ESSAYS ON CEO BEHAVIOR

by

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Abstract

This dissertation is composed of two essays that examine the feedback between firm financial characteristics and CEO behavioral tendencies. The first essay examines the relationship between CEOs' facial width-to-height ratios (fWHR) and firms' financial policies. Greater facial width is considered to be a masculine physical trait and has been linked to increased aggressive behavior and greater risk tolerance. I find that high-fWHR CEOs pursue more aggressive financial policies, including increased leverage and reduced cash holdings. Additionally, I find that high-fWHR CEOs tend to maintain smaller ownership shares of their firms, suggesting that these CEOs place relatively lower importance on signaling alignment with shareholders. I also show that acquisition attempts led by high-fWHR CEOs are more likely to be unsuccessful. Despite that these managerial characteristics in high-fWHR CEOs are not offset by greater profitability, I find that high-fWHR CEOs do not face a greater risk of forced turnover. In the second essay, I examine CEOs' option-exercise decisions. The retention of deep in-the-money stock options has been ascribed to managers' overconfidence in their ability to increase firm value. I find that this behavior is predicted by non-private firm financial information and macroeconomic conditions. Specifically, managers are more likely to retain deep in-the-money stock options when their firms are more profitable, less financially constrained, and have greater growth opportunities. This behavior is also more frequently exhibited during periods of macroeconomic expansion. Given its apparent reactionary nature, this behavior seems to be

a reflection of managers' optimism regarding the near-term financial prospects of their firms and is not necessarily attributable to managerial overconfidence.

Dedication

This dissertation is dedicated to my family, friends, and loved ones. I could not have completed this journey without your support.

List of Abbreviations and Symbols

2D:4D Ratio of length of index finger to length of ring finger

CEO Chief Executive Officer

fWHR Facial width-to-height ratio

GDP Gross domestic product

M&A Mergers & acquisitions

MBA Master of Business Administration

R&D Research & development

ROA Return on assets

S&P Standard & Poor's

SEC U.S. Securities and Exchange Commission

SIC Standard Industrial Classification

p Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value

t Computed value of t test

Δ First difference

$>$ Greater than

$<$ Less than

$=$ Equal to

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Introduction

This dissertation is comprised of two essays which examine the feedback between CEO behavioral tendencies and firm financial characteristics. The first essay, "CEO Facial Masculinity and Firm Financial Outcomes," outlines links between the facial width-to-height ratio (fWHR) of corporate chief executives and firm financial policies. Greater facial width-to-height ratio is related to increased testosterone levels and has been linked to aggressive behavior and increased risk tolerance. Male faces with higher fWHR are perceived as being more masculine. Using data hand-collected from images of 968 male CEOs who headed S&P 500 firms between 2002 and 2013, I find that CEO facial width is positively correlated with both book and market leverage and negatively correlated with the level of cash holdings, but is not related to firm investment levels or profitability. Though the inclusion of firm fixed-effects indicates that CEO fWHR does not have significant explanatory power of differences in financial policies within firms, the relationships between CEO fWHR and financial policies remain after removing post-turnover firm-year observations from the sample. Additionally, there is little evidence to suggest that the observed relationship between CEO fWHR and financial policies can be attributed to newly-hired CEOs sorting into firms with certain financial characteristics. Overall, it appears that CEO masculinity has a significant impact on corporate financial decisions, as higher testosterone levels during early life may later induce CEOs to pursue more aggressive financial policies. Additionally, although there does not appear to be a relationship between

CEO fWHR and the level or type of their compensation, high-fWHR CEOs tend to own a smaller percentage of their firms' outstanding shares, both including and excluding options. Since CEOs tend to be over-invested in their firms' outcomes, this tendency toward lower ownership suggests that higher-fWHR CEOs might prioritize acting in their own best interests ahead of signaling their alignment with other shareholders. I also find evidence that CEO fWHR might affect M&A negotiations, as acquisition attempts led by high-fWHR CEOs are more likely to fail. Despite that the increased financial risks associated with high-fWHR CEOs are not offset by increased profitability, I find that high-fWHR CEOs are not more likely to face forced turnover.

The second essay, "Overconfidence or Optimism? A Look at CEO Option-Exercise Behavior," examines the retention of deep in-the-money exercisable stock options by CEOs, a behavior which has generally been attributed to managers' overconfidence in their ability to increase firm value. I find that this behavior is related to numerous time-varying firm circumstances and macroeconomic conditions. CEOs are more likely to retain deep in-the-money options when firm stock returns and profitability are higher, and less likely to do so when their firms are excessively levered or cash constrained. Additionally, this behavior is more frequently observed in CEOs of firms with high levels of investment and lower dividend payouts, even after controlling for potential endogeneity in these relationships. Furthermore, macroeconomic conditions affect CEO option-exercise decisions, as CEOs more frequently retain deep in-the-money stock options when GDP growth, interest rates, inflation, and employment levels are high, even after controlling for firms' idiosyncratic stock returns. Since CEOs tend to retain stock options when their firms are more profitable and less financially constrained, as well as during periods of macroeconomic expansion, I argue that the year-to-year variation in this behavior is more a reflection of a CEOs' changing levels of optimism regarding the near-term financial prospects of their firms and

that this behavior is not necessarily indicative of managerial overconfidence. However, the habitual exhibition of optimism, beyond what would be expected given a firm's profitability, investment opportunities, and level of financial constraint, could be attributed to managerial overconfidence. By examining stock option decisions in CEOs who have managed multiple firms, I find some evidence that overconfidence may be managerial fixed effect. I also find that female CEOs are less overconfident, while managers who become CEO at a younger age are more overconfident, and that managers tend to become less overconfident as their tenures progress.

