholder wealth through looking at bond yields. Firms compensate managers to maximize shareholder value, yet these same incentives affect bondholder risk. I investigate the relation between executive equity pay and the cost of debt. My findings indicate a "u-shaped" relation between bond yields and equity pay. These results are consistent with the notion that bondholders prefer a moderate amount of executive equity pay and above or below that level, bondholders

increase yields to protect their interests. Instrumenting equity pay using CEO heritage, I find support for a curvilinear relation. These findings suggest that moderate levels of equity pay mitigate the agency costs between firm shareholders and bondholders.

Finally, I study the affect of board gender diversity on CEO and director compensation. Females occupy only about 12% of director positions on corporate boards. I find that boards with more female's onboard tend to give CEOs larger fractions of equity in their compensation packages while incentivizing directors with lower fractions of equity pay. This evidence is consistent with the notion that female board members are superior monitors yet also possess greater risk-aversion than male board members.

ACKNOWLEDGEMENTS

First, I would like to thank my dissertation advisor, Ronald Anderson, and my committee members Kose John, Peter Chinloy, Amir Shoham, and Emanuel Zur for their guidance during my time in the PhD program at Temple University. From day one, Ron Anderson has taken me under his wing and invested many hours in me. Ron has helped me develop not only an understanding of financial research and instruction but also an understanding of academia as a whole. I am also grateful to Peter Chinloy and Amir Shoham who have spent many hours collaborating with me on a variety of projects. I am thankful to have Kose John on my committee who taught me valuable lessons from his courses in empirical and theoretical corporate finance. I also appreciate the continual encouragement from Emanuel Zur, who was an early advocate for my doctoral studies.

Second, I would like to thank the Finance department at Temple University as a whole, including Connie Mao, Oleg Rytchkov, Philip English, and Gurdip Bakshi who have all played important roles in my studies, dissertation, and placement.

Third, I would like to thank my parents, Doug and Jodi Imes for their continual love and support.

Fourth, I would like to thank my wife, Cally Imes, who has stood by me, encouraged me, supported me, prayed with me, put me through school, and loved me unconditionally from long before I ever decided to pursue a doctorate.

Finally, I would like to recognize that God has enabled me to be successful in my studies far beyond my own abilities.

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CHAPTER 1

INCENTIVE CONFLICT IN THE C-SUITE

Introduction

Compensation incentives represent a key governance mechanism in mitigating manager-shareholder conflicts. The literature has well documented how managerial incentives influence executive behavior, exploring how compensation committees seek to align manager and shareholder interests through the provision of equity pay (Shleifer and Vishny 1998; Jensen and Murphy 1990; Core and Larcker 2001; Aggarwal and Samwick 2003; Aggarwal and Samwick 2006; Friedman 2016). For example, Guay (1999) suggests that firms with growth opportunities can motivate risk-averse managers to invest in risky, positive NPV projects through risk-increasing incentive compensation. Additional research finds that increasing the sensitivity of executive wealth to stock return volatility (*vega*) results in risk-increasing decisions such as investment in R&D, leverage, and riskier debt maturity choices (Cohen et al. 2000; Coles, Daniel, and Naveen 2006; Chava and Purnanandam 2010). Within the executive suite (hereafter, C-suite), the CEO and CFO wield substantial influence on corporate policies (Graham, Harvey, and Puri 2009; Bennedsen, Perez-Gonzalez, and Wolfenzon 2011), yet, Chava and Purnanandam (2010) note that firms can still incentivize CEOs and CFOs to pursue different corporate policies, suggesting that the firm's top decision-makers face notably different incentive structures.

Compensation for these two influential C-suite members differs in several key ways. CEOs receive more equity pay and exhibit a correspondingly higher sensitivity of compensation to changes in stock price volatility. Bergstresser and Philippon (2006) find that 24.4% of CEO total pay is equity related in firms with assets greater than one billion dollars. By comparison, Anderson and Imes (2019) indicate that only 14.8% of CFO pay is equity related, suggesting that CEOs are compensated with a larger fraction of equity pay than CFOs receive. Similarly, Chava and Purnanandam (2010) find that shareholders compensate CEOs with nearly four times more risk increasing equity incentives, measured by *vega*, than CFOs receive; suggesting that CEOs possess substantially stronger incentives, on average, to engage in risk-increasing activities relative to CFOs (Coles, Daniel, Naveen 2006; Low 2009; Croci and Petmezas 2015; Athanasakou et al. 2016; Kim, Patro, Pereira 2017). Recent literature further indicates that CFO incentives primarily influence decisions requiring sophisticated financial expertise while CEO incentives focus on R&D, capital expenditures, and leverage (Coles, Daniel, Naveen 2006; Jiang, Petroni, and Wang 2010; Chava and Purnanandam 2010). These differences in CEO and CFO risk-taking incentives potentially undoubtedly affect C-suite decision-making processes, and thus affect the firm's shareholders (Graham, Harvey, and Manju Puri 2015).

I examine whether incentive differences between the CEO and CFO influence stock returns. Using portfolio and multivariate analyses, I measure incentive differences as the ratio of the CEO incentive ratio to the CFO incentive ratio. Each incentive ratio captures the dollar change in executive wealth relative to a one percent change in stock price, scaled by total compensation (Bergstresser and Philippon 2006). I then define incentive difference, also called the wedge, as CEO incentive ratio divided by the CFO incentive ratio. Positing that smaller differences in CEO and CFO incentives result in greater stock returns, I sort firm-month observations into five portfolios and use factor models to examine excess returns. The analysis indicates that firms with smaller differences in CEO and CFO equity incentives earn significantly greater returns than firms with larger differences in CEO-CFO equity incentives. Using the S&P 1500 industrial firms (excluding utilities and financial firms) from 2006 through 2016 and the Carhart (1997) four-factor model, the analysis shows that a strategy of buying the portfolio with the smallest difference in CEO-CFO incentives and shorting the portfolio with the largest difference in CEO-CFO incentives (long-short strategy) earns excess returns, or an *alpha* of between 3.13% and 4.75% per year. Multivariate analyses, after controlling for firm, industry, and time effects, corroborate the factor model results and suggest that decreasing the CEO-CFO incentive wedge from the 75th to the 25th percentile results in an annual excess return of 2.5%. The factor models and the multivariate analyses provide strong evidence that investors earn significantly greater returns in firms where CEOs and CFO receive similar equity incentives relative to firms where CEOs and CFOs have large wedges in their pay packages.

Three reasons potentially explain the positive relation between CEO-CFO pay similarities and excess stock returns. The first explanation focuses on an information asymmetry argument (Liliendfeld and Ruenzi 2014). CEOs and CFOs possess private information unavailable to outside shareholders about the firm's true value. In undervalued firms, CEOs and CFOs may voluntarily take large firm equity positions to benefit from the private information they enjoy (Lin and Howe 1990). The CEOs and CFOs decision to hold larger equity positions in undervalued firms increases the fraction of equity pay that each executive receives, resulting in a lower ratio of CEO equity pay to CFO equity pay and therefore incentive similarities. In an efficient market, CEOs and CFOs increasing their equity holdings potentially signals positive firm prospects to outside investors and results in positive abnormal stock returns as soon as the managerial ownership information becomes publicly available (Leland and Pyle 1977). Once the inside information is fully reflected in the stock price, the information asymmetry is resolved. However, in less efficient markets, outside investors may not fully price CEO and CFO ownership holdings that subsequently lead to positive excess returns. Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, and Ferrell (2009) document that the benefits of certain corporate governance mechanisms such as staggered boards, poison pills, and golden parachutes are not fully priced, leading to excess returns.

I investigate the market inefficiency explanation specifically by examining earnings surprises. I analyze whether investors and markets are surprised by the earnings announcements of firms in which the CEO and CFO possess incentive similarities. If firms with incentive similarities systematically experience earnings surprises, then excess returns may result from under reaction to publicly available compensation information. When examining quarterly earnings surprises, I find that firms where the CEO and CFO possess similar incentives experience similar frequencies and levels of earning surprises as firms with high levels of CEO-CFO incentive differences, suggesting that market inefficiency does not explain the observed excess returns.

The second explanation centers on the argument that ownership serves as an incentive mechanism that mitigates governance problems and encourages (Lilienfeld and Ruenzi 2014) managers to increase firm value. CEOs and CFOs who receive similar fractions of equity pay thus have similar incentives and are likely aligned with each other. When boards incentivize the CEO and CFO similarly, they process information similarly, prioritize similarly, and make similar decisions, arguably resulting in better decision making and superior performance relative to executives with dissimilar incentives. That is, incentive similarities between the CEO and CFO may enhance decision-making quality leading to performance benefits and positive excess stock returns.

I test this explanation by examining if excess returns (*alpha*) are persistent throughout my sample period. If performance explains why firms with incentive similarities realize excess stock returns, then I would expect that investors would learn about the benefits of performance and subsequently incorporate the benefit of incentive similarities into the stock price, causing alpha to eventually disappear. Comparing excess returns in the first half and the second half of the sample period, I find that firms with incentive similarities experience positive and statistically significant alphas both in the 2006-2010 period and in the 2011-2016 period, suggesting that performance does not explain the excess returns.

The third explanation suggests that outside shareholders demand compensation in the form of higher stock returns for bearing systematic risk stemming from incentive similarities in CEO-CFO pay. Some dissension between the CEO and CFO – stemming from incentive differences – potentially benefits shareholders (Balasubramanian and Bhardwaj 2004). One strand of literature indicates that debate among executives enhances understanding and improves decision quality (Schweiger, Sandberg, and Ragan 1986; Schwenk 1990; Amason and Schweiger 1994). Different incentives lead to different perceptions of the business environment. The subsequent exchange of information and sharing of perspectives improves management's decision-making quality that in-turn benefits shareholders (Mitroff 1982). When the board incentivizes the CEO and CFO differently, directors build-in checks and balances between C-suite executives, and CFO monitoring and oversight potentially reduces the likelihood of poor investment or financing choices. Yet, when the CEO and CFO receive similar incentives, they are more likely to agree on decisions, less likely to debate, and less likely to monitor each other; rendering a weaker internal checks-and-balances process. If so, shareholders potentially exhibit a greater risk of poor investment and financing decisions compared to executives with dissimilar incentives packages.

To test this explanation, I examine whether firms that possess incentive similarities in the C-suite invest more in R&D, capital expenditures, and acquisitions or employ a greater use of financing than their industry peers. I measure investment as the sum of research and development, capital expenditure (capex), and acquisitions divided by total assets. Financing is measured as debt to total assets. The analysis indicates that as CEOs and CFOs earn increasingly similar incentive compensation, firms invest more in R&D, capex, and acquisitions, and use more leverage relative to firms with greater disparity between CEO-CFO incentive compensation. Aggarwal and Samwick (2006) indicate that shareholders bear more risk as firms make increasingly larger investments and similarly indicate that more leverage leads to greater shareholder risk. My findings provide evidence that shareholders bear greater risk and consequently demand higher stock returns in firms where the CEO and CFO are compensated with similar fractions of equity pay. The implication is that shareholders bear risk associated with weaker checks and balances stemming from incentive similarities between the CEO and CFO. In response, outside shareholders price the CEO's and CFO's lack of monitoring into the stock price.

Although I argue that stock returns are a function of managerial compensation structure, boards arguably consider other issues in making pay decisions, suggesting that endogenous factors influence the analysis. While my primary analysis employs industry excess returns and controls for both systematic risk factors and firm specific characteristics, I subsequently address causality in a two-stage least squares framework. As an identification strategy to disentangle the effects of stock returns and compensation, I instrument for managerial pay using the geographic origin of the CEO's and CFO's surname. Executives do not choose their surnames, but their name bears a close relation to their heritage or cultural origin that plausibly influences cognition and beliefs on compensation preferences (Constant and Zimmermann 2008, Brugger, Lalive, and Zweimuller 2009, Finseraas and Kotsadam 2017). I argue that CEO and CFO teams with surnames from the same geographic region tend to hold similar attitudes towards incentives, resulting in corresponding incentive packages. CEO and CFO teams of diverse geographic backgrounds are more likely to hold disparate attitudes towards incentives, resulting in incentive differences. Corporate boards arguably display little concern for ancestry except through its impact on executive incentives. The results from the instrumental variable analysis support my primary findings that incentive similarities between the CEO and CFO result in positive excess returns.

My research contributes to the governance literature in three ways. Barron and Waddell (2003) examine executive incentives and find that executives with higher total compensation receive more equity-based incentives. Giroud and Mueller (2010, 2011) find that incentives only matter for firms in noncompetitive industries. Chava and Purnanandam (2010) indicates that CFO incentives have a greater affect than CEO incentives on decisions that require specialized financial knowledge. Kim, Li, and Zhang (2011) provide evidence that CFO equity incentives positively influence future stock price crash risk while

CEO equity incentives have little effect. Graham, Harey, and Puri (2015) find that management teams jointly make decisions but that CEOs delegate less when they possess knowledge specific to the decision. I contribute to this literature on incentives by suggesting that while boards design incentive packages to maximize shareholder value, they allow differences in equity incentives in the CEO and CFO compensation packages. My evidence is consistent with the notion that differences in equity incentives may improve monitoring and facilitate checks and balances between the CEO and CFO.

I make a second contribution by discovering that investors earn excess return in firms with CEOs and CFO's receiving similar equity incentive compensation. After ruling out performance and asymmetric information as potential explanations, my analysis suggests that shareholders bear systemically more risk when boards compensate executives with similar incentives relative to when managers receive disparate equity incentives. Outside shareholders arguably incorporate this systematic risk associated with executive incentive similarities into the firm's stock price. One interpretation of my results is that dissimilar incentives in the C-suite encourage the CEO and CFO to exchange perspectives, discuss potential decisions, and monitor one another. This monitoring reduces the probability of poor decisions and thus decreases the risk borne by shareholders. I provide evidence that firms with dissimilar incentives in the C-suite invest a smaller portion of total assets in R&D, acquisitions, and capital expenditure and employ less leverage while firms with incentive similarities between the CEO and CFO invest more and make greater use of debt financing. This suggests that systematic risk and specifically investment and leverage are the channels through which incentive differences impacts shareholder wealth.

Finally, I contribute by suggesting that the benefits of the incentive differences, which possibly include the exchange of information, monitoring, checks and balances, and subsequent superior decision-making, must be worth the costs to shareholders, otherwise boards would seek to mitigate incentive differences between the CEO and CFO. The fact that differences in incentives between CEOs and CFOs exist at all in our sample, suggests that there must be some benefits of incentive differences which accrue to shareholders.

The structure of the paper is organized as follows. Section II introduces my data, summary statistics, and methodology. Section III presents my main results in the form of a portfolio analysis and a multivariate regression analysis. Section IV investigates potential explanations of my findings and examines endogeneity concerns between incentive differences and excess returns. Section V provides supporting evidence from robustness testing. Section VI concludes the paper.

Data

Sample Selection

The sample comprises the 1,163 non-financial and non-utility firms in the S&P1500 as of January 1st, 2006. These firms are tracked through December 31st, 2016. Of the firms present at the beginning of the sample period, 750 survive through 2016. The remaining 368 firms exit because of acquisition, privatization, or bankruptcy. To control for survivorship bias, I allow firms to exit and re-enter the sample. Firm observations are merged with Compustat, Execucomp, CRSP, and family firm and return data from Kenneth French's website. I lose 47 firms that lack Compustat information, 20 firms that lack executive compensation information, 9 firms that lack ticker symbols in CRSP, 10 firms that lack family firm information, and 4 firms with missing systematic risk factors. I winsorize all independent variables at the 1% and 99% level to mitigate outlier effects. The final sample consists of 110,871 firm-month observations from 1,073 firms and 132 months over the period from January 2006 through December 2016.

I collect monthly stock market data from the Center for Research in Security Prices (CRSP). Firm characteristics and accounting data are gathered from Compustat. Compensation, experience, and position data are garnered from Execucomp. I identify CEOs based on annual titles containing the words “CEO”, “Chief Executive Officer”, or “President”. CFOs are determined based on annual titles containing the words “Chief Financial Officer”, “Chief Finance Officer”, “Finance”, “Accountant”, and “Treasurer” (Jiang, Petroni, and Wang 2010). I select one CEO and one CFO for each firm-year. In years when there is a change in management, Execucomp assigns the CEO (CFO) title to both outgoing and incoming managers. I use the CEO (CFO) with higher total compensation in my empirical analysis. However, robustness testing indicates that using the CEO (CFO) with lower total compensation does not change the results. I obtain data on executive portfolio *vegas* and *deltas* from Lalitha Naveen’s website (Coles, Daniel, and Naveen 2006).

Systematic risk factors and returns on 48 industries come from Ken French’s website. The systematic risk factors include market, size, value, and momentum (Fama and French 1993; Jegadeesh and Titman 1993; Carhart 1997). In my empirical analysis, I employ the value-weighted and equal-weighted industry excess returns. I calculate industry excess return as a security’s monthly stock return in CRSP minus the relevant industry return occurring in the same month.

Measuring Incentive Difference and Industry Excess Returns

I define incentive differences as the ratio of CEO incentives to CFO incentives. Prior literature suggests that equity pay aligns managers' and shareholders' interests and provides incentives for managers to accept positive NPV projects (Core and Larcker 2001; Aggarwal and Samwick 2003, Friedman 2016). Extant research indicates that average CEO wealth displays a correspondingly higher sensitivity to changes in firm value than average CFO wealth (Chava and Purnanandam 2010; Croci and Petmezas 2015; Athanasakou et al. 2016; Kim, Patro, Pereira 2017). Following Bergestresser and Philippon (2006), I use incentive ratio to measure executive equity pay which represents the dollar change in executive wealth associated with a one percent change in stock price scaled by total compensation. Incentive ratio captures the sensitivity of executive wealth to changes in stock price and also accounts for portion of non-equity pay; providing a comprehensive compensation measure. To measure the CEO-CFO pay gap, I use the ratio of CEO equity pay to CFO equity pay.

$$OnePct_{i,t} = .01 * Price_{i,t} * (Shares_{i,t} + Options_{i,t}) \quad (1)$$

$$Incentive\_Ratio_{i,t} = \frac{OnePct_{i,t}}{(OnePct_{i,t} + Salary_{i,t} + Bonus_{i,t})} \quad (2)$$

I calculate industry excess return, the dependent variable, as a firm *i*'s stock return in month *m* minus the average stock return of the firm's industry in month *m*. Monthly stock returns include dividends and distributions. I employ both value-weighted and equal-weighted industry returns for the 48 industries provided on Ken French's website.

$$Industry\ Excess\ Return_{i,m} = Stock\ Return_{i,m} - Weighed\ Industry\ Return_{i,m} \quad (3)$$

Table 1 provides descriptions of the control variables.

Summary Statistics

Table 2 presents summary statistics for firm-month observations. Columns 1 and 2 show sample means and standard deviations for all firm-month observations. Columns 3 and 4 display sample means and standard deviations for firm-month observations in the lowest incentive difference quintile, while columns 5 and 6 present summary statistics for the highest incentive difference quintile. Column 7 shows test statistics from difference in means tests.

Average incentive difference, measured by the log of CEO incentive ratio over CFO incentive ratio, for the low incentive difference quintile is 0.602 while average incentive differences in the highest quintile is 2.365. The average firm compensates CEOs with $4.06 million more than CFOs while firms in the top quintile pay their CEOs $3.511 million more than their CFOs. Firms with high levels of incentive differences tend to exhibit greater family ownership, less profitability, smaller size, greater financial stability, longer CEO tenure, older CEOs, younger CFOs, and lower investment than firms with low levels of incentive differences. Finally, firms in the highest quintile of incentive differences realize excess returns of -0.21% while firms in the lowest incentive difference quintile earn monthly excess returns of 0.09%. The summary statistics indicate that firms characterized by small incentive differences exhibit positive excess returns, lower family ownership, higher profitability, larger total assets, less financial stability, less managerial experience, and larger investment than firms with large differences in CEO-CFO incentives.

Construction of Portfolios

I construct five portfolios based on monthly CEO-CFO incentive differences for the factor model analysis. Portfolio 1 contains firms with the smallest incentive differences between CEO and CFO while Portfolio 5 contains firms with the largest incentive differences. Portfolios are rebalanced at the beginning of each year. While my data comes from the Execucomp, Compustat, and CRSP databases, executive compensation and ownership information are publicly available in 10-K reports, proxy statements, and registration statements filed by the company to register securities for sale to the public (SEC.gov). This means that the portfolios that I construct could be replicated, traded upon, and rebalanced monthly.

I construct monthly average returns for each of the five incentive difference portfolios. Returns are averaged by equal-weighting and value-weighting. Value-weighted portfolios are weighted according to total assets. The long-only portfolio returns are computed as the average industry excess returns of the stocks in the portfolio. The long-short portfolio is assembled by subtracting the average industry excess returns of the highest incentive difference quintile portfolio from the average industry excess returns of the lowest incentive difference quintile portfolio.