Chapter 1

CEO Facial Masculinity and Firm Financial Outcomes

I Introduction

A growing body of literature indicates that certain observable CEO characteristics, including age[1], education[2], gender[3], overconfidence[4], military service[5], and early-life experiences[6], can have substantial impacts on corporate finance policies. In an effort to determine whether CEOs' testosterone levels might play a role in determining financial management decisions, I relate CEO facial width-to-height ratio (fWHR) to firm financial policies, since facial width has been shown to be a proxy for testosterone levels (Lefevre, Lewis, Perrett, and Penke, 2013). As the majority of studies on the subject have concluded that high testosterone levels are associated with increased risk tolerance and aggression, I expect that, if testosterone levels affect a CEO's managerial preferences, greater CEO facial width will be associated with riskier, more aggressive financial policies.

[1] Yim (2012)
[2] Bertrand and Schoar (2003); Malmendier and Tate (2005)
[3] Huang and Kisgen (2013)
[4] Malmendier and Tate (2005); Malmendier and Tate(2008); Malmendier, Tate, and Yan (2011)
[5] Malmendier, Tate, and Yan (2011); Benmelech and Frydman (2014)
[6] Graham and Narasimhan (2004); Malmendier, Tate, and Yan (2011)

Because obtaining saliva samples from or measuring digit lengths (another proxy for testosterone levels) of a large number of CEOs would be challenging, one significant advantage of examining CEO facial width instead is that it provides a somewhat readily available and easily observable insight into a CEO's testosterone levels. To test the hypothesis that higher CEO fWHR will be associated with more aggressive firm financial policies, I collect images of 968 male CEOS of large, publicly-traded firms and measure fWHR for each. I then relate the fWHR measurements to leverage, cash holdings, investment, and profitability in their respective firms. While I do not find evidence that CEO fWHR is associated with differences in investment decisions, nor does it appear that CEO testosterone levels are correlated with firm profitability, I do find strong evidence that CEO fWHR is associated with more aggressive financial policies. Specifically, I find that firms managed by high-fWHR CEOs have higher leverage and lower cash holdings. These results are robust to the inclusion of industry and year fixed effects and firm-year controls.

While the observed relationship between CEO fWHR and financial policies might reflect the effects of testosterone on CEOs' managerial preferences, it is also possible that high-fWHR, more masculine CEOs might naturally sort into firms that already exhibit a propensity for aggressive financial policies. After examining financial characteristics of firms prior to hiring CEOs for which fWHR data has been collected, I find little evidence to support the latter hypothesis. To examine the former possibility, that the relationship between CEO fWHR and financial policies reflects managerial preferences, I construct two subsamples where CEOs might have greater influence on the financial policies of their firms. The first subsample is created by removing the first two years of firm-year observations following a new CEO being hired. It should be expected that the financial characteristics of a firm will more accurately represent a CEO's managerial preferences after their third year than during earlier parts of his or her tenure, as CEOs will have had

ample time to implement their desired financial policies by their third year. A second subsample is comprised of "long-term" CEOs, which I classify as CEOs who achieve tenures of at least eight years with their firms. These long-term CEOs are likely to be more influential figures in their firms than shorter-tenured CEOs, and the financial policies of the firms they manage should provide a more accurate representation of their managerial preferences. In both of these subsamples, the relationships between CEO fWHR and financial policies are consistent with what is observed in the full sample. High facial width among these CEOs is again correlated with higher leverage and lower cash holdings. Given that the relationship between fWHR and financial policies holds among more influential CEOs, and considering that CEOs do not appear to sort into financially aggressive or conservative firms according to fWHR, it appears that association between CEO facial masculinity and firm financial policies may be a result of variation in managers' risk preferences.

I also examine the relationship between CEO facial masculinity, executive compensation, and firm ownership. Although maintaining a larger ownership share signals that a CEO is aligned with his shareholders, CEOs are typically greatly overinvested in the outcomes of their firms and have an incentive to decrease their ownership levels as a means of reducing exposure to idiosyncratic firm risk. While I do not find evidence of a significant relationship between CEO fWHR and the level or type of compensation received, I find that high-fWHR CEOs tend to own a smaller fraction of their firms compared to low-fWHR CEOs. This result suggests that less masculine CEOs place relatively greater importance on signaling alignment with shareholders at the expense of diversification in their personal portfolios.

Finally, I investigate the effect of CEO facial masculinity of outcomes in M&A negotiations. Haselhuhn et al. (2014) show that greater facial width is a predictor of

aggression in negotiations in experimental settings. Therefore I expect that CEO facial width might predict several outcomes in M&A negotiations. While I do not find evidence that CEO fWHR is related to the length of time required to complete M&A transactions, nor is it related to the likelihood that an acquiring firm's bid will be unsolicited by the target firm, I find that acquisition attempts led by high-fWHR CEOs are somewhat more likely to fail. I also find that high-fWHR CEOs might tend to pay lower premiums for target firms, though the observed effect is small.

Additionally, despite the greater financial and legal risks (see Jia, Van Lent, and Zhang; 2014) associated with high-fWHR CEOs that are not offset by increased financial performance, I do not find direct evidence that high-fWHR face greater forced turnover risk. However, characteristics associated with high-fWHR CEOs, namely higher leverage and lower firm ownership, predict an increased likelihood of forced turnover.

This paper contributes to the area of corporate finance literature which shows that observable CEO characteristics can have a significant influence on financial management decisions. Additionally, these findings provide further support for the broader notion that higher testosterone levels are associated with greater risk taking behavior, even in large publicly-traded firms.

The remainder of the paper is organized as follows. Section II provides a review of relevant literature. Section III describes the data collection procedure, variable definitions, and summary statistics. Section IV presents results regarding the relationship between CEO fWHR and firm financial outcomes. Section V examines CEO fWHR as a predictor of outcomes in M&A negotiations. Section VI examines the relationship between CEO fWHR and forced turnover risk. Section VII concludes.

II Related Literature

Several studies have investigated the relationship between facial appearance and testosterone levels. Penton-Voak and Chen (2004) find that male subjects with higher testosterone levels were judged to have more masculine-looking faces than low testosterone men. Lefevre, Lewis, Perrett, and Penke (2013) show that males with greater facial width tend to have higher testosterone levels. Male subjects with high fWHR had higher baseline testosterone levels, as well as larger testosterone reactions following exposure to potential mating opportunities. This study provides strong evidence that testosterone could explain links documented between fWHR and certain behavioral traits (suggested by Carré and McCormick, 2008).

The relationship between facial width and aggressive behavior has been studied in several papers. Carré and McCormick (2008) document a positive relationship between fWHR and penalty minutes in hockey players at both the varsity and professional levels, although Deaner, Goetz, Shattuck, and Schnotala (2012) argue that body weight, rather than fWHR, better predicts aggression in hockey players. Carré, McCormick, and Mondloch (2009) find that fWHR is linked to both perceived and actual aggression. In the study, onlookers viewed photographs of male subjects with neutral facial expressions. Observers were asked to gauge each subject's propensity for aggression based on his photograph, and the subjects were tested separately for their actual propensity for aggression. Both the onlookers' perceptions of aggression and the actual aggressive tendencies of the photographed subjects were positively correlated with the subjects' fWHR. Özener (2012), however, finds no relationship between fWHR and self-reported aggression in a sample of Turkish university students. Goetz, Shattuck, Miller, Campbell, Lozoya, Weisfeld, and

Carré (2014) find that the relationship between fWHR and aggression is more robust amongst males of lower social status.

Facial width has been linked to a number of antisocial behavioral traits. Stirrat and Perrett (2010) find that facial width is associated with both perceived trustworthiness as well as an actual propensity to exploit the trust of others for personal financial gain. Haselhuhn and Wong (2012) link high fWHR with feelings of power, as well as cheating and deceptive behavior. Hehman, Leitner, Deegan, and Gaertner (2013) report that fWHR is associated with a greater willingness to explicitly endorse racially prejudiced views, while observers accurately judged wider-faced men as being more likely to have racist attitudes. Valentine, Li, Penke, and Perrett (2014) found that high fWHR males were more likely to be perceived as dominant, as well as more attractive to women for short-term (but not long-term) relationships. The study also found that high fWHR males were more likely to experience feelings of dominance, concluding that facial width is a physical marker of dominance in men.

Facial width has also been linked to positive behavioral traits and outcomes. Lewis, Lefevre, and Bates (2012) document a positive relationship between fWHR and achievement-striving in a sample of former US presidents, while Stirrat and Perrett (2012) show that males with greater facial width demonstrate greater self-sacrifice in order to promote cooperation amongst their teammates in group competitions. Tsujimura and Banissy (2013) find a positive association between fWHR and home run hitting over a two-year period in a sample of Japanese professional baseball players. Facial width in CEOs has been examined in several studies. Wong, Ormistion, and Haselhuhn (2011) show that fWHR in male CEOs is positively related to firm performance, though the effect is limited to firms with simple leadership structures. Jia, Van Lent, and Zhang (2014) find that CEO fWHR is related to financial misreporting, as high fWHR CEOs are more likely to engage in

opportunistic insider trading and options backdating, as well being more likely to be named as a perpetrator in SEC enforcement actions.