Factor Models

My primary analysis employs the Carhart (1997) four-factor model which controls for the Fama-French (1993) systematic risk factors (1993) and the Jegadeesh and Titman (1993) momentum factor.

$$Industry\ Excess\ Return_{i,m} = \alpha_i + \beta_{i,M} * mktrf_m + \beta_{i,smb} * smb_m + \beta_{i,hml} * hml_m + \beta_{i,umd} * umd_m + \varepsilon_{i,m} \quad (4)$$

The dependent variable is the industry excess return of portfolio *i* in month *m*. Market (mktrf) is the excess return of the market portfolio over the risk-free rate. Size (smb) is the difference in returns between stocks with small capitalizations and stocks with large capitalizations. Value (hml) is the difference in returns between high book-to-market and low book-to-market stocks. Momentum (umd) is the difference in returns between stocks with high recent returns and stocks with low recent returns. The four systematic risk factors are based on the CRSP universe of stocks.

Primary Analysis

Portfolio Evidence

To examine whether incentives differences between the CEO and CFO affect stock returns, I employ the Carhart (1997) four-factor model. Table 3 and 4 present coefficient estimates for the five portfolios using the log of the ratio of CEO incentive ratio to CFO incentive ratio. Portfolio 1 contains observations with the smallest difference between CEO-CFO incentive and portfolio 5 includes observations with the largest difference between CEO-CFO incentives. Table 3 shows the results for equally-weighted excess returns and Panel B presents the results for value-weighted excess returns.

The analysis indicates that differences in CEO and CFO equity incentives affect stock returns. Table 3 column 5 shows that the investors holding firms with largest difference between CEO and CFO equity incentives earn negative excess returns. Specifically, an investor pursuing a long-only strategy and holding the portfolio with largest difference in CEO-CFO incentives, underperforms the market by 0.259 basis points per month or about 3.1% per year. In contrast, the portfolio with the smallest difference in

CEO-CFO equity incentives earns returns similar to the overall market, e.g., alpha is not significantly different from zero. Excess returns exhibit a general downward trend from portfolio 1 to portfolio 5; suggesting that as the difference between CEO-CFO incentives increases, investors progressively underperform the overall market.

Column 6 presents the results from a long-short strategy that invests long in the low incentive difference portfolio (quintile 1) while holding a short position in the high incentive difference portfolio (quintile 5). The long-short strategy generates a monthly excess return of 0.261% or 3.13% per year, which is statistically significant at the 1% level. The results from the long-short strategy indicate that firms with smaller incentive differences tend to realize positive excess returns relative to firms where the CEO and CFO are compensated with different fractions of equity pay.

Table 4 displays the results of the value-weighted returns portfolio analysis. Value-weighted portfolio returns for each quintile are calculated by taking a weighted average of the industry excess returns in each month. The weighting is based on total assets; larger firms receive greater weight. I employ a portfolio analysis on value-weighted returns to examine whether the results are being driven exclusively by small firms. The first five columns present the factor alphas and factor loadings for each of the five value-weighted quintile portfolios. Portfolios 1, which consists of the firms with the lowest incentive differences, earns no excess return. Portfolio 2 earns a positive excess return of 0.151% per month or 1.8% per year. Portfolio 3 and 4 do not earn significant economic excess returns. Portfolio 5, the portfolio with the greatest incentive differences, earns an excess return of -0.358% per month or -4.3% annually, which is statistically significant at the five percent level.

The results from the value-weighted long-short strategy are presented in column 6. The long-short strategy invests long in the low incentive differences portfolio (quintile 1) while taking a short position in the high incentive differences portfolio (quintile 5). The long-short strategy generates an excess return of 0.396% per month or 4.75% annually which is statistically significant at the 5% level. The results from the long-short strategy while being slightly influenced by the excess returns in the low incentive difference portfolio, are driven primarily by the negative excess returns in the high incentive difference portfolio.

Overall, Table 3 and 4 provide evidence that after controlling for market, size, value, and momentum risk factors, firms with incentive similarities between the CEO and CFO realize significant positive excess returns relative to firms with high levels of incentive differences. My results are statistically and economically significant for the quintile with the largest differences in incentives and the long-short portfolios, which captures the difference in returns between firms with low levels of incentive differences and firms with high levels of incentive differences. These results further indicate that the excess returns associated with incentive differences are strong in large firms, but even stronger in small firms, as seen by the value-weighted and equal-weighted returns. Since the portfolio sort is based on the level of incentive differences, stemming from information announced in annual 10k reports, a long-only strategy or a long-short strategy could be implemented based on publicly available information. These equal-weighted long-short strategies yielded annual returns of 3.13% and 4.75% during the 2006-2016 sample period.

Multivariate Regression Evidence

Although prior literature indicates that the systematic risk factors in the four factor model drive returns, other firm-specific characteristics may also influence returns in manners not captured by the four systematic risk factors (Brennan, Chordia, Subrahmanyam 1998; Lilienfeld and Ruenzi 2014; need more citations). I employ multivariate regressions to assess whether, firm characteristics may drive returns in companies with low incentive differences. These regressions relate monthly excess industry returns to the current period's incentive differences and firm-specific characteristics.

I estimate the multivariate regressions using two techniques. The Fama-Macbeth regression technique involves running cross-sectional regressions of stock returns on proposed risk factors for each month and then regressing stock returns on the estimated coefficients to determine the risk-premium for each risk factor (Fama and Macbeth 1973; Pontiff and Woodgate 2008; Abhyankar and Gonzalez 2009). I also run ordinary least squares regressions and control for serial correlation and heterogeneity on the coefficient estimates by clustering standard errors at the firm level. Incentive difference is specified in two ways. I measure incentive difference as a dummy equal to one if incentive difference is in the top half of the sample and zero otherwise. I also measure incentive difference as continuous variable, log incentive difference. The firm specific controls include CEO incentive ratio, family dummy, profitability (ROA), leverage, log total assets, *z*-score, volume of shares traded, tenure, CEO age, and CFO age. I also control for time and industry fixed effects in the OLS regression specification. The regression specification is:

$$Industry\ Excess\ Return_{i,m} = \quad (5)$$

$$\alpha_i + \beta_i * Incentive\ difference_{i,m} + \beta_i * CEO\ Incentive\ Ratio_{i,m} + \beta_i * Family\ Dummy_{i,m} + \beta_i * Profitability_{i,m} + \beta_i * Leverage_{i,m} + \beta_i * Log\ Total\ Assets_{i,m} + \beta_i * Z - Score_{i,m} + \beta_i * Price_{i,m} + \beta_i * Volume_{i,m} + \beta_i * Tenure_{i,m} + \beta_i * CEO\ Age_{i,m} + \beta_i * CFO\ Age_{i,m} + \beta_i * Time\ Dummy_{i,m} + \beta_i * Industry\ Dummy_{i,m} + \varepsilon_{i,m}$$

Table 5 presents the results of the multivariate analysis. Column 1 and 2 display the Fama-Macbeth and OLS results where incentive difference is measured as a dummy variable. The Fama-Macbeth coefficient estimate on incentive difference dummy is -0.00311 and is statistically significant at the 5% level. Increasing incentive differences from the bottom half of the sample to the top half of the sample results in an industry excess return of -0.311% monthly, which corresponds to -3.73% annually. The OLS coefficient estimate on incentive difference dummy is -0.00323 and is statistically significant at the 1% level. The OLS coefficient estimate suggests that incentive differences are negatively associated with stock returns. Increasing incentive differences from the bottom half of the sample to the top half of the sample is associated with a decreased industry excess stock return of -0.323% monthly or -3.88% annually.

Column 3 and 4 provide the Fama-Macbeth and OLS results where incentive difference is measured in log form. The Fama-Macbeth coefficient estimate on log incentive difference is –0.00347 and is statistically significant at the 1% level. This indicates that increasing the log incentive difference by one-standard deviation results in a decrease in industry excess return of -0.26% monthly or -3.14% annually. Increasing the log incentive difference from the 25th percentile to the 75th percentile results in a decrease in industry excess return of -0.225% monthly or -2.7% annually. The OLS coefficient estimate on log incentive difference is -0.0034 and is statistically significant at the 1% level. The coefficient estimate suggests that a one-standard deviation increase in log incentive difference yields a decrease in industry excess return of -0.26% monthly or -3.07% annually. An increase in log incentive difference from the 25th percentile to the 75th percentile results in a decrease in industry excess return of -0.22% monthly or -2.64% annually.

The multivariate regressions corroborate the evidence from factor model analyses; specifically, that CEO-CFO incentives differences affect stock returns. After controlling for firm, time, and industry characteristics, the results indicate that firms with large differences between CEO and CFO incentive packages realize negative excess returns of -2.64% to -3.88% per year relative to firms with little differences in CEO-CFO compensation.

Explanations and Identification

Explanations for Excess Returns Associated with Incentive Similarities

I propose three potential explanations for my finding that excess returns are positively associated with incentive similarities. Firms with low levels of incentive differences generate excess returns because of exposure to systematic risk, managerial driven performance, or market inefficiency.

My primary explanation is that incentive similarities are risky for shareholders and investors demand compensation in the form of excess returns. When boards compensate

CEOs and CFOs similarly, they tend to process information concurrently and rank criteria equivalently. Managers with similar incentives also tend to hold homogenous perspectives on the business environment. This congruity in information processing make the CEO and CFO less likely to debate, less likely to monitor one another, and more likely to agree on decisions. A lack of monitoring and debating may lead CEO and CFO teams to inadvertently accept negative NPV projects. Shareholders arguably bear the risks of poor investment and financing decisions from CEOs and CFOs who possess aligned incentives and price these risks into the firm's stock price. However, dissention between the CEO and CFO, when caused by incentive differences, may benefit shareholders (Balasubramanian and Bhardwaj 2004). Dissension is beneficial to shareholders in that it leads to exchanges of information and improved decision quality (Schweiger, Sandberg, and Ragan 1986; Schwenk 1990; Amason and Schweiger 1994). Different incentives lead to different views of the firm's opportunities. The subsequent exchange of information and sharing of perspectives improves management's decision-making quality that in-turn benefits shareholders (Mitroff 1982). Incentive differences encourage the CEO and CFO to monitor one another, creating a system of checks and balances which reduce the likelihood of poor investment or financing choices thus reducing shareholder risk.

Alternatively, excess returns in firms with similarities in CEO-CFO equity pay may be driven by managerial performance. Boards employ equity pay as an incentive device to align the interests of the managers with those of the shareholders. Equity incentives may drive managers to take value increasing actions leading to improvements in firm performance. In aligning the top managers with the shareholders, the top managers are likely aligned with one another. CEOs and CFOs receiving similar fractions of equity pay in their compensation packages are more likely to hold compatible perspectives and agree on decisions made jointly. Thus, similarities in equity pay between the CEO and CFO arguably lead to improved decision making and performance benefits. These performance benefits, if unanticipated by outside shareholders, would result in excess returns.

A third potential explanation for the presence of excess returns in high incentive difference firms is information asymmetry (Liliendfeld and Ruenzi 2014). While shareholders require CEOs and CFOs to hold equity in the company in the form of restricted stock and unvested stock options, CEOs and CFOs may voluntarily choose to own more equity than is required. As insiders, CEOs and CFOs are often better informed than outside shareholders about the true value of the firm. In firms that are undervalued, CEOs and CFOs may choose to hold larger ownership positions in the firm to benefit from private information (Lin and Howe 1990). The CEOs and CFOs decision to hold larger equity positions in undervalued firms increases the fraction of equity pay that each executive receives, resulting in a lower ratio of CEO equity pay to CFO equity pay and therefore incentive similarities. Therefore, incentive similarities or differences stemming from the CEOs and CFOs voluntary equity holdings may convey information about the firm's investment opportunity set (Leland and Pyle 1977). In an efficient market, stock prices reflect such information as soon as it becomes publicly available. Once the inside information is fully reflected in the stock price then the information asymmetry is resolved. However, in less efficient markets, outside investors may not fully price CEO and CFO ownership holdings which subsequently result in positive excess returns. Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, and Ferrell (2009) document that the benefits of certain corporate governance mechanisms such as staggered boards, poison pills, and golden parachutes are not fully priced, leading to excess returns.

I investigate these three potential channels. The first test examines whether firms with incentive similarities respond to the equity incentives of the CEO and CFO by taking greater risks in the form of more investment or riskier financing. Results indicating firms that compensate CEOs and CFOs similarly make greater investment or employ greater use of debt financing would be consistent with the explanation that incentive similarities are a priced risk factor. The second assesses if excess returns are persistent throughout the sample period. If the excess returns of firms with incentive similarities can be explained by outperformance, then I would expect that at some point in the sample period, investors would learn about the benefits of incentive similarities and price it into the stock returns, causing significant excess returns to eventually disappear. Therefore, I would expect to see a large and significant alpha in the early sample and a diminishing alpha in the later sample. The third test examines whether firms with low levels of incentive differences exhibit less information efficiency than firms with high levels of incentive differences. In inefficient markets, CEOs and CFOs who manage undervalued firms may increase their equity holdings to take advantage of private information (Lin and Howe 1990). If markets are inefficient than these firms would be characterized by CEO-CFO incentive similarities and positive abnormal returns resulting from the inside information of the managers. If excess returns in firms with incentive similarities can be explained by information asymmetry, then I would expect these firms with low differences in incentives to realize positive abnormal returns during earnings announcements.

Table 8 presents the results of the impact of incentive differences on investment and financing. Investment is calculated as the sum of research and development, capital expenditure, and acquisitions scaled by total assets. Leverage is measured as long-term debt divided by total assets. I employ the Fama-Macbeth estimation technique. Incentive difference is specified as a dummy variable and in log form and is discussed above. The firm specific characteristics controlled for in the regressions include CEO incentive ratio, family dummy, profitability (ROA), leverage, log total assets, z-score, volume, tenure, CEO age, and CFO age. I also control for time- and industry-fixed effects in both regression techniques. Robust standard errors are clustered at the firm level.

Columns 1 and 2 display the Fama-Macbeth results of investment on incentive differences. In column 1, the coefficient estimate on incentive difference dummy is -0.00801 and is statistically significant at the 1% level. The coefficient estimate on log incentive difference, in column 2, is -0.00658 which is statistically significant at the 1% level. These Fama-Macbeth results suggest that each year, firms with incentive differences in the top half of the sample invest -0.8% less of total assets in R&D, capital expenditures, and acquisitions which corresponds to a -7.7% decrease in investment relative to firms with incentive differences in the bottom half of the sample. A one standard deviation difference in incentives is associated with a decrease in investment of -0.658% of total assets, which corresponds to a decrease in investments of -4.8% annually. These results indicate that firms with higher incentive differences invest a lower proportion of total assets while firms with incentive similarities invest a larger fraction of total assets into R&D, capital expenditures, and acquisitions.

Columns 3 and 4 present the Fama-Macbeth results of leverage on incentive differences. Column 1 displays the coefficient estimates of the regression of leverage on incentive difference dummy. The coefficient estimate is -0.1% and is statistically insignificant. Column 2 displays the coefficient estimates of the regression of leverage on log incentive difference. The coefficient is -0.697% and is statistically significant at the 1% level. The results indicate that a one standard deviation increase in log incentive difference yields a decrease of -0.52% in the firm's use of long-term debt scaled by total assets which corresponds to a -2.7% reduction in leverage. Taken together, the results from the analyses of the impact of incentive differences on investment and leverage indicates that firms with large differences in executive incentives invest lower fractions of total assets in R&D, capital expenditure, and acquisitions, and employ less leverage than firms with small differences in executive incentives. Therefore, shareholders bear greater risk from the investment and financing decisions of firms with small incentive differences than from firms with large incentive differences.

Next, I examine the persistence of excess returns throughout the sample period. Table 9 displays the results of my equal-weighted portfolio analysis. Firm-month observations are again sorted into quintiles based on the level of incentive differences in the current year. I use the Carhart (1997) four factor model to control for market, size, value, and momentum systematic risk factors. The analysis is broken up into two sub-periods. Columns 1-4 show the analysis for the January 2006 through June 2011 sub-period. Columns 5-8 present the results for the July 2011 through December 2016 sub-period.

For the first half of the sample, the alpha coefficient estimate for the lowest incentive difference portfolio (column 1) is 0.00194, which corresponds to an excess return of 2.33% per year. The alpha coefficient estimate on the highest incentive difference portfolio (column 5) is -0.00188 indicating a negative excess return of -2.26% per year. The long-short portfolio has an alpha coefficient estimate of 0.0038, which is statistically significant and equates to an excess return of 4.56% per year. In the second half of the sample, the coefficient estimate for alpha on the lowest incentive difference portfolio (column 1) is -0.00198, which corresponds to a negative excess return of -2.37% per year. The highest incentive difference portfolio (column 5), presents a coefficient estimate of -0.0037, which represents an annual excess return of -4.44% and is statistically significant. The long-short portfolio realizes a coefficient estimate of 0.0017, which corresponds to a negative excess return of 2.09% per year but is statistically insignificant.

The long-short portfolio realizes an excess return of 4.56% in the first half of the sample and 2.09% in the second half of the sample. While the economic magnitude and statistical significance decline in the second half of the sample, the evidence is not strong enough to support the statement that investors have fully priced the benefits of incentive similarities into stock prices. It appears that alpha is persistent throughout the sample period. Thus, I conclude that either investors are unaware that incentivizing the CEO and CFO with similar fractions of equity pay yields outperformance or excess returns in low incentive difference firms are not driven by outperformance.

Next, I employ an event study of quarterly earnings announcements. I examine whether firms with small differences in incentives realize positive abnormal returns during earnings announcements relative to firms with large incentive differences. If firms with smaller incentive differences do realize positive abnormal announcement returns then they may possess less informational efficiency, which would explain why incentivize similarities is associated with excess returns. I find that firms with small differences in incentives appear to have the same informational efficiency as firms with large differences in incentives. These results suggest that the reason why firms with small differences in incentives realize positive abnormal returns cannot be explained by information asymmetry.

Taken together, my results indicate that incentive similarities are positively associated with investment and leverage that shareholders bear greater risk from firms with small incentive differences than from firms with large differences in CEO and CFO incentives. The results from the subperiod analysis indicates that the alpha is positive and economically significant in the first and second half of the sample, although not statistically significant in the second half of the sample. The earnings surprise results indicate that firms with low levels of incentive differences possess the same level of information efficiency as firms with high levels of incentive differences which does not support the information asymmetry explanation. This evidence suggests that excess stock returns serve as compensation to shareholders for bearing systematic risks stemming from incentive similarities.

Identification strategy

My findings suggest that incentive similarities influence the risk borne by shareholders and thus the firm's stock returns. The evidence indicates that incentive similarities are positively associated with future excess returns. My argument presupposes that stock returns are a function of managerial incentive differences.

However, my findings may be endogenous if an omitted variable is correlated with incentive difference and is also driving excess stock returns. For example, CEOs with dominant personalities may negotiate higher wages for themselves while encouraging "competitive atmospheres" in which case the dominance of the CEO may drive stock returns and yet be correlated with incentive differences. The results from table 1, which categorizes incentive differences into quintiles, indicate that CEOs in firms with high levels of incentive differences have longer tenure, work for larger firms, and are less likely to be family-controlled firms. This evidence would be consistent with the notion that dominant CEOs experience incentive similarities and work for firms which generate excess stock returns.

To account for underlying endogeneity in the analysis, my identification strategy employs CEO ancestral heritage as an instrumental variable for incentive differences. Intuitively, an individual's ancestry influences their identity, worldviews, and social preferences, as well as how they treat others (Pan, Siegel, and Wang 2015). Prior literature provides evidence that executive ancestry impacts corporate outcomes such as performance and investment (Pan, Siegel, and Wang 2015; Nguyen, Hagendorff, and Eshraghi 2017). McCrae and Terracciano (2005) find clear differences in personality factors across European, American, Asian, and African cultures, suggesting that personalities vary across cultures. Following Anderson and Imes (2018), I obtain executive ancestral heritage by using the CEO's surname and searching *ancestry.com* to find the geographic region most heavily associated with the family name. Within my sample, 96% of CEOs can trace their surname to European heritage. Europe enjoys an eclectic mix of cultures and ethnicities. For example, England was invaded and occupied by the Romans in the 1st century, Vikings in the 8th century, and Normans in the 11th century. Spain was occupied by the Moors in the 8th century. The Ottoman Empire controlled Greece during the 14th through 17th centuries. Athanasopoulos et al. (2015) suggest that the English hold different social views than the Dutch and Germans. Consequently, I subdivide Europe into six regions which include Northern Europe, Central Europe, Southern Europe, Eastern Europe, Western Europe, and Scandinavia. The remaining 4% of CEOs derive their ancestry from South Asia, East Asia, Australia, and Central America.

Table 10 shows the results of the two-stage least squares variable (2SLS-IV) regression. Column 1 and 2 display the first stage regressions. Column 1 presents the coefficient estimates for the regression of incentive difference dummy on the cultural instruments. Column 2 displays the coefficient estimates for the regression of log incentive difference on the cultural instruments. The results suggest that executives with ancestral heritage from Northern Europe, Central Europe, Scandinavia, Western Europe, East Asia, and the Middle East bear high levels of incentive differences. Executives with African heritage display low levels of incentive differences. Additionally, cultural heritage from Southern Europe, Eastern Europe, South Asia, Central America appear to have no relation with incentive differences. Anecdotally, executives with ancestry from the Middle East and East Asia appear to possess the highest levels of incentive differences.