Testosterone levels have also been directly linked to a number of human behaviors and characteristics, including interpersonal dominance and aggression (Archer, 2006; Mazur and Booth, 1998; Stanton and Schultheiss, 2009), substance abuse, sexual promiscuity, and violence (Mazur, 1995; Dabbs, Frady, Carr, and Besch, 1987), and occupational status (Dabbs, Alford, and Fielden, 1998). In addition, the relationship between testosterone and risk tolerance has been studied extensively. Most studies of this relationship, but not all, have found that testosterone levels are positively correlated with risk tolerance and risk-taking behavior. Apicella, Dreber, Campbell, Gray, Hoffman, and Little (2008) find that both salivary testosterone levels and facial masculinity were positively associated with risk-taking behavior in an investment game with actual monetary payoffs. Stanton, Liening, and Schultheiss (2011) find that salivary testosterone levels explained differences in decision making in the Iowa Gambling Task (see Bechara et al., 1994), as higher testosterone levels were associated with greater risk taking among both male and female test subjects. Stanton, O'Dhaniel, McLaurin, Kuhn, LaBar, Platt, and Huettel (2011) observed a U-shaped, nonlinear relationship between salivary testosterone levels and risk aversion, as individuals with low or high testosterone levels exhibited decreased risk aversion compared to those with testosterone levels in intermediate ranges. In a sample of 550 MBA students from the University of Chicago, Sapienza, Zingales, and Maestripieri (2009) document a negative relationship between salivary testosterone levels and risk aversion in women, but observe no such relationship in men.

Testosterone levels have also been linked to trading success in financial markets. Coates and Herbert (2008) measured salivary testosterone levels of 17 male traders each morning at 11 A.M. over the course of an eight-day study, finding that traders subsequently

earned higher profits on days where their morning testosterone levels were high. The authors suggest that this short-term trading success observed in the study can be attributed to testosterone's effects on search persistence (Andrew and Rogers, 1972), risk tolerance, and novelty-seeking behavior (Boissy and Bouissou, 1994; Hermans, Putnam, Baas, Koppeschaar, and van Honk, 2006), but caution that permanently elevated testosterone levels could lead to a cycle of increasing and potentially irrational risk taking, potentially resulting in long-term losses.

Another commonly used proxy for testosterone levels is the ratio of the length of the index finger to the length of the ring finger, referred to as the 2D:4D ratio. The 2D:4D ratio is a sexually dimorphic trait, usually below one for men and approximately equal to one for women, and is believed to be a proxy for prenatal androgen exposure, with lower ratios indicating higher prenatal androgen exposure (Manning, Scutt, Wilson, and Lewis-Jones, 1998). Manning et al. (1998) also show that 2D:4D is negatively correlated with adult testosterone levels and positively correlated with adult oestrogen levels in both men and women. 2D:4D has been directly linked to a number of behaviors and traits commonly attributed to testosterone, such as athletic ability (Manning and Hill, 2009; Manning and Taylor, 2001), aggression (Bailey and Hurd, 2005), and sensation seeking (Fink, Neave, Laughton, and Manning, 2006). Additionally, 2D:4D has been shown to correlate with fWHR, as men with lower 2D:4D tend to have higher facial width (Fink, Grammer, Mittroecker, Gunz, Schaefer, Bookstein, and Manning, 2005).

Coates, Gurnell and Rustichini (2009) find that lower 2D:4D, associated with higher prenatal androgen exposure, predicted higher long-term profitability and greater career length among a group of 44 male high-frequency traders working in a London-based firm, while Coates and Page (2009) found that lower 2D:4D predicted greater amounts of risk taken by traders. Sapienza et al. (2009) and Apicella et al. (2008) find no relationship

between 2D:4D and risk tolerance, but Stenstrom and Saad (2011) note that this could be due to the confounding effects of racial differences in digit length ratios (Manning, Churchill, and Peters, 2007; Manning and Fink, 2008; Manning, Stewart, Bundred, and Trivers, 2004). Stenstrom, Saad, Nepomuceno, and Mendenhall (2011) observe a stronger relationship between 2D:4D and risk taking in men after controlling for the effects of ethnic heterogeneity. Similarly, Dreber and Hoffman (2007) observe a negative relationship between 2D:4D and financial risk taking in an ethnically homogenous sample of Swedish men and women, but were unable replicate the result among an ethnically heterogeneous sample in Chicago.

III Data

To examine the relationship between CEO fWHR and firm financial policies, I constructed a manager-firm matched panel data set using executive data from Execucomp and firm annual accounting data from Compustat. To be included in the sample, a firm must have been listed in the S&P 500 during at least 3 years between 2002 and 2013 and must be incorporated in the United States. Due to regulatory constraints, I exclude firms with SIC codes within the ranges of 4900-4999 (regulated utilities) and 6000-6999 (financial firms). Next, CEOs of each firm were identified on an annual basis using the "CEOANN" identifier from Execucomp, which also provides the full name, gender, and age of each executive. Following previous studies relating fWHR to behavioral characteristics (Carre and McCormick, 2008; Carre et al., 2009; Wong et al., 2011; LeFerve et al., 2013), the sample was restricted to male subjects, resulting in the exclusion of 29 female CEOs. I include all available data from Compustat and Execucomp for each firm-CEO pair that fits

the sample selection criteria, resulting in a final data set that consists of 510 firms and 7,087 firm-year observations.