Column 3 displays the second stage regression results employing the fitted value of incentive difference dummy. Using ancestral heritage as an instrumental variable, I find a statistically significant and positive relation between incentive differences and excess returns. The coefficient on incentive difference dummy is 0.0156 and is statistically significant at the 5% level. This suggests that firms with incentive differences in the top half of the sample realize excess returns of 1.56% per month, above firms in the bottom half of the sample. This estimate seems large. However, in Column 4, I examine the relation between excess returns and the fitted value of log incentive differences. The coefficient estimate on log incentive ratio is 0.456% and is statistically significant at the 5% level. The evidence from the log incentive difference 2SLS indicates that a one-standard deviation increase in incentive differences results in a monthly excess return of 0.87%, which corresponds to an annual excess return of 10.44%. Overall, the evidence from my identification strategy provides support for my hypothesis that incentive differences positively impacts future stock returns.

Robustness of Main Results

I conduct several robustness tests to corroborate the evidence from the primary analyses. The first robustness test is to replicate the portfolio analysis with an alternative measure of stock returns. While industry excess return is perhaps the more rigorous measure of returns, because the benchmark is the stock returns of the industry, prior literature uses excess return which is calculated as monthly stock return minus the return on a one-month treasury security. As in the main results, firm-month observations are sorted into quintiles based on the level of incentive differences in the current year. I construct an equal-weighted and value-weighted portfolio for each of the five quintiles. Value-weighted portfolios are weighted according to total assets. Systematic risk factors from the Carhart (1997) four-factor model include market, size, value, and momentum.

Table 6 and 7 display the results of my portfolio analysis with an alternate dependent variable. Table 6 shows the results from the equal-weighted portfolio analysis. Portfolio 1, the portfolio with the lowest levels of incentive differences, generates a monthly excess return of 0.0005% or about 0.6% annually, which is statistically insignificant. Portfolio 5, the portfolio with the highest level of incentive difference, generates a monthly excess return of about -0.186% which is about -2.23% annually and is statistically significant at the 5% level. Portfolio 6 is a long-short portfolio which invests long in the low incentive difference portfolio (1) and short in the high incentive difference portfolio (5). Portfolio 6 generates a statistically significant excess return of 0.238% monthly or 2.86% annually.

Table 7 presents the results of the value-weighted portfolio analysis. Portfolio 1, the low incentive difference portfolio, realizes a monthly excess return of 0.118% which is statistically insignificant. Portfolio 5 generates a statistically significant monthly excess return of -0.303% which is about -3.64% annually. The monthly excess return of the long-short portfolio in column 6 is 0.423% monthly and about 5.08% annually, and is statistically significant at the 5% level.

The results of my robustness testing, employing excess return as the dependent variable, support the main results both in sign and magnitude. Firms with low levels of incentive differences generate higher stock returns than firms with high levels of incentive differences. My robustness tests indicate that the long-short portfolio generates excess return between 2.86% and 5.08% annually, which is consistent with the 3.13% to 4.75% annual returns I find in the main results.

Conclusion

This research investigates the relation between CEO-CFO incentive similarities and stock market returns. Compensation committees devise compensation packages with the objective of aligning manager and shareholder interests. In devising CEO and CFO compensation packages, CEOs often end up with larger equity incentives than CFOs receive. However, in a nontrivial fraction of firms, CEOs and CFOs receive similar fractions of equity pay in their compensation packages. This similarity in equity pay may create risk for shareholders. Shareholders arguably show concern about the incentive alignment of CEOs and CFOs. CEO of Perrigo Joseph Papa stated that he doesn't want a CFO who agrees with every idea he suggests. CEO and CFO teams may function best when their incentives are divergent, leading to a system of checks and balances in their joint decision making. Differences in incentives and perspectives may facilitate exchanges of information and enhanced discussion that improve decision making in the C-suite. However, in cases when the CEO and CFO receive similar incentives, they may fail to monitor one another, leading to suboptimal decisions. I thus hypothesized that firms with similarities in equity incentives between the CEO and CFO generate excess returns.

My analysis provides evidence that low incentive difference firms do realize excess returns. Evidence from the portfolio analysis suggests that a long-short portfolio generates excess returns of 4.75% in value-weighted portfolios and 3.13% in equal-weighted portfolios. Results from the multivariate analysis indicate that increasing incentive differences from the 25th percentile to the 75th percentile results in negative excess returns of between -2.64% and -2.7% per year, after controlling for firm specific factors. My findings further indicate that investment and leverage are positively associated with incentive similarities, that excess returns remain persistent in the latter half of the sample period, and that low incentive difference firms possess the same level of information efficiency as high incentive difference firms. This evidence indicates that the excess returns associated with incentive similarities are being driven by exposure to systematic risk rather than performance or market inefficiency. To the best of my knowledge, this is the first paper to provide evidence that shareholders demand compensation in the form of higher stock returns, for bearing incentive similarity risk.

Employing CEO and CFO ancestral heritage as an instrument for incentive differences, my identification strategy indicates that the results are robust to omitted variable biases. I find support for the relation between CEO and CFO incentive similarities and positive excess stock returns both from the portfolio and the pooled times series analyses. The results also are robust to model specifications (Fama-Macbeth and OLS), alternative measures of excess returns, and industry- and time-fixed effects.

Overall, my results suggest that firms with similarities in CEO and CFO equity incentives generate excess returns. My empirical analyses indicate that excess returns are driven by exposure to risk associated with incentive similarities, rather than incentive similarities causing outperformance or being mispriced by market participants. On a policy note, my analysis contributes to compensation committee decisions in determining executive incentives. While compensation contracts are generally designed to align manager interests with those of the shareholder and thus maximize firm value, my analysis suggests that above a certain level, compensation schemes which incentivize CEOs and CFOs differently may be beneficial to shareholder value.

Table I Variable Definitions and Measurements	
Industry Excess Return	A firm's stock return minus the equal or value weighted return of its industry, based on the Fama-French 48 industry factors, in a given month
Incentive Ratio	The dollar change in an executive's wealth associated with a one percent change in stock price, scaled by annual total compensation.
Incentive Difference	The difference in equity incentives between the CEO and CFO measured as the log of (CEO Incentive ratio/CFO Incentive Ratio)
Dif Total Comp	The difference in annual total compensation between the CEO and CFO
Family Firm	A dummy variable equal to one if a family owns at least 5% of a firm's outstanding shares
Profitability (ROA)	A measure of profitability calculated as EBIT/Total Assets
Leverage	The fraction of long-term debt over total assets
Size (Log Assets)	A measure of firm size calculated as Log of Total Assets
Z-score	A measure of the bankruptcy developed by Altman (1968). Z = 1.2*working capital/total assets + 1.4*retained earnings/total assets + 3.3*EBIT/total assets + 0.6*market value of equity/book value of total liabilities + 1.0*sales/total assets.
Price	The Price in dollars of one share of the firm's stock
Volume	The number of shares of stock that are traded in a given year
Tenure	The number of years that the CEO has held the office of CEO at his or her firm
CEO Age	The Age of the CEO, a proxy for CEO experience
CFO Age	The Age of the CFO, a proxy for CFO experience
Investment	(Capital Expenditure + R&D + acquisitions) / total assets
Ancestry	Dummy variables based on ancestral origin. The country most commonly associated with a CEO's surname in ancestry.com is considered to best represent the CEOs cultural heritage.

Table 2 Summary Statistics

	Full Sample		Bottom Quintile		Top Quintile		
	mean	St.dev	mean	St.dev	mean	St.dev	T-test
industry excess return	0.0005	0.088	0.0009	0.0894	-0.002	0.093	3.421
Log Ratio	1.254	0.697	0.602	0.159	2.365	0.733	-3.5
CEO Incentive Ratio	0.313	0.227	0.194	0.181	0.402	0.276	-93.8
CFO Incentive Ratio	0.157	0.14	0.224	0.187	0.05	0.045	134.6
dif total comp	4060.4	4312.5	3387.3	4209.2	3511.6	4362	-3.04
Family Dummy	0.349	0.477	0.33	0.47	0.52	0.499	-40.3
Profitability	0.095	0.085	0.097	0.092	0.09	0.087	8.089
Leverage	0.193	0.162	0.179	0.155	0.178	0.171	0.84
Log Total Assets	7.912	1.508	7.867	1.543	7.574	1.417	20.83
Z-Score	4.307	3.285	4.394	3.329	4.6	3.532	-6.27
Price	39.972	32.176	40.035	31.853	35.724	31.91	14.23
Volume	493k	889k	505k	944k	438l	90175	7.727
Tenure	6.78	7.09	4.152	5.51	9.74	9.23	-77.4
CEO Age	62.51	7.1	61.49	7.02	63.6	8.08	-29.9
CFO Age	57.71	6.5	59.1	6.67	56.69	6.83	37.3
Investment	0.104	0.086	0.102	0.083	0.099	0.085	2.663

Table 2 presents summary statistics for the variables employed in my analysis. The sample consists of 110,871 firm-month observations from 1073 firms. The sample begins in 2006 and ends in 2016. Columns 1 and 2 summarize the full sample. Columns 3 and 4 display statistics for the quintile with the lowest level of incentive differences. Columns 5 and 6 display statistics for the quintile with the highest level of incentive differences. Column 7 provides test statistics from difference in means tests. Incentive difference is measured as the log of the fraction of CEO total compensation that is equity related divided by the fraction of total CFO compensation that is equity related. Monthly industry excess returns are based on the Fama-French 48 industry classification.

Table 3: Portfolio Regressions

Panel A: Equal Weighted Portfolios

	Dependent Variable = Portfolio Industry Excess Returns					
Quintile	1	2	3	4	5	5-1
Alpha	0.0001	0.00149	0.0001	-0.00099	-0.00259	0.00261
	(0.029)	**(2.669)**	(0.0118)	(-1.379)	**(-3.891)**	**(2.818)**
Market	0.0430	0.0484	0.059	0.0795	0.0137	-0.0295
	(2.374)	**(3.168)**	**(3.559)**	**(4.138)**	(0.775)	(-1.116)
Size	0.416	0.371	0.376	0.479	0.521	0.105
	(11.47)	**(12.07)**	**(13.15)**	**(13.38)**	**(18.45)**	**(2.317)**
Value	0.216	0.117	0.184	0.231	0.223	0.00779
	(4.927)	**(5.567)**	**(7.108)**	**(7.956)**	**(7.640)**	(0.169)
Momentum	-0.0553	-0.0735	-0.0465	-0.0856	-0.0685	-0.0134
	(-2.482)	**(-4.030)**	**(-3.835)**	**(-3.459)**	**(-5.098)**	(-0.530)
Average Portfolio Size	153.51	148.94	151.21	150.99	151.39	151.39
Observations	132	132	132	132	132	132
R-squared	0.774	0.787	0.799	0.825	0.820	0.049

Panel A presents coefficient estimates from the Carhart (1997) four factor model for equal-weighted incentive difference portfolios. Portfolios are constructed based on the log of the fraction of CEO total compensation that is equity related divided by the fraction of total CFO compensation that is equity related. I sort observations for each year and month into five quintile portfolios, based on incentive differences. Quintile 5 possesses observations with the highest levels of incentive differences while Quintile 1 includes observations with the lowest levels of incentive differences. Column 6 displays a long-short portfolio where long positions are taken in the quintile with the largest level of incentive differences and short positions are taken in the quintile with the smallest amount of incentive differences. Monthly alphas and factor loadings are presented. The dependent variable is monthly industry excess returns based on the Fama-French 48 industry classification. T-statistics are in parentheses.

Table 4: Portfolio Regressions

Panel B: Value Weighted Portfolios

	Dependent Variable = Portfolio Industry Excess Returns					
Quintile	1	2	3	4	5	5-1
Alpha	0.000386	0.00151	0.000427	-0.0001	-0.00358	0.00396
	(0.484)	**(2.381)**	(0.447)	(-0.142)	**(-3.006)**	**(2.665)**
Market	0.0139	0.0636	0.0308	0.102	0.0653	0.0517
	(0.658)	**(4.179)**	(0.804)	**(3.168)**	**(2.222)**	(1.346)
Size	-0.0935	-0.0311	-0.0988	0.0589	0.0887	0.182
	(-2.729)	(-1.045)	**(-2.840)**	(1.231)	(1.692)	**(2.655)**
Value	0.0522	0.117	0.0880	0.162	0.0808	0.0288
	(1.855)	**(5.302)**	(1.474)	**(3.863)**	(1.579)	(0.472)
Momentum	-0.0178	-0.0510	-0.0504	-0.0746	-0.0795	-0.0613
	(-1.105)	**(-3.257)**	**(-2.806)**	**(-2.111)**	**(-2.909)**	(-1.922)
Average Portfolio Size	153.51	148.94	151.2	150.99	151.39	151.39
Observations	132	132	132	132	132	132
R-squared	0.089	0.431	0.201	0.445	0.247	0.153

Panel B presents coefficient estimates from the Carhart (1997) four factor model for value-weighted incentive difference portfolios. Portfolios are constructed based on the log of the fraction of CEO total compensation that is equity related divided by the fraction of total CFO compensation that is equity related. I sort observations for each year and month into five quintile portfolios, based on incentive differences. Quintile 5 possesses observations with the highest levels of incentive differences while Quintile 1 includes observations with the lowest levels of incentive differences. Column 6 displays a long-short portfolio where long positions are taken in the quintile with the largest level of incentive differences and short positions are taken in the quintile with the smallest amount of incentive differences. Monthly alphas and factor loadings are presented. The dependent variable is monthly industry excess returns based on the Fama-French 48 industry classification. T-statistics are in parentheses.

Table 5: Multivariate Analysis

	Dependent Variable = Industry Excess Return			
	FM	OLS	FM	OLS
VARIABLES	1	2	3	4
Incentive Dif Dummy	-0.00311	-0.00323		
	(-5.104)	**(-5.909)**		
Incentive Difference			-0.00347	-0.00340
			(-5.981)	**(-7.195)**
CEO Incentive Ratio	0.0213	0.0230	0.0236	0.0249
	(6.599)	**(13.73)**	**(6.532)**	**(14.96)**
Family Dummy	0.000105	0.000473	0.000405	0.000803
	(0.169)	(0.796)	(0.661)	(1.336)
Profitability	0.0198	0.0206	0.0187	0.0195
	(1.935)	**(3.937)**	(1.835)	**(3.721)**
Leverage	-0.00228	-0.00135	-0.00276	-0.00179
	(-0.556)	(-0.495)	(-0.669)	(-0.658)
Log Total Assets	-0.00186	-0.00183	-0.00222	-0.00218
	(-1.467)	**(-2.798)**	(-1.749)	**(-3.332)**
Z-Score	0.0001	0.000108	0.0001	0.0001
	(0.445)	(0.818)	(0.260)	(0.712)
Volume	-0.0001	-0.0001	-0.0001	-0.0001
	(-2.328)	**(-5.097)**	**(-2.342)**	**(-4.708)**
Tenure	-0.000174	-0.000213	-0.000161	-0.000201
	(-2.898)	**(-4.245)**	**(-2.751)**	**(-4.011)**
CEO Age	-0.0001	0.0001	-0.0001	0.0001
	(-0.192)	(0.111)	(-0.206)	(0.0230)
CFO Age	0.0001	0.0001	0.000106	0.0001
	(2.357)	(1.708)	**(2.222)**	(1.649)
Industry/Time FE	Yes	Yes	Yes	Yes
Constant	-0.00960	0.0195	-0.00683	0.0221
	(-2.340)	**(3.952)**	(-1.667)	**(4.443)**
Observations	102,555	102,555	102,555	102,555
R-squared	0.047	0.033	0.048	0.033
Number of groups	132		132	

This table presents coefficient estimates from the Fama-Macbeth (1973) and OLS regressions. The dependent variable is monthly industry excess returns based on the Fama-French 48 industry classification. The independent variables include Incentive Differences Dummy and Incentive Difference. Incentive difference is the log of the fraction of CEO total compensation that is equity related divided by the fraction of total CFO compensation that is equity related. Incentive difference dummy is equal to one if incentive difference is in the top half of the sample and equal to zero if otherwise. Control variables include CEO incentive ratio, Family Dummy, Profitability (ROA), Leverage, Log Total Assets, Z-Score, Volume, Tenure, CEO Age, and CFO Age. All regressions contain industry and time fixed effects. Standard errors are clustered at the firm level to control for serial correlation and heterogeneity.

Table 6: Portfolio Regressions Robustness

Panel A: Equal Weighted Portfolios

	Dependent Variable = Excess Returns					
Quintile	1	2	3	4	5	5-1
Alpha	0.000509	0.00242	0.00107	0.0001	-0.00186	0.00238
	(0.577)	**(3.093)**	(1.385)	(0.0958)	**(-2.016)**	**(2.395)**
Market	1.054	1.050	1.070	1.083	1.018	-0.0358
	(47.68)	**(53.15)**	**(63.52)**	**(44.96)**	**(40.80)**	(-1.249)
Size	0.610	0.558	0.563	0.700	0.709	0.0995
	(14.26)	**(14.37)**	**(15.62)**	**(15.13)**	**(17.00)**	**(2.110)**
Value	0.130	0.00809	0.0713	0.119	0.145	0.0134
	(2.232)	(0.208)	(1.959)	**(2.975)**	(3.485)	(0.238)
Momentum	-0.0889	-0.0773	-0.0695	-0.106	-0.0932	-0.00424
	(-3.414)	**(-3.966)**	**(-3.711)**	**(-2.733)**	**(-4.236)**	(-0.155)
Average Portfolio Size	153.51	148.94	151.21	150.99	151.39	151.39
Observations	132	132	132	132	132	132
R-squared	0.972	0.974	0.975	0.970	0.968	0.040

Panel A presents coefficient estimates from the Carhart (1997) four factor model for equal-weighted incentive difference portfolios. Portfolios are constructed based on the log of the fraction of CEO total compensation that is equity related divided by the fraction of total CFO compensation that is equity related. I sort observations for each year and month into five quintile portfolios, based on incentive differences. Quintile 5 possesses observations with the highest levels of incentive differences while Quintile 1 includes observations with the lowest levels of incentive differences. Column 6 displays a long-short portfolio where long positions are taken in the quintile with the largest level of incentive differences and short positions are taken in the quintile with the smallest amount of incentive differences. Monthly alphas and factor loadings are presented. The dependent variable is monthly excess returns above the treasury bill rate. T-statistics are in parentheses.

Table 7: Portfolio Regressions Robustness

Panel B: Value Weighted Portfolios

	Dependent Variable = Excess Returns					
Quintile	1	2	3	4	5	5-1
Alpha	0.00118	0.00154	0.00100	0.00108	-0.00303	0.00423
	(0.890)	(1.170)	(0.911)	(0.875)	(-1.949)	**(2.061)**
Market	0.994	1.087	1.010	1.100	1.100	0.107
	(28.63)	**(32.00)**	**(27.98)**	**(32.47)**	**(30.40)**	**(2.029)**
Size	-0.0798	-0.0144	0.0296	0.144	0.193	0.272
	(-1.206)	(-0.221)	(0.634)	**(2.603)**	**(2.445)**	**(2.604)**
Value	0.0619	0.214	-0.0298	0.0238	-0.0818	-0.144
	(1.288)	**(3.973)**	(-0.445)	(0.453)	(-1.110)	(-1.552)
Momentum	-0.0190	-0.0681	-0.0858	-0.0268	-0.102	-0.0824
	(-0.712)	**(-2.096)**	**(-2.850)**	(-0.780)	**(-2.590)**	(-1.761)
Average Portfolio Size	153.51	148.94	151.2	150.99	151.39	151.39
Observations	132	132	132	132	132	132
R-squared	0.897	0.923	0.937	0.933	0.897	0.159

Panel B presents coefficient estimates from the Carhart (1997) four factor model for value-weighted incentive difference portfolios. Portfolios are constructed based on the log of the fraction of CEO total compensation that is equity related divided by the fraction of total CFO compensation that is equity related. I sort observations for each year and month into five quintile portfolios, based on incentive differences. Quintile 5 possesses observations with the highest levels of incentive differences while Quintile 1 includes observations with the lowest levels of incentive differences. Column 6 displays a long-short portfolio where long positions are taken in the quintile with the largest level of incentive differences and short positions are taken in the quintile with the smallest amount of incentive differences. Monthly alphas and factor loadings are presented. The dependent variable is monthly excess returns above the treasury bill rate. T-statistics are in parentheses.

Table 8: Investment and Leverage Mechanism

VARIABLES	Dep Variable = Investment 1	2	Dep Variable = Leverage 3	4
Incentive Difference Dummy	-0.00801		-0.00106	
	(-12.58)		(-1.371)	
Incentive Difference		-0.00658		-0.00697
		(-7.542)		**(-8.117)**
CEO Incentive Ratio	0.0388	0.0427	-0.00211	0.00315
	(21.41)	**(20.81)**	(-0.389)	(0.538)
Family Dummy	-0.0120	-0.0114	-0.0143	-0.0132
	(-13.41)	**(-13.64)**	**(-29.62)**	**(-23.65)**
Profitability	-0.145	-0.147	0.480	0.478
	(-16.20)	**(-16.77)**	**(31.16)**	**(31.11)**
Leverage	0.0146	0.0145		
	(3.110)	**(3.029)**		
Size	-0.0195	-0.0201	0.0333	0.0320
	(-24.10)	**(-24.72)**	**(43.94)**	**(41.67)**
Z-Score	0.00196	0.00193	-0.0302	-0.0303
	(7.112)	**(6.780)**	**(-54.84)**	**(-54.73)**
Volume	0.0001	0.0001	-0.0001	-0.0001
	(14.79)	**(14.89)**	**(-19.94)**	**(-18.87)**
Tenure	**0.000722**	**0.000720**	**0.00158**	**0.00166**
	(22.33)	**(20.83)**	**(22.80)**	**(28.23)**
CEO Age	-0.00129	-0.00128	-0.00120	-0.00121
	(-33.75)	**(-32.78)**	**(-16.53)**	**(-16.51)**
CFO Age	-0.000234	-0.000205	-0.000993	-0.00109
	(-7.291)	**(-6.033)**	**(-11.88)**	**(-11.50)**
Industry/Time FE	No	No	No	No
Constant	0.198	0.199	0.388	0.401
	(59.93)	**(49.33)**	**(47.85)**	**(42.83)**
Observations	102,555	102,555	102,555	102,555
R-squared	0.063	0.065	0.320	0.321
Number of groups	132	132	132	132

This table presents coefficient estimates from the Fama-Macbeth (1973) regressions. The dependent variables are investment and leverage. Investment is measured as acquisitions + capital expenditure + research and development scaled by total assets. Leverage is calculated as long-term debt over total assets. The independent variables include Incentive Differences Dummy and Incentive Difference. Incentive difference is the log of the fraction of CEO total compensation that is equity related divided by the fraction of total CFO compensation that is equity related. Incentive difference dummy is equal to one if incentive difference is in the top half of the sample and equal to zero if otherwise. Control variables include CEO incentive ratio, Family Dummy, Profitability (ROA), Leverage, Log Total Assets, Z-Score, Volume, Tenure, CEO Age, and CFO Age. All regressions contain industry and time fixed effects. Standard errors are clustered at the firm level to control for serial correlation and heterogeneity.

Table 9: Sub Period Portfolio Regressions								
	Equal Weighted Portfolios Jan 2006 - June 2011				Equal Weighted Portfolios July 2011 – Dec 2016			
	Dependent Variable = Portfolio Industry Excess Returns				Dependent Variable = Portfolio Industry Excess Returns			
Quintile	1	3	5	5-1	1	3	5	5-1
Alpha	0.0019	0.0017	-0.001	-0.003	-0.002	0.0001	-0.003	-0.002
	(1.67)	(1.56)	(-1.59)	**(-2.23)**	(-1.48)	(0.03)	**(-3.1)**	(-1.0)
Market	0.0453	0.131	-0.005	-0.051	0.0577	0.0241	0.104	0.0467
	(1.21)	**(4.31)**	(-0.14)	(-0.9)	(1.47)	(0.79)	**(3.02)**	(0.77)
Size	0.497	0.342	0.427	-0.070	0.345	0.402	0.466	0.121
	(9.13)	**(7.1)**	**(10.53)**	(-0.93)	**(6.70)**	**(6.81)**	**(7.75)**	(1.79)
Value	0.183	0.111	0.172	-0.009	0.276	0.168	0.321	0.0452
	(3.29)	**(2.28)**	**(3.652)**	(-0.16)	**(5.25)**	**(2.76)**	**(5.49)**	(0.58)
Momentum	-0.095	-0.036	-0.086	0.0085	-0.084	0.0385	-0.040	0.0435
	(-5.9)	**(-3.01)**	**(-7.01)**	(0.403)	(-1.63)	(0.82)	(-1.00)	(0.60)
Portfolio Size	153.51	151.21	151.39	151.39	153.51	151.21	151.39	151.39
Observation	36	36	36	36	36	36	36	36
R-squared	0.864	0.847	0.810	0.118	0.846	0.796	0.888	0.176

Table 9 presents the sub period (Jan 2006 - June 2011 and July 2011 - Dec 2016) coefficient estimates from the Carhart (1997) four factor model for equal-weighted incentive difference portfolios. I sort observations for each year and month into five quintile portfolios, based on the ratio of CEO incentive ratio to CFO incentive ratio. Quintile 5 possesses observations with the highest levels of incentive differences while Quintile 1 includes observations with the lowest levels of incentive differences. Columns 4 and 8 displays a long-short portfolio where long positions are taken in the quintile with the lowest level of incentive differences and short positions are taken in the quintile with the highest amount of incentive differences. Monthly alphas and factor loadings are presented. T-statistics are in parentheses.

Table 10: 2SLS Regression Using Ancestry.com				
	1st Stage		2nd Stage	
Dependent Variable	Incentive Dif Dummy	Log Dif Dummy	Industry Excess Return	
Incentive Dif Dummy			0.0156	
			(2.139)	
Log Incentive Dif				0.00456
				(2.061)
ancestry1	0.0430	0.182		
	(11.58)	**(12.10)**		
ancestry2	0.0807	0.263		
	(17.26)	**(14.54)**		
ancestry3	0.0568	0.180		
	(6.447)	**(5.348)**		
ancestry4	0.147	0.511		
	(14.43)	**(13.89)**		
ancestry5	0.0332	0.0381		
	(3.015)	(0.882)		
ancestry6	0.0657	0.352		
	(5.754)	**(9.618)**		
ancestry7	0.0593	-0.0539		
	(4.127)	(-0.985)		
ancestry8	0.447	1.224		
	(17.56)	**(24.23)**		
ancestry9	0.310	1.053		
	(13.71)	**(18.25)**		
ancestry10	0.320	1.249		
	(71.99)	**(20.82)**		
ancestry11	0.0866	0.325		
	(3.927)	**(4.365)**		
ancestry12	-0.170	-1.127		
	(-8.118)	**(-40.84)**		
Firm Controls	Yes	Yes	Yes	Yes
Tenure	0.00806	0.0300	-0.000135	-0.000128
	(32.52)	**(30.01)**	(-1.709)	(-1.478)
CEO Age	-0.000567	0.00297	0.0001	-0.0001
	(-2.307)	**(3.071)**	(0.239)	(-0.630)
CFO Age	0.0001	0.00518	0.000103	0.0001
	(0.374)	**(5.505)**	**(2.122)**	(1.490)
Constant	0.197	1.930	-0.0146	-0.0194
	(10.67)	**(26.34)**	**(-3.703)**	**(-3.357)**
Observations	95,273	89,752	95,273	89,752
R-squared	0.187	0.192		

This Table presents coefficient estimates from a 2SLS Regression where CEO Ancestry is employed as an instrumental variable for incentive difference Firm Control Variables include Family Dummy, Profitability, Leverage, Size Dummy, Z-Score, Price, and Volume. Standard errors are clustered at the firm level to control for serial correlation and heterogeneity. T-statistics are in parenthesis.

CHAPTER 2

EXECUTIVE RISK-TAKING AND THE AGENCY COST OF DEBT

Introduction

Shareholders strive to align managerial interests with their own, but in doing so they can create conflict with bondholders. The provision of equity pay aligns managers' and shareholders' interests to maximize share value but simultaneously creates incentives for managers to expropriate bondholder wealth through risk shifting and asset substitution (John, Mehran, and Qian 2010; Liu and Mauer 2011; Beladi and Quijano 2013; Bolton, Mehran, and Shapiro 2015). Bondholders can reduce or mitigate managerial expropriation risks through the use of covenants but these contractual restrictions cannot fully prevent wealth transfer from debt holders to equity holders (Smith and Warner 1979, John and Kalay 1982, Garven and MacMinn 1993, Bradley and Roberts 2015, De Franco et al. 2016, Gilje 2016). Bondholders thus price the risk arising from managerial expropriation into the cost of debt.

Much of the governance literature focuses on the effects of CEO compensation on firm performance and other firm attributes. Yet, anecdotal accounts and academic literature indicate that chief financial officer (CFO) pay influences shareholder wealth and debt decisions (DeFond, Hann, and Hu 2005; Chava and Purnanandam 2010; Kim, Li, Zhang 2011). Ernst & Young for example, conclude that the "CFO is now arguably the most influential role in the organization, particularly at a time when economic uncertainty continues to cause unpredictable demand, capital availability and cash flows".[1]

[1] Finance Forte – The Future of Finance Leadership, 2011

Shareholders incentivize both CEOs and CFOs to maximize equity value (Core and Larcker 2001; Aggarwal and Samwick 2003, Friedman 2016). Chava and Purnanandam (2010) find that the differing risk-taking incentives or compensation structures supplied by shareholders to these two executives influence different aspects of the firm. CEO risk-taking incentives influence leverage and cash-holdings. CFO risk-taking incentives drive debt maturity and accruals. The design of executive compensation packages to maximize shareholder wealth suggests that CEO and CFO equity incentives influence the riskiness of the firm's debt and thus, the yield demanded by bondholders.

We examine the effect of CEO and CFO equity incentives on the cost of debt, focusing on two primary hypotheses. In the first hypothesis, which we term *managerial entrenchment*, we argue that increases in managerial equity pay lead to decreases in firms' cost of debt. As the levels of equity pay increase, managers—who hold increasingly larger portions of equity in the firm— become insulated from board discipline (Berger, Ofek, Yermack 1997; Faleye 2007). Prior literature suggests that managers respond to this reduction in pressure by "taking value-destroying actions that reduce their firm's stock volatility and risk of distress" (Bertrand and Mullainathan 2003; Gormley and Matsa 2016). This reduction in risk-taking arguably benefits bondholders as they seek to recover their principal and earn coupon payments (Anderson, Mansi, and Reeb 2003; Chava and Purnanandam 2010). The managerial entrenchment argument indicates that increases in managerial equity pay cause bondholders to bear less risk, resulting in a lower cost of debt (Guay 1999, Eling and Marek 2014, DeYoung et al. 2010).

In the second hypothesis that we term *shareholder alignment*, we argue that bond yields exhibit a curvilinear, "u-shaped", relation to managerial equity pay. Executives with little or no equity pay hold strong incentives to protect their employment and arguably reject positive NPV projects that expose them to termination risk (Polk and Sapienza 2009). Bondholders however, need firms to generate cash flows to make principal and interest payments; suggesting that as equity pay increases from zero, the likelihood of managers accepting positive NPV projects increases and thereby increases the likelihood of bondholders receiving payment. Bondholders respond by reducing the cost of debt. However, as equity pay becomes a larger fraction of compensation, managers hold incentives to engage in asset substitution and risk shifting (Haugen and Senbet 1981; Low 2009; Milidonis and Stathopoulos 2011; Anantharaman and Lee 2014). To maximize the value of their equity holdings, managers potentially exchange low risk assets for high-risk investments. Bondholders, anticipating the risk of wealth expropriation, demand higher yields (Nash et al., 2003). We thus argue a curvilinear relation between managerial equity pay and bond yields. At low levels of equity pay, bond yields decrease as managers receive increasingly larger fractions of stock and option compensation. However, as equity pay continues to increase, bondholders bear greater risk of wealth expropriation and respond by demanding higher yields on their capital. Figure 1 details our two hypotheses.

Using the S&P1500 industrial firms from 2002 through 2015, we find evidence consistent with the *shareholder alignment* hypothesis on a curvilinear relation between managerial equity pay and the cost of debt. Specifically, the cost of debt initially declines and then increases as equity incentives increase for both the CEO and CFO. Incentive ratio, our measure of CEO and CFO equity incentives, represents the dollar change in executive wealth resulting from a one percent change in the value of the firm's stock price, scaled by annual total compensation (Bergstresser and Philippon 2006). The inflection point—when debt yields cease declining and start increasing—for CEO's is approximately 54% of total pay in equity forms and for CFOs is 39% of total pay in equity forms. Our analysis indicates that bondholders prefer that top managers receive a moderate amount of equity pay. For CEOs, increasing equity pay one standard deviation from 32% to 54% of total pay results in a 7-basis point decrease in the cost of debt. Similarly, for CFOs, increasing equity pay one standard deviation from 27% to 39% of total pay results in a 4-basis point decrease in the cost of debt. Beyond equity pay ratios of 54% (39%) for CEOs (CFOs), a one standard deviation increase in equity pay results in increases in the cost of debt of 7 (4) basis points.

We argue that the cost of debt is a function of managerial compensation structure. Yet, boards potentially consider leverage and debt costs in making pay decisions, suggesting factors endogenous to pay and leverage decisions potentially influence our analysis. As an identification strategy to disentangle the effects of debt yields and compensation, we instrument for managerial pay using the geographic origin of the CEO's surname. Executives do not choose their surname but their name bears a close relation to their heritage or cultural origin that plausibly influences cognition and beliefs on compensation preferences (Constant and Zimmermann 2008, Brugger, Lalive, and Zweimuller 2009, Finseraas and Kotsadam 2017). For example, Andrew Carnegie developed a reputation for being tightfisted in his dealings with employees and competitors, a trait often associated with his Scottish ancestry. Bondholders arguably show little concern for executive heritage except through its impact on incentives. The results from instrumental variable analysis support our primary inference of a U-shape relation between equity pay and the cost of debt.

Our results are robust to alternative measures of the cost of debt, equity pay, industry and firm controls, and provide strong evidence of a curvilinear relation between CEO and CFO equity pay and the cost of debt. Taken together, our empirical results provide evidence that creditors are aware of the incentives provided to the management team and that bondholders price CEO and CFO equity incentives into the cost of debt. Bondholders prefer moderate levels of equity pay and above or below that level, debtholders bear greater risk and thus require greater yields on their capital. Furthermore, bond yields display greater sensitivity to changes in CEO equity incentives than CFO equity incentives. This finding suggests that CEO incentives dominate CFO incentives in their influence on the firm's cost of debt.

Our research contributes to the literature in three ways. First, we document a curvilinear, "U"-shaped relation between executive compensation and the cost of debt financing. Prior literature discusses this causal relation (John and John 1993; Liu and Jiraporn 2010; Liu, Mauer, and Zhang 2014). Kabir et al. (2013) examine the relation between individual compensation components and debt costs, finding that deferred compensation in the form of pension contributions negatively influences bond yields. We extend the work of Kabir et al. (2013) by providing the first evidence documenting a curvilinear relation between equity incentives and yield spreads. Second, our analysis provides additional insights into the pay-setting process. Firms design compensation packages to maximize shareholder wealth (Anderson and Bizjak 2003, Conyon and He 2004, Benson and Davidson 2010). Compensation contracts that maximize shareholder wealth should also minimize the total agency costs of the firm (Jensen and Meckling 1976, John and John 1993, Ang, Cole, and Lin 2000, Florackis 2008). We document that when

CEOs (CFOs) receive 54% (39%) of their pay in equity forms, firms experience the lowest cost of debt.

Third, the analysis indicates that while this curvilinear relation holds for both CEO and CFO compensation, yield spreads display higher sensitivity to CEO incentive pay. Boards compensate CEOs with greater total pay and greater percentages of equity pay in their compensation packages than CFOs. Yet, prior literature suggests that CFO equity pay exhibits greater relevance than CEO equity pay in matters that require specialized financial knowledge (Jiang et al. 2010; Kim, Li, Zhang 2011). While we find that CFO incentives influence firms' cost of debt, our evidence indicates that yield spreads display greater sensitivity to CEO equity incentives than CFO equity incentives.

The remainder of the paper is organized as follows. Section 2 describes our data, variable measures, and summary statistics. Section 3 provides the multivariate analysis as well as our identification strategy which investigates endogeneity concerns between pay and leverage decisions. Section 4 tests the robustness of our results using alternative measures and specifications. Section 5 concludes the paper.

Data

Sample Selection

The sample consists of the non-financial and non-utility firms in the S&P1500 as of January 1st, 2002. These firms are tracked through December 31st, 2015. Of the firms present in the S&P1500 in 2002, 54% survive through 2015. The remaining 46% experience acquisition, privatization, or bankruptcy during the sample period. To control for survivorship bias, we allow firms to exit and reenter the sample. Observations are merged with Execucomp, Compustat, CRSP, S&P Credit Rating, and Trace data. We lose 28 firms that lack executive compensation information, 12 firms that lack ticker symbols in CRSP, and 44 firms with missing Compustat data. To mitigate the effect of outliers in the data, we winsorize all variables at the 1% and 99% level. The final sample includes 10,042 firm-year observations from 1,026 firms during the period 2002 through 2015. Fifty-eight percent of the industrial S&P1500 firms maintain publicly traded debt during the period. To account for the censored nature of firms with publicly traded debt, we use Tobit regression techniques and, in robustness testing, OLS regressions to support our primary findings.

Firm accounting and financial data comes from Compustat and stock return data comes from CRSP. We obtain compensation, experience, and position data from Execucomp. CEOs are identified when Execucomp flags PCEO or CEOANN as one, or if their annual title contains the words "Chief Executive Officer" or "CEO". Similarly, we identify CFOs when the Execucomp flags, PCFO or CFOANN, equal one or when their annual title contains the phrases "Chief Finance Officer", "Chief Financial Officer", "CFO", or "Accountant". In years when executives experience turnover, Execucomp assigns the title CEO (CEO) to both the outgoing and incoming CEO (CFO). We use the outgoing CEO and CFO in turnover years for our empirical analysis.

We collect bond data from Trade Reporting and Compliance Engine (Trace). Trace provides data on over-the-counter secondary market transactions in fixed income securities. This information includes issue name, trade date, transaction size, maturity, coupon, and yield. Approximately 58% of the firms in the S&P1500 have bond issues present in the Trace dataset. The remaining 42% either finance through private debt, bank loans, or have no meaningful debt. Large firms typically have numerous outstanding bond issues (e.g., in 2015, General Electric had 425 issues outstanding while Wendy's Company had just one issue outstanding). When including all bond issues in each firm, we introduce a large firm bias into our analysis. To mitigate bias toward firms with multiple bond issues, we select the most junior issue of each firm year. When possible, we choose issues that are consistent from one year to the next. In robustness testing which is provided in our online appendix, we include all bond issues and control for the number of outstanding bond issues for each firm on an annual basis. The results using the alternative methodology are consistent with our findings in the primary specification.

Yield spread is the difference between the yield to maturity on a corporate bond and the yield to maturity on a treasury security of the same maturity. To calculate yield spread, we sort bond maturity from our Trace dataset into 1, 2, 3, 5, 7, 10, 20 and 30 years and then match them with treasury securities of equivalent maturity. Government treasury-yield information is available in the Federal Reserve Economic Database (FRED) in St. Louis.

Measuring Executive Incentives and Yield Spread

We employ Bergstresser and Philippon's (2006) incentive ratio, to measure the magnitude of CEO and CFO incentives stemming from equity based compensation. Bergstresser and Philippon calculate *OnePct* as the dollar increase in executive wealth stemming from a one percent increase in stock price. Executive wealth includes all stock and options holdings in the firm. Incentive ratio is computed as *OnePct* scaled by annual total compensation and represents the fraction of an executive's annual compensation that is equity-related.

$$OnePct_{i,t} = .01 * Price_{i,t} * (Shares_{i,t} + Options_{i,t}) \quad (1)$$

$$Incentive\_Ratio_{i,t} = \frac{OnePct_{i,t}}{(OnePct_{i,t} + Salary_{i,t} + Bonus_{i,t})} \quad (2)$$

This structure enhances our understanding of incentives by simplifying aggregate incentives into a single variable. Incentive ratio divides equity incentives by total incentives. To capture nonlinearities in the relation between debt yield and executive compensation, we include the square of incentive ratio.

As noted earlier, we use each firm's junior most bond issue for each year to calculate the cost of debt and thus, mitigate a bias towards firms with multiple bond issues. Junior issues, in the event of financial distress, are also satisfied only after fulfilling obligations to senior issues, suggesting a greater sensitivity between the risk arising from agency costs and debt yields. The cost of debt is the yield on each firm's most junior bond less the yield on a similar maturity U.S. treasury bond (Duffie, 1998). Most of these bonds trade multiple times per year. For every trade date, we calculate the yield spread based on the corporate's yield to maturity and treasury yield. We then average these yield spreads throughout the year to obtain an annual average yield spread for each bond issue. This annual average yield spread on the junior issue represents the firm's marginal cost of debt. Following Edwards, Harris, and Piwowar (2007), we delete 208 trade reports that were incorrectly reported or are missing key information. We then normalize yield spread in the multivariate analysis with a log transformation.

Control Variables

Executive characteristics, firm characteristics, and bond features or structure influence the cost of debt. To account for these factors, we introduce several control variables into the analysis. These variables include tenure, executive age, family firm dummy, profitability, size, leverage, option grant to restricted stock grant ratio, default risk, bond maturity, liquidity, and coupon rate. Management tenure, the number of years a CEO has held his or her current role, serves as a proxy for executive experience (Nam, Wang, Zhang 2008). While Execucomp does not provide information on the length of CFO tenure, we employ CFO age as a proxy for CFO experience.

The family firm dummy captures the subset of firms in which a family owns a 5% or larger ownership stake in the firm. Prior literature indicates that these families act in a monitoring capacity and provide incentive structures that result in a lower cost of debt (Anderson, Mansi, Reeb 2003; Mullins and Schoar 2016).