Images of each CEO were obtained through Google Image searches and selected in accordance with Carre and McCormick's (2008) guidelines (subject facing forward, head not tilted). Most photos came from company websites or news articles which clearly and directly identified each CEO, and I was careful to ensure that all photos correctly identified their intended subjects when photos were obtained from other sources. I was unable to find satisfactory photos for 11 CEOs that would have otherwise been included in the sample. Measurements for each CEO's fWHR were obtained by placing their images in Adobe InDesign and using the rectangle tool to measure the distance between the upper lip and brow (facial height) and between the left and right zygion (facial width; Weston, Friday, and Lio, 2007). The final data set includes fWHR measurements for 968 CEOs.

Table 1a provides distribution statistics for the fWHR measure of the CEOs analyzed in this study, as well as statistics regarding fWHR of male subjects provided in several other studies of facial width and behavior. It is interesting to note that CEOs and U.S. Presidents have greater facial widths on average compared to graduate and undergraduate students, which suggests that men in more powerful positions tend to have higher testosterone levels. Table 1b shows the average CEO fWHR across different industries according to a Fama-French 12-industry classification. There appears to be relatively little variation across these industries. However, CEOs of financial and utilities firms, which tend to have different risk profiles from other firms, might exhibit significant differences in facial width from other CEOs. However, this data is not collected.

Annual firm accounting data was obtained from Compustat. To test for a link between CEO fWHR and firm leverage, I examine both a book-based and a market-based measure of firm leverage. Book leverage is long-term debt divided by total assets *(at)*, and

market leverage is long-term debt scaled by market value, where long-term debt is calculated as the sum of total long-term debt *(dltt)* and debt in current liabilities *(dlc)*, and market value is long-term debt plus the product of the number of common shares outstanding *(csho)* and the share price at the close of the fiscal year *(prcc_f)*.

Two measures of cash holdings are used in tests to determine if a relationship exists between CEO fWHR and firm cash holdings. The first measure is cash *(ch)* divided by total assets. The second measure is cash and short-term investments *(che)* divided by total assets. To examine the relationship between CEO fWHR and firm investment policies, yearly observations for capital expenditures *(capx),* acquisitions *(aqc,)* and R&D *(rdip)* are collected from Compustat, all of which are scaled by total assets in the analysis. I also analyze the relationship between CEO fWHR and firm performance by examining firms' return-on-assets *(ni/at)* and operating return-on-assets *(ebitda/at).* Several additional firm-year variables are used as controls in multivariate regressions later in the paper. Cash flow is defined as operating profit *(ebitda)* minus interest expense *(xint),* income taxes *(txt)*, and dividends *(dvc)*. Controls for R&D expenditures, depreciation *(dp)*, and asset tangibility *(ppegt/at)* are also employed. In addition, industry-adjusted measures are calculated for all leverage, cash holdings, investment, and firm performance variables. For each variable, I calculate the median industry-annual value using Fama-French 12 industry classifications, and then subtract the appropriate industry-annual median from the corresponding firm-year measure. Industry-annual medians, rather than means, are used for industry-adjusted measures due to wide variability in financial characteristics and prevalence of outliers among U.S. Compustat firms.

IV CEO fWHR and Firm Outcomes

The goal of this paper is to determine if CEO testosterone levels, proxied by facial width, are related to firm financial policies. I expect that, if CEO facial width is correlated with financial policies, high-fWHR will tend to pursue more aggressive financial policies. To begin, CEOs in the sample are sorted from lowest fWHR to highest and placed into two groups: one with CEOs whose fWHR is at or above the median value (high-fWHR), and another for CEOs with below-median facial width (low-fWHR). Several CEO characteristics that have been examined in the literature, such as overconfidence, gender, and military experience, are binary in nature and, as such, lend themselves naturally to discrete grouping (male CEOs vs. female CEOs, for example). Although the fWHR measure employed in this study is continuous rather than binary, one advantage for placing CEOs into two groups as previously described is that it allows for a simple measurement of the economic magnitude of the relationship between CEO fWHR and firm financial outcomes. For example, Table 2 shows that market leverage in firms managed by high-fWHR CEOs is .024 higher than in firms managed by low-fWHR CEOs, an increase of 12.6% relative to the unconditional sample mean. This statistic, however, does not account for firm characteristics, such as size and profitability, or industry and year trends, though I do include measures that adjust for industry-annual trends within this testing framework. Additionally, it is possible that two CEOs with very different management styles might not differ greatly in their fWHR measurements. Nonetheless, the two CEOs would be placed into separate groups if their respective fWHR measurements fell on opposite sides of the sample median. In this case, simply comparing means between the two groups might overstate or incorrectly represent the actual relationship between CEO fWHR and financial policy. A correlation statistic is provided to verify that the difference in means is consistent

with a linear relationship between the continuous measure of CEO fWHR and financial policy, and not simply a product of outlying observations within the two groups. Finally, the relationship between CEO fWHR and firm outcomes is analyzed using multivariate regressions. All of the regressions contain industry and year dummies. Standard errors in these regressions are clustered at the firm level.