We use return on asset (ROA) as a measure of profitability with earnings before interest and tax as the numerator and total assets as the denominator. Firm size is proxied as the log of total assets. Firms with greater leverage face higher default probabilities. We measure leverage as the ratio of long term debt to total assets.

Beginning in 2005, compensation committees began to increasingly employ restricted stock grants as a form of equity pay (Bryan, Hwang, and Lilien 2000; Grace 2004; Han and MacMinn (2006). To account for the possibility that restricted stock provides different incentives than option grants, we include the ratio of option grants to restricted stock grants in the multivariate analysis. This ratio captures the annual industry average amount of equity pay that stems from in-the-money stock option holdings relative to restricted stock. *Z-score* proxies for the risk of financial distress (Altman 1968, Altman and Saunders 1997). We compute *Z as:*

$$Z = 1.2 * \frac{WC}{TA} + 1.4 * \frac{RE}{TA} + 3.3 * \frac{EBIT}{TA} + 0.6 * \frac{MV\ Equity}{BV\ TL} + 1.0 * \frac{Rev}{TA} \quad (3)$$

Where;

WC = Working Capital
TA = Total Assets
RE = Retained Earnings
EBIT = Earnings Before Interest and Taxes
MV Equity = Market Value of Equity
BV TL = Total Liabilities
Rev = Revenue

Firms with higher Z-scores exhibit lower probabilities of experiencing bankruptcy during the subsequent two years (Altman 1968).

Bond maturity represents the number of years until a bond issue matures. Bond's with higher maturities display higher sensitivities to changes in interest rates and investors often demand a premium for interest rate sensitivity. We use the log of maturity for the analysis. Investors demand a premium for bonds that trade infrequently, i.e. liquidity premium. Issues with greater number of transactions exhibit greater liquidity. We capture liquidity as the log of the number of bond trades that occur in each year. Coupon rate is provided by Trace and represents the yield that an investor receives each year for holding the fixed income obligations of the firm. Table 11 presents variable definitions and measurements.

Descriptive Statistics

Table 12 presents descriptive statistics for the variables in the analysis. The table presents mean, median, standard deviation, minimum, and maximum values for each variable. For our sample, the average yield spread over an equivalent maturity U.S. Treasury on the junior issue is 302 basis points and the median yield spread is 214 basis points. The mean value of CEO (CFO) Incentive Ratio is 0.298 (0.148). The data suggests that CEO's receive higher fractions of equity pay than CFO's. However, substantial variation exists in CEO and CFO incentive ratio. The standard deviation of incentive ratio for CEO (CFO) is 0.222 (0.126). The maximum CEO (CFO) incentive ratio is 0.96 (0.59) which enables an examination of the effect of incentive ratio on the cost of debt at high levels of equity pay.

The industry median value of option to restricted stock incentive pay is 3.06 with a standard deviation of 1671. The high standard deviation likely arises from the industries which compensate executives with little or no restricted stock. Family firms represent 32.2% of the sample observations, consistent with the percent of family firms from other studies (Shleifer and Vishny, 1986).

The median length of CEO tenure is 5 years with a standard deviation of 7.00 years. The median CFO age is 57 with a standard deviation of 6.6 years. Average return on assets, measured as EBIT-to-total assets, is 9.2%. The median firm holds $1.98 billion in assets, while average firm size is $7.91 billion. Average leverage is 17.8% of total assets with a standard deviation of 15.2%. Average *Z*-score is 4.36. A *Z*-score above 3 is considered safe while a *Z*-score below 1.81 is considered distressed. Within the sample, 13.8% of firms meet the definition of distressed. The average maturity on the junior issues is 10.83 years with a standard deviation of 10.96 years. The number of bond transactions per year for firms with publicly traded debt ranges from 0 trades to 5,652 trades with an average of 126.87 and median of 167. The average coupon rate is 5.97 with a minimum of 0 and a maximum of 11.38.

Table 13 provides a univariate analysis by arranging the data into quintiles based on CEO incentive ratio with quintile 1 comprising the lowest incentive ratio and quintile 5, the highest incentive ratio. The table also provides mean values for the key variables in the analysis. The results of this analysis reveal that firms with high CEO incentive ratios display lower costs of debt, better performance, larger total assets, slightly less leverage, lower bankruptcy risk, greater liquidity, and slightly lower coupon rates. Managers with higher CEO incentive ratios also appear to possess more experience as reflected by longer tenure. Further, we note a monotonic decrease in yield spreads as the CEO incentive ratio increases from quintile 1 to quintile 5; suggesting that the cost of debt declines as CEOs have greater portions of their pay tied to equity performance. Specifically, in the quintile with the lowest CEO incentive ratio, we observe an average yield spread of 459 basis points that steadily decreases to 224 basis points in the quintile with the highest CEO incentive ratio. Because industry, firm, and bond characteristics also influence yield spreads, we further examine our hypotheses in the next section using multivariate analysis.

Multivariate Analysis on the Cost of Debt and Executive Incentives

The multivariate analysis employs Tobit regressions to evaluate the cross-sectional impact of CEO and CFO incentive ratios on yield spread. In our sample of 1,026 industrial (non-utility, non-financial) firms in the S&P1500, 58% have outstanding, publicly traded debt. The other 42% of firms do not have publicly traded debt, indicating a cluster of observations with no yield spreads (zero values). Tobit regressions, versus OLS regressions, provide consistent parameter estimates in the event the dependent variable experiences censoring from above or below (McDonald and Moffitt, 1980). In the 5,502 observations where censoring occurs, indicating no available bond data, we set yield spread, log maturity, liquidity, and coupon rate equal to zero. This enables us to include firms without publicly traded debt in our multivariate analysis.

We use a log-linear regression specification; indicating that a one-unit change in incentive ratio produces a change in yield spread equaling 100% * coefficient estimate on incentive ratio. All regressions include industry (Fama-French 48 industry group) and year dummy variables. We control for serial correlation and heterogeneity on the coefficient estimates by clustering on firm-level identifiers. Our primary research question focuses on the relation between CEO (CFO) incentive ratio and the cost of debt. To capture nonlinearities between executive incentive ratio and yield spreads, we include (CEO incentive ratio)^2 and (CFO incentive ratio)^2. Opposing and significant coefficient estimates on incentive ratio and (incentive ratio)^2 indicate a nonlinear relation between debt yields and executive incentives. The control variables in the regression include tenure, profitability, size, leverage, *Z*-score, log maturity, liquidity, coupon rate, and year and industry dummy variables. The regression specification is:

$$\begin{aligned} Log\ Yield\ Spread_{i,t} &= \beta_0 + \beta_1(Incentive\ Ratio_{i,t}) + \beta_2(Incentive\ Ratio_{i,t})^2 \\ &+ \beta_3(Opt\_Rest\ Ratio_{i,t}) \quad (4) + \beta_4(Family\ FIrm_{i,t}) + \beta_5(Tenure_{i,t}) \\ &+ \beta_6(Profitability_{i,t}) + \beta_7(Size_{i,t}) + \beta_8(Leverage_{i,t}) + \beta_9(Z\_Score_{i,t}) \\ &+ \beta_{10}(Log\ Maturity_{it}) + \beta_{11}(Liquidity_{i,t}) + \beta_{12}(Coupon\ Rate_{i,t}) \\ &+ \beta_{13}(Time\ Dum_{i,t}) + \beta_{14}(Industry\ Dum_{i,t}) + \varepsilon \end{aligned}$$

Table 14 displays the regression results. Column 1 shows a specification examining a linear relation between yield spreads and CEO incentive ratio, i.e., we do not include the square of incentive ratio. When examining a simple linear specification, we find a negative relation between debt yields and CEO equity incentives. The coefficient estimate on CEO incentive ratio is -0.0887 and significant at the 5% level; suggesting debt yields bear a negative relation to CEO equity incentive pay practices.

When introducing (CEO incentive ratio)^2, column 2 of Table 14, we find statistical evidence of a nonlinear relation between debt yields and equity pay. The coefficient estimates on CEO incentive ratio and (CEO incentive ratio)^2 are -0.3917 and 0.3658, respectively, with both significant at the 5% level or better. Our analysis suggests that as CEO incentive ratio increases, debt costs initially decrease but as the incentive ratio continues to increase, we observe that debt costs begin to increase. The analysis points to a "U-shape" relation between yield spreads and CEO incentive ratio. Debt costs, on average, decrease as CEO equity pay increase from 0% to 54% of total pay. After 54% of total pay, debt costs begin to increase. In our sample, 15% or 1,507 observations possess a CEO incentive ratio which lies above the inflection point. From an economic perspective, as CEO incentive ratio increases from 0 to 0.54, yield spread falls by 32 basis points. As CEO incentive ratio increases further from 0.54 to 0.96, yield spread rise by 20 basis points.

Our analysis indicates that both the linear and curvilinear perform well in explaining the relation between executive incentives and the cost of debt. To examine if one specification better explains the relation between yields and incentive ratio, we use the Akaiki Information Criterion (AIC). The Akaike Information Criterion estimates the relative quality of competing statistical models in explaining a given dataset. The AIC trades off goodness of fit ($R^{2)}$ against simplicity (few parameters). AIC estimates the relative information lost when a model is used to represent the process that generated the data. AIC indicates which model best explains the data; however, it does not make a statement about the absolute quality of the models (Akaike 1973; Akaike 1974; Akaike 1985; Burnham and Anderson 2002; Burnham and Anderson 2004; Fang 2011). Lower AIC scores indicate better models. The results indicate that the nonlinear model better explains the data then a simple linear model. Overall, our evidence of CEO incentive ratio supports the hypothesis that bondholders prefer managers to hold equity incentives but past a certain point (about 54% of equity pay), bondholders bear more risk and thus increase the cost of debt.

Columns 3 and 4 present the results when examining CFO equity pay in linear and nonlinear regression specifications. We find a negative and significant relation between yield spreads and CFO incentive ratio when using a simple linear model. Like the CEO regressions however, the AIC test indicates that the nonlinear model better describes the data for CFOs than a simple linear model. The coefficient estimates on CFO incentive ratio and $(\text{CFO incentive ratio})^2$ are -0.5075 and 0.6526 respectively; again, indicating a "U-shaped" relation between debt yields and CFO equity pay. That is, debt yields decrease until CFO equity pay reaches about 39% of total pay and after that point, debt yields begin to increase as CFO equity incentives increase. Of the 10,042 observations in our sample, 575 or 5.7% of the CFO's receive an incentive ratio about the inflection point. The economic interpretation suggests that as CFO equity pay increases from 0 to 0.39, yields spreads fall by 31 basis points. Above the inflection point, as CFO incentive ratio increases from 0.39 to 0.586, yield spreads rise by 9 basis points.

Column 5 provides regression results for the nonlinear relation between CEO incentive ratio and yield spreads while controlling for CFO incentive ratio. The coefficient estimates for CEO incentive ratio and $(\text{CEO incentive ratio})^2$ are -0.3101 and 0.318 and are both statistically significant at the 5% level. The inflection point for CEO equity pay is at 0.49 of pay in equity forms. These results suggest that the effect of CEO equity pay on cost of debt, after controlling for CFO pay, continues to exhibit a curvilinear relation to debt yields.

Similarly, Column 6 displays the results when examining CFO equity pay in a nonlinear regression specification while controlling for CEO equity incentives and CEO experience. The coefficient estimates for CFO incentive ratio and $(\text{CFO incentive ratio})^2$ are -0.4897 and 0.6424, indicating an inflection point at 0.38 of CFO pay in equity forms. These results indicate that the relation between debt yields and CFO equity pay are unaffected by CEO incentives. However, evidence from columns 2 and 4 suggests that yield spreads are more sensitive to CEO equity pay than CFO equity pay. See Figure 2 for a graphical depiction of our results. As CEO (CFO) incentive ratio increases from zero to the inflection point, yield spreads fall 32 (31) basis points. Above the inflection point, as CEO (CFO) incentive ratio rises to the sample maximums, yield spreads rise 20 (9) basis points.

Our control variables exhibit relations to yield spread consistent with prior literature. The ratio of option holdings to restricted stock holdings at the industry level appears to have no effect on the cost of debt. The presence of family on the board is associated with lower costs of debt in each specification. Tenure and CFO age which proxy for management experience have little effect on yields. Profitability displays a negative association with the cost of debt, suggesting that as profits increase, bondholders demand lower yield spreads. Size negatively effects yield spread because large firms provide greater financial stability than small firms. Leverage is positively associated with the cost of debt. As firms borrow more, the probability of financial distress increases which is reflected in the cost of debt on junior claimholders. *Z*-score exhibits a negative relation to yield spreads, supporting the notion that financially distressed firms have a higher cost of debt. Log maturity is positively associated with the cost of debt, which is consistent with the notion that bondholders demand higher yield spreads on longer maturity bond. Liquidity exhibits a positive association with yield spread. Finally, firms paying higher coupons exhibit higher yield spreads.

Overall, our analysis indicates that debt yields exhibit a robust, nonlinear relation to managerial equity pay. Yield spreads respond to increases in CEO and CFO equity pay, by first falling, and then rising as CEO and CFO equity pay increases further. We find that the effect of CFO incentives on the firm's cost of debt is unaffected by the incentives of the CEO. However, yields spreads display greater sensitivity to CEO equity pay than to CFO equity pay. We suggest that although sophisticated financial expertise is needed to interface between the firm and its external sources of capital, CEO incentives to expropriate bondholder wealth, stemming from greater total pay and higher levels of ownership in the firm, dominate CFO incentives. Thus, bond yields display greater sensitivity to CEO equity incentives than CFO equity incentives.

Identification Strategy

The results of our analysis indicate that executive pay structure influences the risk borne by bondholders and thus, the firms' cost of debt. We find a "U-shaped" relation between debt yields and CEO (CFO) equity pay. Our argument suggests that debt yields are a function of compensation structure.

Causality, however, may flow in the opposite direction with boards or compensation committees considering debt costs when structuring executive compensation contracts. For example, firms in financial distress may compensate executives with higher levels of fixed pay or salary to compensate managers for the underlying risk associated with employment in the firm. The results from Table 13 categorizing CEO incentive ratio into quintiles indicates that firms paying the lowest levels of equity pay also experience the greatest level of financial distress as measured by *Z*-score. Conversely, in firms experiencing the least amount of financial distress, executives earn greater fractions of their pay in equity-based forms.

To investigate the direction of causality and account for the possibility of omitted variables in our analysis, our identification strategy uses executive ancestry as an instrument for CEO incentive ratio. Intuitively, an individual's ancestry becomes part of one's identity and affects worldviews, interactions with others, and societal preferences and norms (Pan, Siegel, and Wang 2014). In the case of managers, prior literature indicates that ancestral heritage affects corporate outcomes such as performance and investment (Pan, Seigel, and Wang 2015; Nguyen, Hagendorff, Eshraghi 2017). Bondholders however, arguably show little or no concern with executives' ancestry except through its influence on managerial behavior. We capture executive heritage data using the CEO's surname and searching *ancestry.com* to find the geographic region most heavily associated with the family name. Within our sample of CEOs, 96% of the surnames arise from European ancestry. Europe represents a wealth of cultural diversity with the English for example, holding different social views than the Dutch or Germans (Athanasopoulos et al. 2015). Consequently, we further subdivide Europe into six regions that are; Northern Europe, Central European, Southern Europe, Eastern Europe, Western Europe, and Scandinavia. The remaining 4% of surnames arise from South Asia, East Asia, Australia, and Central America. Table 15 presents our classification of executive heritage as well as the countries and number of CEO observations associated with each region.

Table 16 displays the results of the two-stage least square instrumental variable (2SLS-IV) regression. Column 1 shows the first stage regression and we observe a strong statistical relation between CEO incentive ratio and the cultural instruments. Incentive ratio bears a negative and significant (>5%) relation to Southern Europe, Western Europe, Australia, and Central America. We find positive and significant relations to Scandinavian and East Asian ancestry.

Column 2 shows the second stage regression results using the fitted value for CEO incentive ratio. Using the instrumented value of incentive ratio in the linear specification, we find no significant relation between CEO incentive ratio and the cost of debt. The coefficient estimate on the fitted value of incentive ratio is 0.1595. However, in Column 3, when we employ CEO heritage as an instrumental variable for both CEO incentive ratio and the square of (CEO incentive ratio) (Guiso, Sapienza, and Zingales 2006; Bekker and Van der Ploeg 2005; Hausman et. Al 2012; Garrido, Burgess, and Penrod 2012), we again find a "U-shaped" relation between debt yields and executive equity pay. The coefficient estimates on CEO incentive ratio and (CEO incentive ratio)^2 are -1.4398 and 2.0388, respectively, indicating that debt yields first decline as CEOs earn increasingly greater fractions of their pay in equity forms but as these fractions continue to increase, debt yield change direction and begin to increase. Overall, the results of our identification strategy provide support to the notion that executive pay structure influence debt yields and the relation between yield spreads and executive pay exhibits a curvilinear, “U-shaped” pattern.

Robustness Testing

Alternative Specifications

In our primary specifications, we use Tobit regression techniques because 42% of the S&P1500 industrials have no outstanding, publicly traded debt; thus, creating a cluster of zero observations. To assess the robustness of the Tobit specifications, we replicate the analysis by eliminating firms with no publicly traded debt and using ordinary least squares (OLS) regressions. The analysis again uses the junior most bond issue and examines the effect of CEO and CFO incentive ratio on bond yields in a log-linear specification, i.e., a one percent change in incentive ratio causes a 100%*(coefficient estimate on incentive ratio) change in yield spread.

Table 17 presents the OLS regression results. Column 1 displays the linear relation between CEO incentive ratio and yield spreads. Column 2 provides evidence of a non-linear relation between yields spreads and CEO equity pay. The coefficients on CEO incentive ratio and (CEO incentive ratio)^2 are -0.7041 and 0.6266 and are significant at the 5% level. The CEO equity pay inflection point occurs around 0.56 which is consistent with the inflection point at 0.54 found in the Tobit model. As CEO incentive pay climbs from 0 to 0.56, yield spreads fall by 62 basis points. Above the inflection point of 0.56, as CEO incentive pay continues to increase, yield spreads rise 30 basis points. The Akaiki information criterion indicates that the curvilinear model does a better job of explaining the data than the linear model.

Columns 3 and 4 examine the relation between CFO equity incentives and the cost of debt. Column 3 presents the linear relation with a statistically significant coefficient on CFO incentive ratio of -0.2748. When we add (CFO incentive ratio)^2 in column 4, evidence from the non-linear model supports a U-shaped relation between CFO incentive ratio and yield spreads. The coefficients on CFO incentive ratio and (CFO incentive ratio)^2 are -0.8214 and 1.1095. The inflection point on CFO incentive ratio occurs at 0.37. The evidence suggests that as CFO incentive ratio increases from 0 to 0.37, yields spreads fall 47 basis points. Above the inflection point, as CFO incentive ratio continues to increase, yield spreads increase by 16 basis points. The Akaiki Information Criterion suggest that the nonlinear model presented in column 4 better explains the data.

Column 5 presents the coefficient estimates from the nonlinear specification between CEO incentive ratio and yield spread while controlling for CFO equity incentives. The coefficients on CEO incentive ratio and (CEO incentive ratio)^2 are -0.6239 and 0.5802 with an inflection point at 0.54. Column 6 examines the relation between CFO incentive ratio and yield spread, while controlling for CEO equity pay and CEO experience. The coefficients on CFO incentive ratio and (CFO incentive ratio)^2 are -0.7182 and 1.0359 and are both significant at the 5% level. The inflection point is 0.35 suggesting that the relation between CFO equity incentives and the cost of debt is not substantially affected by CEO equity pay. The Akaiki information criterion indicates that column 5, the non-linear CFO incentive model that also controls for CEO incentives is the specification that best describes the data. The results of the OLS robustness testing support our *shareholder alignment hypothesis,* indicating a U-shaped relation between incentive pay and cost of debt and with inflection points consistent with those found in the Tobit regressions.

In a second robustness testing, we use an alternate measure of executive equity pay; *vega*. *Vega* represents the change in executive wealth stemming from a one percent increase in the volatility of the firm's stock price. Prior literature uses *vega* as a proxy for the risk-taking incentives stemming from executive pay structure.

Table 18, columns 1-4 present the regression results with *vega* as the measure of executive equity incentives. Again, columns 1 and 2 show the linear and nonlinear specifications for CEO pay and columns 3 and 4 the results for CFOs. We use Tobit regressions and use the same control variables as in the primary specification. The analysis again points towards a "U-shaped" curvilinear relation between debt yields and executive equity pay. The coefficient estimates on CEO *vega* and (CEO *vega*)^2 exhibit significant but opposing signs, suggesting that debt costs first decrease as *vega* increases but continuing increases in *vega*, result in an increase in debt costs. We find similar results for CFO *vega*. The AIC tests confirm that that nonlinear model better describes the data for both CEOs and CFOs.