In cases where a relationship is observed between CEO fWHR and financial management decisions, it is important to examine whether the relationship is a result of managerial influence or a remnant of pre-existing firm characteristics. For instance, it may be that the previously mentioned positive relationship between firm leverage and CEO fWHR could be a result of high-fWHR executives sorting into high-leverage firms. It is possible that financially aggressive firms tend to select high-testosterone managers that will favor aggressive financial policies already in place, which might partially explain any observed relationships between CEO fWHR and certain financial policies. Several tests are conducted to determine whether managerial influence is responsible for the correlation between CEO fWHR and financial policies. Specifically, all previously outlined testing procedures are performed on two subsamples of CEOs. One subsample consists of CEOs who managed their firms for eight years or longer. These "long-term" CEOs might be expected to wield greater influence over the financial management of their firms, and, as such, the observed financial policies of their firms should reflect true managerial intent to a greater extent than the financial policies of managers with shorter tenures. A second subsample is created by eliminating firm-year observations that occur during the first two years following a CEO turnover event. The elimination of these post-transition years is intended to exclude observations where a firm's financial policies may still be, to some extent, a remnant of the previous CEO's managerial influence and not entirely attributable to the influence of the new CEO. By the third year of a CEO's tenure, a firm's financial

policies should provide a more accurate representation of its CEO's managerial preferences than in observations immediately following turnover. Compared to those observed within the full sample, correlations between CEO fWHR and financial outcomes in these subsamples should be considered stronger evidence that the relationship is due to actual managerial influence, as opposed to the sorting of CEOs into firms with pre-existing financial characteristics.

IV.1 CEO fWHR and Firm Leverage:

A univariate analysis of the relationship between CEO fWHR and firm leverage is presented Table 2. I expect that, if CEO testosterone levels affect leverage choice, a positive relationship between CEO facial width and firm leverage will be observed. In firms managed by high-fWHR CEOs, book leverage is .017 higher than in firms managed by low-fWHR managers, which represents an increase of 7.2% relative to the unconditional mean. For market leverage, the difference between high- and low-fWHR groups is .024, an increase of 12.6% relative to the unconditional mean. After adjusting for industry-annual trends, the differences between fWHR groups increase for both book and market leverage. Firms managed by high-fWHR CEOs have industry-adjusted book leverage .02 greater than those with low-fWHR CEOs, an increase of 8.5% relative to the unconditional mean for book leverage. The difference in industry-adjusted market leverage between fWHR groups (high minus low) is .027, which represents an increase of 11.4% relative to the unconditional mean. The correlation coefficients are also consistent with a positive relationship between CEO fWHR and firm leverage, with a stronger correlations observed for market leverage than for book leverage and for industry-adjusted rather than unadjusted measures.

Regression results for the effect of CEO fWHR on firm leverage are found in Table 3. The dependent variable for all models in Table 3 is market leverage. Model 1 of Table 3 includes regressors for CEO fWHR in addition to dummy variables for industry and year fixed effects. Models 2 adds a control for firm size, while Model 3 adds controls for profitability, asset tangibility, and depreciation. Larger firms and firms with more tangible assets are shown to have higher leverage, while more profitable firms have lower leverage. The coefficient for CEO fWHR is positive and statistically significant at the 1% level in all three models. In Model 4, the dummy variables used to measure industry fixed effects are changed to represent the Fama-French 49-industry classification, rather than the 12-industry classification used previously in Models 1 through 3. This change causes the magnitude and significance of the CEO fWHR regressor to be reduced, as it is no longer statistically significant (p=.146). Model 5 uses firm fixed effects rather than industry dummies. The coefficient for CEO fWHR in Model 5 is positive but not statistically significant (p=.216). This indicates that while firms with high-fWHR CEOs tend to have higher leverage, CEO-fWHR is not a strong predictor of within-firm variations in leverage. To examine the extent to which the relationship between CEO fWHR and firm leverage observed in the full sample might be a product of actual managerial influence, the relationship between leverage and CEO fWHR is further examined in two subsamples. Model 6 of Table 3 examines the relationship between CEO fWHR and firm leverage for observations in which the CEO is in at least the third year of his tenure with the firm. The coefficient for CEO fWHR in this model is positive and significant at the 1% level. Since a firm's financial policies should more accurately reflect a manager's preferences by the third year of his tenure rather than when he first begins as CEO, this result gives support to the notion that the relationship between CEO fWHR and firm leverage is a product of managerial influence. Furthermore, Model 7 shows that the positive relationship between

CEO fWHR and firm leverage persists when examining only CEOs with tenures of at least 8 years. This result also supports the managerial influence hypothesis, since longer-tenured CEOs are likely to have greater authority to exert influence on the financial policies of their firms.

Due to concerns of potential survivorship bias resulting from the sample selection procedure, Model 8 of Table 3 includes only observations from after 2001. The coefficient for CEO fWHR, though attenuated slightly compared to Models 1 through 3, remains positive and is significant at the 5% level. Model 9 examines if unfavorable macroeconomic conditions have an attenuating effect on the relationship between CEO fWHR and firm leverage. CEOs should have greater ability to choose the financial policies of their firms to suit their individual preferences when macroeconomic conditions are stable. Under this assumption, the effect of CEO fWHR on firm leverage should be reduced when macroeconomic conditions are unfavorable. Model 10 shows that this relationship is smaller in years in which unemployment increased, though the effect of the interaction is not statistically significant (p=.705).

IV.2 CEO fWHR and Cash Holdings

Since greater facial width is associated with increased risk tolerance, it should be expected that high-fWHR CEOs will have lower cash holdings than low-fWHR CEOs, as holding less cash would be associated with a potential increase in liquidity risk for the firm. Table 2 presents a univariate analysis of the relationship between CEO fWHR and firm liquidity. In both measures of liquidity used, CEOs with high-fWHR are show to manage firms which hold significantly less cash than low-fWHR CEOs. The average cash ratio is .013 higher for low-fWHR CEOs compared to those in the high-fWHR group. After adjusting for industry

and year trends, the difference is .02. This difference represents 20.8% of the unconditional sample mean. The difference in cash & short-term investments between low- and high-fWHR groups is .02, a decrease of 14.5% for high-fWHR CEOs relative to the mean value for the full sample. When adjusting for industry-year trends, this difference grows to .023, which is 16.7% of the unconditional sample mean. The correlation coefficients observed in Table 2 are highly significant and confirm the negative relationship between CEO fWHR and all measures of firm cash holdings used in this study.

Results of multivariate regressions of firm cash holdings on CEO fWHR are presented in Table 4. The framework for these tests is identical that used in multivariate tests for leverage in Table 3. Model 1 contains regressors CEO fWHR along with industry and year dummies. Model 2 adds controls for firm size, while Model 3 adds controls for capital expenditures, acquisitions, dividend payout, R&D expenditures, and cash flow. Firm size and investment in capital expenditures and acquisitions are negatively related to cash holdings, while dividend payout, R&D expenditures, and cash flow generally exhibit a positive effect. In all 3 models, the coefficient is negative and significant at the 5% level, confirming the negative relationship between CEO fWHR and firm cash holdings observed in Table 2. Model 4 uses dummies based on the Fama-French 49-industry classification rather than the 12-industry classification used in previous models. This results in a reduction of the magnitude of the CEO fWHR coefficient, which is not statistically significant in Model 4 ($p=.202$). The use of firm fixed effects in Model 5 indicates, surprisingly, that CEO fWHR is positively associated with variation of cash levels within firms, although the coefficient is not significant ($p=.340$). To better assess whether the relationship between CEO fWHR and firm liquidity is a product of managerial preference, Model 6 uses a sample in which post-turnover observations are removed. Model 7 examines the relationship between CEO fWHR and cash holdings in long-term CEOs (tenure of at

least 8 years). In both models, the coefficient for fWHR is negative and statistically significant, at the 5% level in Model 6 and at the 1% level in Model 7. In order to address concerns of survivorship bias, Model 8 excludes observations from before 2002. The previously observed effect of CEO fWHR on firm liquidity is confirmed, as the CEO fWHR coefficient is negative and significant at the 5% level. Model 9 explores the interaction between CEO fWHR and macroeconomic conditions. One might expect to see a stronger effect of CEO fWHR on cash holdings when macroeconomic conditions are favorable, as CEOs would have more freedom to choose financial policies according to their preferences when their firms are less financially constrained. The expected coefficient for the interaction term, then, would be positive, representative of an attenuated effect of CEO fWHR during years in which the unemployment rate increased. However, the coefficient for this interaction is negative and significant at the 10% level, indicating that the relationship between CEO fWHR and firm cash holdings is actually stronger during periods of macroeconomic distress. One possible explanation for this result is that, while all CEOs would generally prefer to have adequate cash balances, high-fWHR CEOs are more willing to let cash balances diminish during periods of economic turmoil, while low-fWHR CEOs strive to maintain a higher degree of liquidity. This interpretation would be consistent with a higher risk tolerance in high-fWHR CEOs.

IV.3 CEO fWHR, Investment, and Profitability

A univariate analysis of the relationship between CEO fWHR and firm investment is presented in Table 2. If testosterone affects a CEO's investment decisions, I would expect to observe a positive relationship between CEO fWHR and firm investment, since higher investment would be considered riskier and more aggressive. However, I find no

meaningful relationship between CEO fWHR and levels of firm investment. None of the differences between high- and low-fWHR groups for acquisitions, capital expenditures, or R&D have t-statistics which indicate statistical significance. This is also the case for industry-adjusted measures of investment. Additionally, correlations confirm that there is no meaningful relationship between CEO fWHR and firm investment, as all coefficients are insignificant. Table 5 presents results of regressions of firm investment on CEO fWHR. Models 1, 3, and 5 of Table 5 include dummies for year and industry fixed effects. Models 2, 4, and 6 replace industry dummies with firm fixed effects. All models contain controls for firm size, profitability, asset tangibility, and dividend payouts. In all models of Table 5, the coefficient for CEO fWHR is statistically insignificant.

While high-fWHR managers demonstrate, to some extent, more aggressive financial policies, it is unclear as to whether these policies might lead to better or worse financial performance. Results of univariate tests of the relationship between CEO fWHR and firm profitability is presented in Table 2. No clear pattern emerges between CEO fWHR and profitability, as differences in means for all measures of profitability are insignificant. Results of multivariate regressions reported in Table 6 confirm that there is not a clear relationship between CEO fWHR and firm profitability. In all models, the coefficient for CEO fWHR is not statistically significant. These results, however, are not necessarily inconsistent with the relationship between CEO fWHR and firm profitability outlined in Wong, Ormiston, and Haselhuhn (2011), specifically that the effect of CEO fWHR on firm profitability differs depending on the cognitively complexity of leadership teams within organizations, as such inquiry is beyond the scope of this paper. Nonetheless, I find no meaningful relationship between CEO facial width and firm profitability, despite differences in other important financial policies.