Table 18, column 1 displays the linear relation between CEO *vega* and the cost of debt, which is negative and statistically significant with a coefficient of -0.0331. Column 2 presents the non-linear relation between CEO *vega*, (CEO *vega*)^{2}and cost of debt. The coefficients on CEO *vega* and (CEO *vega*)^2 are -1.0085 and 0.4728. The inflection point appears to be around 2,000 for CEO *vega*. As CEO *vega* increases from 0 to 2,000 the yield spread decreases by 134 basis points. Beyond that point, as CEO *vega* approaches 1.53 million which is the largest CEO *vega* in the sample, yield spread increases 93 basis points. The Akaiki information criterion suggests that the nonlinear CEO *vega* model is superior to the linear CEO *vega* model.

Column 3 examines the linear relation between CFO *vega* and cost of debt, which is also negative with a statistically significant coefficient of -0.0224. Column 4 presents the non-linear relation between CFO *vega* and cost of debt. CFO *vega* ranges from 0 to 404,000 in the sample. Our evidence on CFO vega and yield spreads points to a curvilinear relation. The inflection point for CFO vega is around 1,700. As CFO *vega* increases from 0 to 1,700, yield spread rises by 55 basis points. Further increasing CFO *vega* from 1,700 to 404,000 results in a yield spread decrease of 133 basis points. In the non-linear specification, the coefficients on CFO *vega* and (CFO *vega*)^2 are 0.2735 and -0.1443. Although, not significant at conventional levels, the analysis yields several pieces of evidence that the relation between yield spreads and CFO *vega* is curvilinear. First, CFO *vega* and (CFO *vega*)^2 display opposing signs at the 15% significance level. Second, the Akaiki information criterion indicates that the non-linear model of CFO *vega* provides a more complete explanation of yield spreads than the linear model. The results of the regressions in Table 18, which employ *vega* as a proxy for equity increasing incentives, provide strong support of a nonlinear relation in CEO incentives but provide weak support of a nonlinear relation in CFO incentives.

Table 18, columns 5 and 6 display coefficient estimates from Tobit regressions using a piecewise linear specification. CEO incentive ratio and CFO incentive ratio are split, based on their inflection points from the primary multivariate analysis which indicates an inflection point of 0.54 for CEOs and 0.39 for CFOs. Below the inflection point, the coefficient on CEO incentive ratio is -0.22 and above the inflection point the coefficient is 0.29. For CFOs, the coefficients are -0.257 below the inflection point and 0.13 above the inflection point. The findings from the piecewise linear regression support the shareholder alignment hypothesis.

Overall, our robustness testing provides evidence consistent with the primary specifications, suggesting that debt costs exhibit a curvilinear, "U-shaped" pattern relative to executive equity pay. Debt costs initially decrease as CEOs and CFOs earn increasing greater portions of their compensation in equity forms but as the fraction of equity pay continues to increase, bondholders bear greater risk and thus demand higher yields on their capital.

Conclusion

We investigate the risk borne by bondholders arising from CEO and CFO equity incentives. Bondholders arguably show concern about executive equity incentives because of the risk of expropriation of their wealth by managers and shareholders. We examine two arguments; the managerial entrenchment hypothesis and the shareholder alignment hypothesis. In the managerial entrenchment hypothesis, we argue that increases in managerial equity pay lead to decreases in firms' cost of debt. As the levels of equity pay increase, managers who hold increasingly larger portions of equity in the firm and become insulated from board discipline (Berger, Ofek, Yermack 1997; Faleye 2007). Managers respond to this reduction in pressure by reducing stock volatility and the risk of distress.

This reduction in risk-taking arguably benefits bondholders, indicating that increases in managerial equity pay cause bondholders to bear less risk, resulting in a lower cost of debt.

With the shareholder alignment hypothesis, we argue that bond yields exhibit a curvilinear, “u-shaped” relation to managerial equity pay. Executives with little or no equity pay hold strong incentives to protect their employment and arguably reject positive NPV projects that expose them to termination risk (Polk and Sapienza 2009). Bondholders however, need firms to generate cash flows to make principal and interest payments; suggesting that as equity pay increases from zero, the likelihood of managers accepting positive NPV projects increases and thereby increases the likelihood of bondholders receiving payment. Bondholders respond by reducing the cost of debt. However, as equity pay becomes an increasingly larger fraction of compensation, managers hold incentives to engage in asset substitution and risk shifting. To maximize the value of their equity holdings, managers potentially exchange low risk assets for high-risk investments. Bondholders, anticipating the risk of wealth expropriation, demand higher yields. We thus argue that at low levels of equity pay, bond yields decrease as managers receive increasingly larger fractions of stock and option compensation. As equity pay continues to increase however, bondholders bear greater risk of wealth expropriation and respond by demanding higher yields on their capital.

Our analysis provides strong support for the shareholder alignment hypothesis. We find that at low levels of equity pay, bond yields decrease as managers earn increasingly larger fractions of their pay in equity forms. Yet, at high levels of equity-based compensation, bondholders respond by increasing the cost of debt capital. The analysis indicates a U-shaped curvilinear relation between the cost of debt and managerial equity pay. For CEOs, we find an inflection point at 54% of total pay in equity forms and CFOs at 39% of total pay in equity forms. Below the inflection points, debt yields and equity pay exhibit a negative relation and above the inflection points, debt yields and equity pay exhibit a positive relation. To the best of our knowledge, this is the first paper to provide evidence of a nonlinear relation between CEO and CFO equity pay and the cost of debt. Our findings also suggest that yield spreads are more sensitive to CEO incentives than CFO incentives, even though prior literature suggests that CFO incentives often dominate CEO incentives in matters that require specialized financial knowledge.

Using CEO ancestry as an instrument for our identification strategy, we find our results robust to concerns of omitted variable biases and reverse causality. The results are also robust to alternative model specifications (i.e., piecewise linear regressions, OLS and Tobit specifications), alternative measures of equity pay, and industry, firm and time effects.

Overall, our results suggest that bondholders price the risk of capital expropriation – arising from managerial incentives – into the cost of debt capital. From a policy perspective, the analysis contributes to firms' and boards' deliberations in the executive pay-setting process. Although compensation contracts are generally set to maximize shareholder wealth, we find that firms experience the lowest cost of debt when managers, CEOs and CFOs, earn modest levels of pay in equity-based forms; suggesting moderate levels of equity pay mitigate the agency costs and risk between firm shareholders and bondholders.

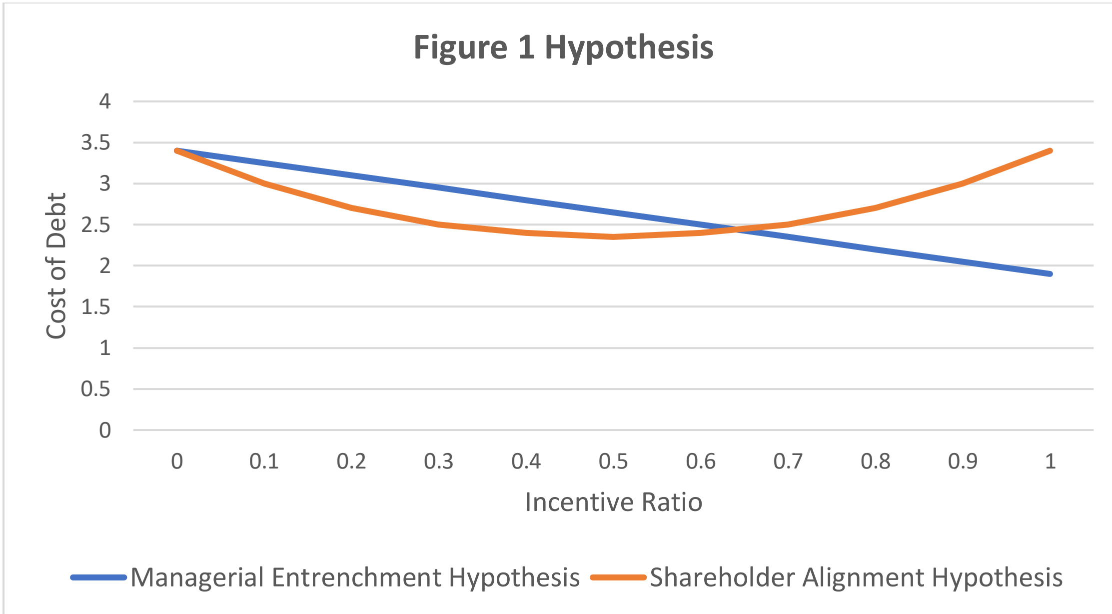

Figure 1 displays the dual hypothesis between CEO and CFO incentive ratio and yield.

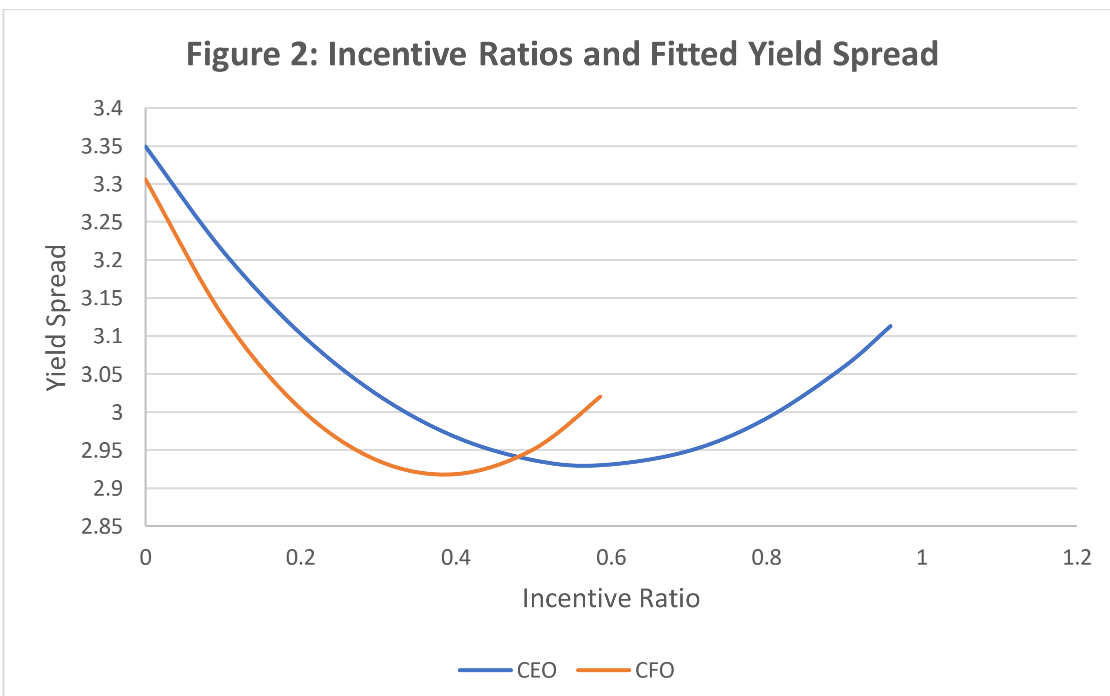

Figure 2 displays the relation between CEO incentive ratio and yield spread as well as the relation between CFO incentive ratio and yield spread. The yield spread curves represent fitted values based on coefficients estimated in Column 2 and 4 of Table 14 which is our primary multivariate analysis.

Table 11 Variable Definitions and Measurements	
Yield Spread	The average difference between the yield on a corporate bond and the yield on a treasury security of equivalent maturity. Yield spread is increased by one and then specified in log form. This ensures that log (Yield Spread) contains only positive values which is important for the economic interpretation of these variables.
Incentive Ratio	The fraction of an executive's compensation that stems from a one percent increase in stock price
Tenure	The number of years that the CEO has held the office of CEO at his or her firm
Opt-Rest Ratio	The industry average dollar value of stock options divided by the industry average dollar value of restricted stock, for each year.
Family Firm	A dummy variable equal to one if a family owns at least 5% of a firm's outstanding shares
CFO Age	The Age of the CFO, a proxy for CFO experience
Profitability (ROA)	A measure of profitability calculated as EBIT/Total Assets
Size (Log Assets)	A measure of firm size calculated as Log of Total Assets
Leverage	The fraction of long term debt over total assets
Z-score	A measure of the bankruptcy developed by Altman (1968). Z = 1.2*working capital/total assets + 1.4*retained earnings/total assets + 3.3*EBIT/total assets + 0.6*market value of equity/book value of total liabilities + 1.0*sales/total assets.
Log Maturity	The length of time, in years, until the bond issue matures, specified in log form
Liquidity	Measures the ease of which an asset can be bought or sold and is calculated as the log of the number of transactions in each year, for a particular bond issue. Liquidity is specified in log form.
Coupon Rate	The stated interest, in terms of par, on a fixed income security
Log Number Issues	A measure of how many bond issues a firm has outstanding in each year, in log form.
Ancestry	Dummy variables based on ancestral origin. The country most commonly associated with a CEO's surname in ancestry.com is considered to best represent the CEOs cultural heritage.

Table 12 Summary Statistics

Variables	Mean	Median	SD	Min	Max	Observations
Yield Spread Mean	3.02	2.14	2.81	0.005	19.91	4540
CEO Incentive Ratio	0.298	0.254	0.222	0.004	0.96	10042
(CEO Incentive Ratio)^2	0.138	0.06	0.19	0	0.922	10042
CFO Incentive Ratio	0.148	0.115	0.126	0	0.586	10042
(CFO incentive ratio)^2	0.038	0.013	0.061	0	0.344	10042
Opt-Rest Ratio	79.67	3.056	1671	0	84822	10042
Family Firm	0.322	0	0.467	0	1	10042
Tenure	6.75	5.00	7.00	0	35	10042
CFO Age	57.2	57	6.605	43	72	10042
Profitability (ROA)	0.092	0.092	0.09	-0.257	0.339	10042
Size (Log Assets)	7.721	7.591	1.554	4.453	11.706	10042
Total Assets	7908	1981	17384	85.9	121271	10042
Leverage	0.178	0.164	0.152	0	0.662	10042
Z-score	4.362	3.51	3.526	-2.558	21.818	10039
Log Maturity	1.958	2.06	1.07	-2.855	4.403	4537
Maturity	10.829	7.845	10.96	0.052	81.73	4540
Liquidity (Log Trades)	4.852	5.127	1.867	0	8.63	4540
Coupon Rate	5.97	6.5	2.233	0	11.38	4540

This table provides summary statistics for the variables employed in my analysis. The sample consists of 10,042 firm-year observations from 1,026 firms. Of those observations, 4,537 have publicly traded debt. Each observation represents the most junior bond issue in each firm-year. The sample begins in 2002 and ends in 2015. See table 11 for variable definitions and measurements.

Table 13 Summary Statistics by CEO Incentive Ratio Quintile

Variables	Q1	Q2	Q3	Q4	Q5
Yield Spread Mean	4.58	3.54	2.83	2.67	2.24
CEO Incentive Ratio	0.055	0.146	0.246	0.385	0.658
$(\text{CEO Incentive Ratio})^2$	0.004	0.022	0.062	0.15	0.453
CFO Incentive Ratio	0.048	0.096	0.142	0.199	0.254
$(\text{CFO Incentive Ratio})^2$	0.005	0.014	0.027	0.052	0.091
Opt-Rest Ratio	15.03	50.35	91.9	100.07	141.04
Family Firm	0.352	0.285	0.25	0.308	0.413
Tenure	4.12	5.16	5.85	7.42	11.23
CFO Age	56.5	57.5	57.6	57.2	57.3
Profitability (ROA)	0.048	0.078	0.095	0.112	0.126
Size (Log Total Assets)	6.88	7.29	7.76	8.23	8.45
Total Assets	3200	4259	6998	10437	14648
Leverage	0.182	0.182	0.18	0.182	0.165
Z-score	3.37	3.83	4.31	4.65	5.65
Log Maturity	1.76	1.98	2.04	2.04	1.92
Maturity	8.93	10.26	11.46	12.03	10.6
Liquidity	4.90	4.83	4.77	4.79	4.98
Coupon Rate	6.08	5.96	6.04	6.06	5.76

This table provides quintile averages for the variables employed in the analysis. Observations are divided into five buckets, based on CEO Incentive Ratio, Q1 having the lowest CEO Incentive Ratio values and Q5 displaying the highest values. The sample consists of 10,042 firm-year observations from 1,026 firms. Each observation represents the most junior bond issue in each firm-year. The sample begins in 2002 and ends in 2015.

Table 14: Tobit Regressions, Yield Spread and Incentive Ratio						
Variables	Dependent Variable = Log (Yield Spread)					
	1	2	3	4	5	6
CEO Incentive Ratio	-0.0887	-0.3917			-0.3101	-0.0283
	(-2.19)	**(-3.58)**			**(-2.64)**	(-0.62)
$(\text{CEO Incentive Ratio})^2$		0.3658			0.318	
		(2.98)			**(2.54)**	
CFO Incentive Ratio			-0.188	-0.5075	-0.1341	-0.4897
			(-3.07)	**(-3.04)**	(-1.88)	**(-2.83)**
$(\text{CFO Incentive Ratio})^2$				0.6526		0.6424
				(2.06)		**(2.02)**
Opt-Rest Ratio	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.46)	(0.42)	(0.52)	(0.48)	(0.47)	(0.46)
Family Firm	-0.0473	-0.0548	-0.0488	-0.0501	-0.057	-0.0532
	(-2.88)	**(-3.30)**	**(-3.02)**	**(-3.1)**	**(-3.42)**	**(-3.21)**
Tenure	0.0023	0.0024			0.0021	0.0019
	(1.89)	(1.95)			(1.71)	(1.54)
CFO Age			-0.0011	-0.001	-0.0013	-0.0011
			(-0.92)	(-0.83)	(-1.10)	(-0.91)
Profitability (ROA)	-0.5484	-0.5185	-0.5345	-0.5221	-0.5054	-0.5156
	(-5.08)	**(-4.78)**	**(-4.95)**	**(-4.83)**	**(-4.66)**	**(-4.76)**
Size (Log Assets)	-0.0897	-0.0873	-0.0879	-0.0863	-0.0846	-0.0846
	(-14.12)	**(-13.66)**	**(-14.14)**	**(-13.76)**	**(-13.02)**	**(-13.00)**
Leverage	0.6363	0.6361	0.638	0.6372	0.634	0.634
	(11.42)	**(11.42)**	**(11.44)**	**(11.43)**	**(11.37)**	**(11.37)**
Z Score	-0.0205	-0.0205	-0.0197	-0.0195	-0.02	-0.0197
	(-4.79)	**(-4.80)**	**(-4.66)**	**(-4.60)**	**(-4.70)**	**(-4.63)**
Log Maturity	0.1716	0.1721	0.1709	0.1718	0.1718	0.1722
	(24.86)	**(24.94)**	**(24.81)**	**(24.90)**	**(24.92)**	**(24.93)**
Liquidity	0.1476	0.1471	0.1475	0.1473	0.1469	0.1471
	(43.00)	**(42.86)**	**(43.04)**	**(42.95)**	**(42.84)**	**(42.90)**
Coupon Rate	0.1672	0.1676	0.1672	0.1671	0.1675	0.1671
	(55.16)	**(55.28)**	**(55.16)**	**(55.17)**	**(55.19)**	**(55.14)**
Time/Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.856	-0.8464	-0.7857	-0.7859	-0.9394	-0.7918
	(-2.92)	**(-2.89)**	**(-2.59)**	**(-2.60)**	**(-3.67)**	**(-2.61)**
Observations	10,042	10,042	10,042	10,042	10,042	10,042
Akaike Information Criterion	7920.04	7913.2	7914.37	7912.13	7913.77	7911.41
R-squared	0.6638	0.6642	0.6641	0.6642	0.6645	0.6643

This table presents coefficient estimates from regressions of corporate yield spread on CEO (CFO) incentive ratio and control variables. Each observation represents the most junior bond issue in each firm-year. We use a Tobit (censored regression) model which enables the inclusion of observations which do not have publicly traded bonds. All regressions contain 10,042 observations from the sample of 1,026 firms and include time and industry fixed effects.

Table 15: Summary of CEO Surname Heritage

Region	Countries Included	Observations
Northern Europe	England, Scotland, Ireland, Wales	2687
Central Europe	Germany, Austria	1498
Southern Europe	Italy, Greece, Croatia	422
Scandinavia	Norway, Sweden, Denmark	203
Eastern Europe	Russia, Poland	150
Western Europe	France, Spain, Portugal	145
South Asia	India	92
East Asia	Japan, Korea, China	33
Middle East	Turkey, Lebanon, Syria	41
Australia	Australia	7
Central America	Nassau, Cuba, Mexico, Costa Rica	35

Table 15 presents information on CEO surname heritage for our sample. We obtain surname heritage from ancestry.com. The country most commonly associated with a CEO's surname in ancestry.com is considered to best represent the CEOs cultural heritage.

Table 16: 2SLS Regressions, Yield Spread and Incentive Ratio

	1st Stage 2SLS	2nd Stage 2SLS	
Variables	Dep Variable = Log (CEO Incentive)	Dep Variable = Log (Yield Spread)	
Fitted Log CEO Incentive		0.1595 (0.53)	-1.4399 **(-1.68)**
(Fitted Log CEO Incentive)^2			2.0388 **(1.81)**
Instruments			
Northern Europe Ancestry	-0.0018 (-0.21)		
Central Europe Ancestry	-0.0039 (0.41)		
Southern Europe Ancestry	-0.0299 **(-2.71)**		
Scandinavian Ancestry	0.0333 **(2.42)**		
Eastern Europe Ancestry	-0.0033 (-0.17)		
Western Europe Ancestry	-0.0265 (-1.78)		
South Asian Ancestry	0.0288 (1.50)		
East Asian Ancestry	0.2345 **(9.00)**		
Middle Eastern Ancestry	0.0191 (0.62)		
Australian Ancestry	-0.3356 **(-5.04)**		
Central American Ancestry	-0.0456 **(-1.54)**		
Controls			
Opt-Rest Ratio	0.0001 **(3.74)**	-0.0001 **(-2.70)**	-0.0001 **(-4.23)**
Family Firm	0.0411 **(5.83)**	-0.0281 (-1.17)	-0.0797 **(-2.11)**
Tenure	0.0133 **(28.53)**	-0.0026 (-0.60)	-0.0035 (-0.82)
CFO Age	0.0001 (0.23)	-0.0038 **(-2.78)**	-0.0045 **(-3.87)**
Profitability (ROA)	0.2074 **(4.43)**	-1.4295 (**-7.84**)	-1.0291 **(-6.25)**
Size (Log Assets)	0.0649 **(31.64)**	-0.1329 (**-6.60**)	-0.1218 **(-6.41)**
Leverage	0.0285 (1.37)	0.3624 (**4.30**)	0.3342 **(4.68)**
Z Score	0.0198 **(9.50)**	-0.0116 (-1.21)	-0.0241 **(-2.98)**
Log Maturity	0.0016 (0.69)	-0.0222 (**-2.14**)	0.0139 (1.81)
Liquidity	-0.0013 (-0.93)	0.018 (**3.29**)	0.0316 **(6.62)**
Coupon Rate	-0.0065 **(-5.83)**	0.0467 (**8.24**)	0.0783 **(16.38)**
Constant	-0.3862 **(-12.58)**	2.2417 (**15.26**)	2.197 **(11.51)**
Observations	4,733	4,733	4,537
R-squared	0.3831	0.1562	0.2318

Table 16 displays the effects of CEO equity pay on the cost of debt, using a 2SLS regression. Each observation represents the most junior bond issue in each firm and year. Column 1 presents the coefficients and t-statistics of the first-stage OLS regression. Ancestry relates to the origin of the CEO's last name. Column 2 presents the second-stage of the 2SLS where Log (Yield Spread) is the dependent variable. The instrumented value of Log (CEO Incentive Ratio) is the primary independent variables. Column 3 includes Log (CEO Incentive Ratio)2 as an additional independent variable. These have both been instrumented using ancestry. Robust standard errors are employed. T-statistics are provided in parenthesis and corrected for heteroscedasticity.

Table 17: OLS Regressions, Yield Spread and Incentive Ratio						
Variables	Dependent Variable = Log (Yield Spread)					
VARIABLES	1	2	3	4	5	6
CEO Incentive Ratio	-0.1791	-0.7041			-0.6239	-0.1032
	(-2.97)	**(-4.06)**			**(-3.72)**	(-1.51)
$(\text{CEO Incentive Ratio})^2$		0.6266			0.5802	
		(3.27)			**(3.17)**	
CFO Incentive Ratio			-0.2748	-0.8214	-0.1267	-0.7182
			(-2.97)	**(-3.52)**	(-1.23)	**(-2.96)**
$(\text{CFO Incentive Ratio})^2$				1.1095		1.0359
				(2.56)		**(2.43)**
Opt-Rest Ratio	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	(1.58)	(1.70)	(1.90)	(1.58)	(1.88)	(1.50)
Family Firm	-0.01	-0.0247	-0.0203	-0.0226	-0.0271	-0.0181
	(-0.35)	(-0.84)	(-0.71)	(-0.79)	(-0.91)	(-0.61)
Tenure	0.0018	0.0019			0.0016	0.0012
	(0.99)	(1.05)			(0.87)	(0.64)
CFO Age			-0.0001	0.0002	-0.0006	-0.0001
			(-0.03)	(0.10)	(-0.33)	(-0.05)
Profitability (ROA)	-1.194	-1.1421	-1.1722	-1.153	-1.1271	-1.149
	(-5.63)	**(-5.53)**	**(-5.65)**	**(-5.59)**	**(-5.50)**	**(-5.55)**
Size (Log Assets)	-0.1063	-0.1025	-0.1072	-0.1045	-0.1002	-0.1005
	(-8.62)	**(-5.53)**	**(-8.76)**	**(-8.56)**	**(-8.01)**	**(-8.02)**
Leverage	0.5023	0.4981	0.5053	0.4993	0.4978	0.4975
	(4.29)	**(4.28)**	**(4.30)**	**(4.26)**	**(4.29)**	**(4.27)**
Z Score	-0.0082	-0.0086	-0.0086	-0.0083	-0.0081	-0.0074
	(-0.85)	(-0.90)	(-0.88)	(-0.86)	(-0.84)	(-0.76)
Log Maturity	0.016	0.0168	0.015	0.0167	0.0165	0.0171
	(1.48)	(1.55)	(1.39)	(1.53)	(1.52)	(1.57)
Liquidity	0.0278	0.0269	0.028	0.0275	0.0269	0.0273
	(4.57)	**(4.44)**	**(4.63)**	**(4.56)**	**(4.45)**	**(4.51)**
Coupon Rate	0.0761	0.0767	0.0763	0.0761	0.0766	0.0758
	(12.35)	**(12.46)**	**(12.38)**	**(12.32)**	**(12.41)**	**(12.25)**
Time/Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,540	4,540	4,540	4,540	4,540	4,540
AIC	4963.44	4935.94	4960.82	4950.6	4935.03	4946.95
R-squared	0.4106	0.4145	0.4110	0.4128	0.4151	0.4135

This table presents estimated coefficients from ordinary least square regressions of corporate yield spread on CEO (CFO) incentive ratio and various control variables. We normalize the dependent variable by increasing yield spread by one and then taking the log form. Each observation represents the most junior bond issue in each firm-year. All regressions contain 4,540 observations from the sample of 599 firms and include industry and time fixed effects. Standard errors are clustered at the firm level. T-statistics are provided in parenthesis and corrected for heteroscedasticity.

Table 18: Vega and Piecewise Linear Regressions

Variables	OLS				Tobit	
	Dependent Variable = Log (Yield Spread)					
	1	2	3	4	5	6
Log CEO Vega	-0.0331	-1.0085				
	(-3.13)	**(-3.41)**				
(Log CEO Vega)^2		0.4728				
		(3.31)				
Log CFO Vega			-0.0224	0.2735		
			(-2.52)	(1.45)		
(Log CFO Vega)^2				-0.1443		
				(-1.56)		
CEO Incentive _0to55					-0.2196	
					(-4.08)	
CEO Incentive _55to100					0.2926	
					(2.64)	
CFO Incentive _0to40						-0.257
						(-3.47)
CFO Incentive _40to60						0.123
						(0.44)
Opt-Rest Ratio	0.0001	0.0001	0.0001	0.0001	1.32e-06	1.74e-06
	(1.57)	(1.84)	(1.56)	(1.45)	(0.37)	(0.49)
Tenure	0.0011	0.0018			0.00237	0.0015
	(0.58)	(0.96)			**(1.96)**	(1.37)
CFO Age			-0.0017	-0.0016		
			(-0.91)	(-0.86)		
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,656	3,656	3,644	3,644	10,042	10,042
AIC	3898.3	3880.11	3923.76	3920.4	-	-
R-squared	0.4133	0.4122	0.4155	0.4153	0.6645	0.6642

This table presents estimated coefficients from the regressions of corporate yield spreads, in log form, on vega and various control variables in columns 1-4. Columns 5 and 6 present a piecewise linear regression. Vega represents the change in executive wealth stemming from a one percent increase in the volatility of the firm's stock price. Prior literature uses vega to proxy for the risk increasing incentives stemming from executive compensation. Here, vega is used as an alternative measure of equity incentives. Each observation represents the most junior bond issue in each firm-year. We use ordinary least squares regressions and cluster the standard errors at the firm level. All regressions include industry and time fixed effects. Controls include family firm dummy, profitability, size, leverage, z-score, log maturity, liquidity, and coupon rate. T-statistics are provided in parenthesis and corrected for heteroscedasticity. Akaiki Information Criteria (AIC) are reported as well.

CHAPTER 3

GENDER DIVERSITY ON BOARD'S IMPACT ON COMPENSATION: THE CASE OF GENDER LANGUAGE DIVERSITY

Introduction

"Heterogeneous boards of directors with independent thinking enforce governance, and diversity strengthens creativity" – Pearl Zhu, author of Digitizing Boardroom: The Multifaceted Aspects of Digital Ready Boards.

In the past decade, several countries, as well as California, have passed laws to promote gender diversity on boards (Hoel 2008; De Anca 2008; Smith 2014). Terjesen, Sealy, and Singh (2009) explore how gender diversity on boards impacts social equality and director talent. Carter, Simkins, and Simson (2003) examine the link between gender diversity on the board and firm value and find a positive relation. Catalyst (2004) finds that firms with the highest representation of women on top management teams experience higher return on equity and return on assets than firms with low levels of representation on top management teams. In contrast, Adams and Feffeira (2009) find evidence that the average effect of gender-diversity on firm performance is negative. Ryan and Haslam (2005; 2007) suggest that a shortage of supply allows women to self-select onto better performing firms. Other evidence suggests that diversity-promoting firms realize abnormal announcement returns associated with female director announcement (Ellis and Keys 2003).

Gender diversity on boards arguably affects firm value and performance through incentive design. This is because the literature suggests that women are more risk averse than males (Wilson and Herrnstein 1985; Eckel and Grossman 2008; Jianakoplos and Bernasek 1998). For example, Sapienza, Zingales, and Maestripieri (2009) present evidence that gender differences in financial risk aversion are influenced by testosterone.

In this study, we examine the impact of board diversity on CEO and independent board director compensation. We argue that boards that are gender diverse are more likely to tie managers to shareholders through the provision of equity related compensation. This is because female board members are more likely to be outsiders, making them less likely to collude with managers on decisions that subvert shareholder interests. Additionally, prior literature suggests that women are superior monitors to men. At the same time, we hypothesize that gender diverse boards display higher levels of risk-aversion, since women are more risk-averse than men on average. This results in gender diverse boards designing their own compensation packages such that they receive less equity pay as a fraction of total pay. This results in a principal-agent problem where female board members prefer for managers to be tied to the firm while simultaneously minimizing their exposure to firm risk.

Using a sample of industrial firms from 2006 through 2017, we find that gender diversity on boards is associated with CEOs receiving more equity pay as a fraction of total pay. After controlling for industry, time, and firm specific characteristics, the analysis suggests that CEO equity pay is 10.7% higher in firms with at least one female board member. Firms with at least two women on the board compensate their CEOs with 16.5% more equity pay than all-male boards. Our results further suggest that CEO equity pay increases 6.6% for each female present on the board. Interestingly, the examination of the effect of board gender diversity on independent director equity pay, as a fraction of total annual pay, yields opposing results. Firms with at least one female board director compensate independent directors with 10.9% less equity pay than all-male boards. Independent board directors serving on boards with at least two females receive

7.97% less equity pay. Furthermore, for each woman present on the board, independent board directors receive 7.71% less equity pay than non-diverse boards. The results are robust to various measures of board gender diversity, firm control variables, and industry-fixed effects based on SIC 4-digit codes. The results are both statistically and economically significant. Broadly speaking, our analysis suggests that gender diversity on corporate boards is associated with more equity pay for CEOs and less equity pay for independent directors.

Although our findings indicate that female inclusion on boards leads to relatively greater equity pay for CEOs and lesser equity pay for independent directors, county-level factors may influence the presence of women on boards in firms headquartered in those counties. This may indicate that factors endogenous to pay and diversity influence the analysis. We employ several county level factors related to gender including the percentage of the county that is male, the percentage of the county that is married, household income, and grammatical language structure as instrumental variables in an identification strategy to disentangle the influence of board diversity on compensation. The first three instruments are objective in that they directly influence the number of female board candidates within a given county. Board Diversity is more subjective in nature but arguably associated with language structure. Languages display substantial variation in the presence of gender, within the vocabulary. For example, in English the word armchair has no masculine or feminine article associated with it. However, the Spanish word for armchair—la butaca—follows a feminine grammatical gender, and is associated with the feminine article “la”. Spanish displays greater levels of “linguistic gender marking” than English. Prior literature documents the influence of gender marking on behavior (Lupyan and Dale 2010, Ladd et al. 2015). Others find that gender marking affects gender gaps in pay, division of household labor, education levels, and political employment (Givati and Troiano 2012, Santacreu-Vasut et al. 2013, 2014, Hicks et al. 2015, Mavisakalyan 2015). Hicks, Santacreu-Vasut, and Shoham (2015) suggest that attitudes and beliefs regarding gender-roles are formed early in life and that they are influenced by language structure. These county-level gender variables are unlikely to impact compensation except through its influence on board diversity. Therefore, we argue that county-level factors including the percentage of the county's population that is male/female, the percentage of the county that is married, household income, and language structure are valid instruments for board diversity. The results of the first stage and second stage least squares regressions support our primary findings that board diversity positively influences executive equity pay. After accounting for endogeneity, we find no evidence that gender diversity on boards impacts independent director equity compensation.

This research makes the following contributions to the literature. First, we contribute to a growing body of literature examines the relation between board diversity and corporate governance (Fields and Keys 2003; Carter, Simkins and Simpson 2003; Farrell and Hersch 2005). For example, Ahern and Dittmar (2012) and Matsa and Miller (2013) investigate the relationship between gender diversity on boards and debt policy. Adams and Ferreira (2009) and Liu et al. (2014) study the impact of board diversity on firm performance. Sila et al. (2016) investigate the influence of board diversity on firm risk. Hoogendoorn et al. (2013) find that gender diversity on boards improves decision-making. We contribute by examining the relation between female presence on boards and CEO/director incentives.

Second, we contribute to the literature by suggesting that female board members face opposite and competing pressures to monitor and reduce risk. Prior literature argues that women are more risk averse than men (Byrnes et al. 1999; Croson and Gneezy 2009). Furthermore, females make more conservative investment decisions than males (Bernasek and Shwiff 2001;

Sunden and Surette 1998). Levi et al. (2013) finds that boards with female directors are less likely to participate in M&A activities and pay lower acquisition premiums when they do. Another line of literature provides evidence that females are better monitors than males (Barua et al. 2010; Clatworthy and Peel 2013; Krishnan and Parsons 2008; Peni and Vahamaa 2010; Srinidhi et a. 2011). Carter, Simkins, and Simpson (2003) Suggests that diversity increases board independence because board members from diverse backgrounds might ask questions that board members from traditional backgrounds would ask, resulting in a more activist board. We contribute by providing evidence consistent with the notion that female directors do monitor executives. Contrarily, they also add a decree of risk-aversion to board decisions. For female board members, monitoring dominates risk-aversion in CEO pay setting decisions. However, in independent director pay decisions, risk-aversion dominates since female board directors have no need to monitor themselves or other independent board directors.

Third, we contribute to the discussion on the influence of female board directors on executive and director pay by documenting that the presence of female directors positively impacts CEO equity compensation while negatively impacting independent director compensation.

Finally, we illustrate the impact of endogeneity in the relation between board diversity and director pay. Using gender related demographic variables and the gender marking index as instrumental variables in a 2SLS analysis, we find that the presence of females on boards positively impact CEO equity pay but appears to have no impact on director pay. This extends the literature, which finds that board diversity effects are influenced by the choice of estimator, by focusing on the endogenous relationship between gender diversity on boards and compensation (Adams and Ferreira 2009; Wintoki et al. 2012; Sila et al. 2016).

The remainder of the paper is organized as follows. Section 2 discusses the databases required for our analysis as well as our sample selection and descriptive statistics. Section 3 presents our multivariate analysis. Section 4 develops our identification strategy which employs instrumental variables including county level demographics relating to gender and the gender-marking index to instrument for board gender diversity. Section 5 concludes the paper.

Data

Sample Selection

Our primary analysis employs data from the BoardEx Summary dataset. BoardEx contains information on board members and executives for both US and non-US companies. This information includes director identification, age, nationality, gender, education, professional designations, role, time on the board, and compensation information (Shoham, Almor, Lee, Ahammad 2016). [2], we collapse the BoardEx based on firm-year level, resulting in aggregated director information at the firm level. To control for the influence of executive and corporate characteristics on director and executive pay, we merge Compustat and Execucomp with BoardEx based on the unique firm identifiers "isin" and "gvkey" and year. The final sample contains 11,962 firm year observations from 1,219 firms during the period 2000 through 2017. We allow the panel to be unbalanced in order to avoid survivorship bias.

In our identification strategy, we employ three additional datasets: Modern language association census and ACS (American Community Survey) economics characteristics. These two datasets arguably capture the influence of county level demographics such as the languages, marriage, gender, and income on board gender diversity. Our third dataset provides gender

[2] BoardEx data description can be viewed at https://metalib.ie.edu/ayuda/Varios/BoardExWRDSDataDictionary.pdf

marking information based on languages (Santacreu-Vasut, Shenkar, and Shoham 2014; Shoham, Almor, Lee, Ahammad 2017).

Measuring Gender Diversity on boards and Director Pay

Our dependent variable captures executive and director equity pay. We break pay into independent director pay and executive pay. The reason we differentiate between the two is because the effect of gender diversity on boards may impact executive pay in a different direction than it impacts executive pay. Independent director pay is measured as director equity and represents the director's equity holdings in the firm scaled by their annual salary. Executive pay is proxied by executive equity and represents the executive's equity holdings in the firm scaled by annual salary. Our choice to measure equity as firm related wealth rather than annual equity compensation accounts for prior equity compensation that may still impact executive's decisions and subsequent pay packages. Based on the literature presented above, we expect that female presence on boards will have a positive impact on executive pay and a negative impact on director pay.

We employ several measures of gender diversity to measure our independent variable which is the presence of females on corporate boards (Adams and Ferreira 2009; Sila, Gonzalez, and Hagendorff 2016). First, we employ a dummy variable (Female Dummy) equal to one if at least one female is present on a corporate board in a given firm-year. Second, we employ a dummy (Female Dummy 2) variable equal to one if at least two females are present on a corporate board. This setup is designed to differentiate firms which possess a token female on the board from those that are truly interested in having a board that is diverse regarding gender. The third way that we measure gender diversity on boards is by using the number of women (Number Females present on the board. However, larger boards are more likely to have more women on the board. Fourth, we employ the fraction of women (Fraction Female) on a board as our final measure of gender diversity on boards.

Firm characteristics, executive experience, and board composition influence director and executive pay. To control for these factors, we include several control variables into the analysis. These variables include firm size, profitability, leverage, and CEO tenure. Prior literature argues that board characteristics may be selected based on the firm's complexity, monitoring needs, and bargaining power of the CEO (Boone et al. 2007; Coles et al. 2008; Hermalin and Weisbach 1998; Linck et al. 2008). We employ book value of total assets to control for the complexity and monitoring needs of the firm. CEO tenure proxies for executive experience (Nam, Wang, Zhang 2008). Profitability is measured as net income over total assets. Leverage is associated with risk and CEOs in high risk firms likely require a compensation premium for bearing such risk (Friend and Lang 1988). We measure leverage as total debt over total assets. Berger et al. (1997) indicates that longer CEO tenure entrenches CEOs and may be associated with greater ownership in the company. Year- and industry-fixed effects based on the four-digit SIC codes are also included. All variables are winsorized at the 1% and 99% levels to mitigate the effect of outliers.

Descriptive Statistics

Table 19 presents descriptive statistics for the sample. The average independent director owns equity in the firm worth 2.648 times their annual salary while the top 25% of equity directors hold 3.229 times more equity pay than their fixed pay. By comparison, the average CEO holds 3.91 times more equity in the firm than their annual salary with a standard deviation of 1.303. At least one woman is present on 78.7% of corporate boards in our sample. Forty-five percent of our sample contains two or more women on the board in a given firm-year. The average number of women present in a firm-year is 1.445 and 13.3% of board seats are occupied by females. The average total assets in a given firm-year is 36.487 billion dollars with a standard deviation of 147.313 billion. The average firm employs 21.5% debt to cover assets. Average profitability is 8.9% while median profitability is 8.5%. The average CEO tenure in the sample is 6.271 years while the median firm-year observation employs a CEO with four years of experience. About half of the boards in our sample are independent, although the top 25% of firms contains independent directors representing 60% of the board. The weighted gii ranges from 0.468 to 3.749 with an average of 1.228. The average percentage of men in a given county is 48.3% in our sample. Average percent of the local county population that is married is 45.4% in a given firm-year. Finally, average family income is 43,935 with a standard deviation of 9,089.

Multivariate Analysis on Gender Diversity on Boards and Director Pay

Our multivariate analysis employs pooled time series regressions to evaluate the impact of board gender diversity on independent director and executive compensation. Nearly 79% of the sample (firm-year observations) contain at least one female present on the board while 45% of the observations contain two or more females on boards. We use a linear-linear regression specification, indicating that a one unit change in board diversity results in a 100% * coefficient change in equity holdings scaled by annual salary. All regressions include year and industry fixed effects, based on the four-digit SIC codes. Standard errors are clustered at the firm level to control for serial correlation. The independent variables in the regression include one of our four measures of gender diversity on boards, total assets, profitability, leverage, and CEO tenure. The regression specification is:

$$\text{Director Pay}_{i,t} = \beta_0 + \beta_1(\text{Gender Diversity on Board}) + \beta_2(\text{Total Assets}) + \beta_3(\text{ROA}) + \beta_4(\text{Leverage}) + \beta_5(\text{CEO Tenure}) + \beta_6(\text{Time Dummy}) + \beta_7(\text{SIC Dummy})$$

$$\text{CEO Pay}_{i,t} = \beta_0 + \beta_1(\text{Gender Diversity on Board}) + \beta_2(\text{Total Assets}) + \beta_3(\text{ROA}) + \beta_4(\text{Leverage}) + \beta_5(\text{CEO Tenure}) + \beta_6(\text{Time Dummy}) + \beta_7(\text{SIC Dummy})$$

Table 20 presents the regression coefficient estimates examining the relation between gender diversity on boards and independent director pay while Table 21 displays the coefficient estimates from the regression of CEO pay on board gender diversity. Table 20, column 1 examines the impact of having at least one female present on a board on independent director pay. The coefficient estimate is -0.109 and is statistically significant at the 10% level, indicating that independent directors in firms which have at least one female present on the board of directors have 10.9% lower equity holdings in the firm, as a fraction of annual salary. Column 2 presents the results of the regression of independent director pay on female dummy 2. The coefficient estimate is -0.0797 and is statistically significant at the 5% level, suggesting that independent directors on firms with at least two female board directors hold -7.97% less equity in the firm, as a fraction of annual salary.

Table 20 column 3 displays the regression coefficient estimates of independent director pay on the number of females on the board. The coefficient estimate is -0.771, is statistically significant at the 1% level, and suggests that each female that a board adds results in a decrease in equity holdings for independent board directors of 7.71% as a fraction of annual salary. Column 4 shows the influence of the fraction of female board members on independent director pay. Here, the coefficient estimate is -0.937, which indicates that a 10% increase in the fraction of board seats held by women would result in a reduction in equity holdings of -9.37% as a fraction of annual salary.

Table 21 provides the coefficient estimates for the regression of CEO pay on board gender diversity. We find that the while the results are statistically significant, the sign is opposite of that indicated in Table 20. Table 21, column 1 examines the impact of having at least one female on the board on chief executive pay. The coefficient estimate is 0.107. Column 2 depicts the effect of having at least two females present on the board on CEO pay. The coefficient estimate is 0.165 and is statistically significant at the 1% level, indicating that boards which have at least two female directors are associated with CEOs holding 16.5% more equity in the firm as a fraction of annual salary. The coefficient estimate in column 3 is 0.066 and is statistically significant at the 5% level, suggesting that increasing the number of females on the board by one female results in the CEO of that company holding 6.6% more equity as a fraction of annual salary. Finally, column 4 has a coefficient estimate of 0.557 which indicates that increasing the fraction of females on the board by 10% results in CEO equity holdings increasing by 5.57% as a fraction of annual salary. The results for the regressions of CEO pay on board gender diversity indicate that firms with greater gender diversity on boards compensate their executives with more equity pay as a fraction of annual salary.

The control variables in our analysis exhibit relations with director pay and CEO pay that are consistent with prior literature. Larger firms tend to provide their independent directors and CEOs with larger holdings of equity as a fraction of annual salary. Firms that make greater use of debt financing, i.e., employ greater leverage, compensate their directors and executives with smaller equity grants, relative to their annual salaries. Perhaps executives and directors require higher fixed salary as compensation for bearing greater financial risk in the firm. CEOs and independent directors hold more equity in firms, which display greater profitability. We believe this is attributable to unrealized appreciation in prior restricted stock grants. Tenure is positively associated with the portion of equity pay that independent directors and CEOs hold in the firm indicating that experienced CEOs tend to hold more equity in the firm and independent directors hold greater equity in firms where CEOs possess greater experience.

Overall, our analysis suggests that the inclusion of females on corporate boards results in independent directors holding less equity in the firm and CEOs holding more equity in the firm. We find that the effect is statistically and economically significant across our various measures of gender diversity on boards. Furthermore, the effect on compensation appears to strengthen as more females are added to the board of directors. This is consistent with the work of Konrad, Kramer, and Erkut (2008) which finds that "with three or more women on the board, the board has a completely different feel".

Identification Strategy

The results of our analysis suggest that the presence of women on corporate boards positively impact the equity holdings of CEOs while negatively influencing the equity holdings of independent board directors. Our argument indicates that pay is affected by board diversity.

However, our analysis may suffer from either reverse causality or omitted variable bias. For example, some firms may compensate their CEOs with larger portions of equity pay, thus more closely aligning them with shareholders. If this manager-shareholder alignment causes outperformance then eventually, qualified female board directors may self-select onto boards of less risky firms (Farrell and Hersch 2005). In these firms, CEOs have large equity holdings, longer than average tenure, and greater board diversity as a result of prior superior performance. Alternatively, firm characteristics such as organizational culture may affect the number of women on the board.

To investigate the causality direction and account for omitted variable bias, our identification strategy employs objective and subjective instrumental variables. The objective element of our analysis stems from literature which indicates that county demographics have an important impact on firm characteristics (Hilary and Hui 2009; Kumar et al. 2011). Following Kumar, Page, and Spalt (2011), we use the percentage of the county population that is married, the percentage of the county population that is female, and the average family income level of the county as instrumental variables for gender diversity on boards. The link here is straightforward. The participation of women on local corporate boards are directly influenced by the percentage of the local population that is female as well as the percentage of the local population that is married. Prior literature suggests that "men with high earnings …. Their wives are less likely to be working than women married to less well-paid men" (Mincer 1974; Treas 1987; Cerrutti 2000). Thus, family income is likely negatively related to female participation in the labor force. While marriage, gender, and income arguably influence board diversity of companies located in the same counties; we find no plausible reason why these three factors would impact equity holdings of executives and directors, except through board diversity. Therefore, we argue that these objective instrumental variables meet both the instrumental relevance and instrumental exogeneity.

Gender marking is our subjective instrumental variable for board gender diversity. We borrow the term gender marking from the psychology and linguistics literature. The Sapir-Whorf hypothesis of linguistic relativity (Saphir 1929; Whorf 1956) theorizes that language shapes a person's view of the world. Boroditsky (2010) explains that "the languages we speak not only reflect or express our thoughts, but also shape the very thoughts we wish to express… we discover that human nature too can differ dramatically, depending on the languages we speak". It follows that some cultures have very traditional views of female/male roles while others are more progressive. Johansson (2005) suggests that activities such as tool making, reproduction, and division of labor explain gender distinctions in modern language. Language-based gender distinctions are stable, very old, and directly influence our understanding of society and male/female roles in society (Santacreu-Vasut, Shenkar, and Shoham 2014). Therefore, language variation in gender may explain cultural variations in gender roles (Boroditsky et al. 2003). Gay, Hicks, Santacreau-Vasut, and Shoham (2017) provide evidence that female immigrants who speak languages associated with low gender-based distinctions exhibit higher labor force participation. Women who speak languages associated with lower intensity of gender in grammatical structures also receive higher pay, receive more promotions, and tent to be better educated than women who speak languages associated with high gender intensity (Santacreu-Vasut et al. 2013, 2014; Hicks et al. 2015; Mavisakalyan 2015; Davis and Reynolds 2016).

The literature measures language-based gender distinctions through gender marking. Gender marking measures the extent to which a language structure distinguishes between genders. We measure gender marking through the Gender Intensity Index (GII). GII sums up a languages' sex-base, number of genders, gender assignment, and gendered pronouns to a number between zero and four. The result is that each language has a gender marking value between zero and four where four would be characteristic of a language that makes large male-female distinctions and zero would represent no distinction between gender (Hicks, Santacreu-Vasut, and Shoham 2015). We argue that director and executive pay is unaffected by language-based gender distinctions except through board diversity.

Table 22 presents the first stage of the two-stage least squares instrumental variable regression. In the first stage of the 2SLS specification, gender diversity on boards is regressed on gender marking, married, male-female ratio, average family income, and control variables. In columns 1 through 3, we measure gender diversity on boards as (1) a dummy variable equal to one if the board contains at least one woman, (2) the number of women present on the board, and (3) the fraction of the board which is occupied by women. Gender marking is measured by the Gender Intensity Index (GII). In column 1, the coefficient estimate on GII is -0.172 and is statistically significant at the 10% level. In column 2, the coefficient estimate on GII is -0.0831 and is statistically significant at the 10% level. In column 3, the coefficient estimate on GII is -0.0105 and is statistically significant at the 5% level. The results of the first-stage 2SLS indicate that firms headquartered in counties characterized by large gender distinction languages, higher household incomes, and higher incidents of marriage have fewer women on their boards of directors. Curiously, the percentage of the county population that is male appears to be positively associated with board diversity.

Next, we move on to the second stage of the 2SLS specification. In the second stage, we examine the relation between director pay and the instrumented board diversity measures. We again differentiate between independent director pay (Table 23) and CEO pay (Table 24). Table 23 investigates the relation between the equity holdings of independent board directors, scaled by annual salary, and board diversity. Control variables include firm size, leverage, profitability, tenure, and industry- and time-fixed effects. The coefficient estimate on instrumented board diversity in column 1 is 0.277 and is statistically insignificant. The coefficient estimate on instrumented board diversity in column 2 is 0.468 and is statistically insignificant. The coefficient estimate on instrumented board diversity in column 3 is 6.494, which is statistically insignificant.

These results indicate that board diversity does not appear to impact independent director equity holding when instrumented by the gender intensity index, household income level, marriage, and percentage of the county population that is male.

Table 24 presents the second stage 2SLS regressions of CEO equity holdings, scaled by annual salary, on instrumented board gender diversity. Control variables again include firm size, leverage, profitability, tenure, and industry- and time-fixed effects. The coefficient estimate on instrumented board diversity in column 1 is 1.534 and is statistically significant at the 1% level. Column 2 presents a coefficient estimate on instrumented board diversity of 0.767 is statistically significant at the 5% level. Column 3 shows a coefficient estimate on instrumented board diversity of 14.56 and is statistically significant at the 1% level. These results indicate that board diversity, when instrumented by the gender intensity index, appear to positively impact CEO equity holdings.

Taken together, the findings of our identification strategy indicate that while females on boards have no impact on the equity holdings of independent board directors, board diversity does result in increased CEO equity holdings, which more closely align CEOs with shareholders. This finding further indicates that females on corporate boards display both superior monitoring and greater risk-aversion than all male boards. However, these effects are opposite in nature. We find that regarding CEO compensation, the monitoring effect of female board directors dominates the risk-aversion affect. Since equity compensation is a form of monitoring, the net effect is that CEOs receive more equity pay in an attempt to tie them to firm performance.

Conclusion

Gender diversity on boards is an important topic in governance reform today. However, academics have much to learn about the impact of female board participation on corporate policies. In this paper, we provide new evidence that gender diverse boards positively impact CEO equity pay and negatively influence independent director equity pay. Prior literature indicates that women possess superior monitoring abilities to men, and yet women on average display greater risk aversion than men do. Additionally, monitoring and risk-aversion arguably have opposing impacts on pay. On the one hand, one way to monitor is to align the incentives of the agent with those of the principal; suggesting that boards may monitor through equity compensation grants. Risk-aversion on the other hand results in less equity pay which causes reduction in risk-taking. Our evidence indicates that regarding CEO pay, the effect of female board monitoring dominates the effect of risk-aversion, resulting in gender diverse boards compensating CEOs with greater quantities of equity pay. At the same time, gender diverse boards compensate independent directors, with lower portions of equity pay which suggests that the risk-aversion effect dominates the monitoring effect for independent directors. This is intuitive since female board directors have no need to monitor themselves.

Our analysis addresses causality through a 2SLS instrumental variable analysis. We instrument for gender diversity on boards through employing county level gender characteristics as instruments. The instruments include percentage of the county that is married, percentage of the county that is female, average county income, and the weighted gender intensity index. Boroditsky et al. (2003) indicates that language variations in gender explain cultural variations in gender roles. Therefore, the gender intensity index (GII) reflects the extent to which a language structure distinguishes between genders. GII sums up a languages' sex-base, number of genders, gender assignment, and gendered pronouns to a number between zero and four where four would reflect a high gender-marked language. We argue that while county-level gender characteristics and gender marking are correlated with gender board diversity, they do not influence executive or director pay except through board diversity. The results of the 2SLS indicate that the instrumented presence of women on boards positively impacts executive equity pay, but contrary to our previous findings, board diversity appears to have no causal impact on independent director equity pay.

On the whole, our analysis indicates that the presence of females on corporate boards substantially influence compensation structures of directors and executives. We suggest that female presence on boards benefit corporate policies implemented by boards.

Table 19 Summary Statistics

Variable	mean	p50	p75	sd	Min	max	N
Equity Director	2.648	2.555	3.229	1.054	0.427	5.995	11926
Equity Executive	3.91	3.855	4.628	1.303	0.419	7.937	11962
Female Dummy	0.787	1	1	0.409	0	1	11962
Female Dummy 2	0.45	0	1	0.498	0	1	11962
Number Females	1.455	1	2	1.129	0	7	11962
Fraction Females	0.133	0.125	0.2	0.098	0	0.625	11962
Total Assets	36487	6873	21349	147313	3.055	2573126	11954
Leverage	0.215	0.193	0.32	0.176	0	0.81	11918
ROA	0.089	0.085	0.138	0.093	-0.298	0.339	11492
Tenure	6.271	4	9	6.129	0	31	10433
Independent Director	0.509	0.533	0.6	0.121	0.143	0.714	11962
Weighted GII	1.228	1.126	1.266	0.335	0.468	3.749	9729
Male	0.483	0.482	0.49	0.011	0.463	0.509	10397
Married	0.454	0.465	0.524	0.092	0.253	0.607	9259
Income	43935	41523	51667	9089	29386	61248	10397

Table 19 provides summary statistics on the 11,962 firm-year observations in the sample. The sample begins in 2000 and ends in 2017.

Table 20 Director Equity and Board Diversity

	Dependent Variable = Equity Director			
VARIABLES	1	2	3	4
Female Dummy	-0.109			
	(-1.90)			
Female Dummy 2		-0.0797		
		(-2.09)		
Number Females			-0.0771	
			(-3.96)	
Fraction Females				-0.937
				(-4.28)
Assets	4.05e-07	4.24e-07	4.82e-07	4.53e-07
	(1.762)	(1.833)	**(2.028)**	(1.945)
Leverage	-0.569	-0.564	-0.585	-0.584
	(-3.686)	**(-3.640)**	**(-3.792)**	**(-3.784)**
ROA	1.982	1.976	1.976	1.971
	(6.592)	**(6.584)**	**(6.600)**	**(6.579)**
Tenure	0.0132	0.0131	0.0126	0.0126
	(3.263)	**(3.247)**	**(3.132)**	**(3.113)**
Time and Industry FE	Yes	Yes	Yes	Yes
Constant	3.199	3.171	3.231	3.241
	(41.61)	**(42.00)**	**(45.96)**	**(46.26)**
Observations	9,970	9,970	9,970	9,970
R-squared	0.259	0.259	0.262	0.263

This table presents coefficient estimates from regressions of director equity pay on board diversity. Each observation represents a firm in a given year. We employ an ordinary least square regression technique while controlling for industry and year fixed effects. All regressions contain 9,970 firm year observations. T-statistics are in parenthesis and are correlated for heteroscedasticity.

Table 21 Executive Equity and Board Diversity

	Dependent Variable = Equity Executive			
VARIABLES	1	2	3	4
Female Dummy	0.107			
	(1.602)			
Female Dummy 2		0.165		
		(3.318)		
Number Females			0.0660	
			(2.554)	
Fraction Females				0.557
				(1.990)
Assets	8.16e-07	7.61e-07	7.52e-07	7.93e-07
	(2.586)	**(2.477)**	**(2.427)**	**(2.523)**
Leverage	-0.346	-0.347	-0.334	-0.342
	(-2.057)	**(-2.064)**	**(-1.977)**	**(-2.028)**
ROA	3.405	3.400	3.411	3.417
	(10.50)	**(10.46)**	**(10.46)**	**(10.47)**
Tenure	0.0539	0.0545	0.0543	0.0541
	(11.51)	**(11.81)**	**(11.71)**	**(11.62)**
Industry and Time FE	Yes	Yes	Yes	Yes
Constant	3.555	3.543	3.535	3.555
	(8.449)	**(8.591)**	**(8.586)**	**(8.497)**
Observations	9,970	9,970	9,970	9,970
R-squared	0.318	0.320	0.319	0.318

This table presents coefficient estimates from regressions of CEO equity pay on board diversity. Each observation represents a firm in a given year. We employ an ordinary least square regression technique while controlling for industry and year fixed effects. All regressions contain 9,970 firm year observations. T-statistics are in parenthesis and are correlated for heteroscedasticity.

Table 22 Board Diversity and the Gender Intensity Index

VARIABLES	Female Dummy 1	Number of Females 2	Fraction of Females 3
Weighted GII	-0.172	-0.0831	-0.0105
	(-1.764)	(-1.814)	**(-2.533)**
Assets	3.93e-05	8.15e-07	4.75e-08
	(13.13)	**(3.604)**	**(3.809)**
Leverage	-0.376	-0.223	-0.0227
	(-2.055)	**(-2.455)**	**(-2.778)**
ROA	0.835	0.359	0.0296
	(2.850)	**(2.382)**	**(2.047)**
Tenure	-0.0324	-0.0122	-0.00101
	(-8.287)	**(-6.280)**	**(-5.590)**
Married	0.411	-1.204	-0.0883
	(1.059)	**(-6.235)**	**(-5.068)**
Male	-1.964	**2.816**	0.408
	(-0.606)	(1.753)	**(2.718)**
income1	-6.80e-06	-3.41e-06	-1.82e-08
	(-1.900)	(-1.783)	(-0.112)
Industry and Time FE	Yes	Yes	Yes
Constant	0.503	-0.804	-0.160
	(0.329)	(-1.102)	**(-2.357)**
Observations	5,308	6,985	6,985
R-squared		0.456	0.434

This table displays the first-stage of the two-stage least squares regression technique. It presents coefficient estimates from regressions of board diversity measures on the language weighted gender intensity index at the county level. observations represent a firm in a given year. Industry and year fixed affects are controlled for. T-statistics are in parenthesis and are correlated for heteroscedasticity.

Table 23 2SLS Director Equity and Board Diversity

	Dependent Variable = Equity Director		
VARIABLES	1	2	3
Fitted Female Dummy	0.277		
	(1.023)		
Fitted Number Females		0.468	
		(1.366)	
Fitted Fraction Females			6.494
			(1.454)
Assets	6.75e-07	2.67e-07	3.35e-07
	(1.748)	(0.570)	(0.773)
Leverage	-0.642	-0.555	-0.505
	(-2.964)	**(-2.665)**	**(-2.325)**
ROA	1.198	1.381	1.361
	(3.131)	**(3.694)**	**(3.615)**
Tenure	0.0217	0.0221	0.0231
	(3.376)	**(3.397)**	**(3.491)**
Time and Industry FE	Yes	Yes	Yes
Constant	2.937	3.336	3.373
	(13.61)	**(37.62)**	**(33.07)**
Observations	5,308	6,985	6,985
R-squared	0.244	0.282	0.282

This table displays the second-stage of the two-stage least squares regression technique. It presents coefficient estimates from regressions of director equity pay on the fitted values of board diversity, which have been instrumented for using the gender intensity index. Each observation represents a firm in a given year. Industry and year fixed affects are controlled for. T-statistics are in parenthesis and are correlated for heteroscedasticity.

Table 24 2SLS Executive Equity and Board Diversity

	Dep Variable = Equity Executive		
VARIABLES	1	2	3
Fitted Female Dummy	1.534		
	(5.483)		
Fitted Number Females		0.767	
		(1.966)	
Fitted Fraction Females			14.56
			(2.833)
Assets	7.67e-07	2.49e-07	1.38e-07
	(2.844)	(0.547)	(0.339)
leverage	-0.291	-0.347	-0.168
	(-1.271)	(-1.469)	(-0.668)
ROA	2.230	2.575	2.450
	(5.936)	**(6.637)**	**(6.402)**
Tenure	0.0692	0.0653	0.0711
	(9.979)	**(8.841)**	**(9.194)**
Time and Industry FE	Yes	Yes	Yes
Constant	2.842	2.601	2.710
	(12.22)	**(26.24)**	**(24.30)**
Observations	5,308	6,985	6,985
R-squared	0.334	0.352	0.355

This table displays the second-stage of the two-stage least squares regression technique. It presents coefficient estimates from regressions of CEO equity pay on the fitted values of board diversity, which have been instrumented for using the gender intensity index. Each observation represents a firm in a given year. Industry and year fixed affects are controlled for. T-statistics are in parenthesis and are correlated for heteroscedasticity.

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