IV.4 Which Firms Hire High-fWHR CEOs?

There are two possible explanations for the observed relationship between CEO fWHR and firm financial policies. One possibility is that high-fWHR CEOs have higher risk tolerance and therefore pursue riskier financial policies, such as higher leverage and lower cash holdings. The fact that more aggressive financial policies are seen in firms managed by long-term CEOs, as well as when post-turnover observations are removed, provides some degree of evidence for the hypothesis that the observed financial policies are products of managerial influence and consistent with CEOs' preferences. The second possible explanation, though the two hypotheses are not necessarily mutually exclusive, is that firms with aggressive financial policies tend to select high-fWHR individuals when hiring new CEOs. These high-fWHR individuals should, on average, have higher risk tolerance and, as such, might be better fits for firms with already aggressive financial policies. If this is the case, the observed relationship between CEO fWHR and firm financial policies might be a product of CEO selection rather than managerial preferences.

The relationship between firm financial policies and facial width of subsequently-hired CEOs is investigated in Table 7. The dependent variable, fWHR of newly hired CEOs, is regressed on lagged firm size, as well as lagged and industry-adjusted values for market leverage, cash & short-term investments, and ROA. Though the coefficients for these regressors are not statistically significant, it could still be the case that some of the relationship between CEO fWHR and financial policies might be partially due to the sorting of CEOs into firms with certain characteristics. Of interest is the positive coefficient for industry-adjusted market leverage, which is consistent with high-fWHR CEOs sorting into firms with higher leverage. Though it is not statistically significant (p=.265), the positive coefficient is perhaps suggestive of a contributing role of the CEO-firm matching process to

the observed relationship between CEO fWHR and financial policies. Model 5 indicates that high-fWHR CEOs do not tend to be hired at different ages than low-fWHR CEOs. I also test whether macroeconomic conditions predict fWHR of newly-hired CEOs. The results from Models 6 and 7 of Table 7 suggest that high-fWHR CEOs may tend to be hired during periods of macroeconomic distress, as evidenced by the negative coefficient for GDP growth (p=.171) and the positive coefficient for unemployment, which is significant at the 5% level.

Overall, there does not appear to be a relationship between CEO fWHR and the pre-existing financial characteristics of the firms that hire them. Although the contributing influence of some kind of sorting effect cannot be ruled out completely, there appears to be more evidence that the observed relationships between CEO fWHR and firm financial policies are a result of managerial influence than of pre-existing differences financial characteristics between firms.

IV.5 CEO fWHR, Executive Compensation, and Firm Ownership

I examine the relationship between CEO fWHR, compensation, and firm ownership in Table 8. Mayew, Parsons, and Venkatachalam (2013) find that CEOs with deeper-pitched voices tend to be paid more, employed at larger firms, and are less likely to be fired. Since greater facial width, like deeper voice, is associated with greater masculinity, it follows that CEOs with higher facial width might similarly be expected to be paid more on average. Additionally, it might be expected that high-fWHR CEOs, having greater risk tolerance, would be paid more in risky forms of compensation, such as stock or option grants, while receiving relatively lower fixed salaries. However, I find little support for this hypothesis. Table 8 shows a weakly negative relationship between CEO fWHR and compensation, both in terms of total and specific forms compensation. T-test results in Panel A of Table 8 show

a significant decrease for high-fWHR CEOs in total compensation (*tdc1*), value of option grants, and value of stock awards relative to CEOs from the low-fWHR group. However, the correlation coefficients for stock grants and option grants are not statistically significant. The correlation between CEO fWHR and salary is negative and significant at the 5% level, however, the corresponding t-test indicates that the difference in salary between the two groups is not significant. Panel B of Table 8 reports regression results examining the relationship between CEO fWHR and compensation. Compensation is positively associated with firm size and prior stock returns, while contemporaneous stock returns and profitability have weak predictive power of compensation. However, CEO fWHR is not a significant determinant of total compensation, salary, option grants, or stock grants in regressions from Panel B of Table 8, both in models with industry dummies and in those with firm fixed effects.

An interesting relationship between CEO fWHR and firm ownership is documented in Table 9. There are two competing factors that might influence the amount of equity that a CEO chooses to hold of the firm he manages. First, as noted in Malmendier and Tate (2005), holding firm equity could be considered a form of signaling that the CEO believes that the firm has strong prospects and that the CEO's incentives are aligned with shareholders'. On the other hand, a CEO's wealth will tend to be disproportionately affected by the financial outcomes of his firm. Changes in firm value affect the CEO's holdings of firm stock and options. If the firm performs poorly, the CEO can be fired and experience a significant negative shock to his wealth. Since the CEO's relative overinvestment in the outcomes of his firm causes his investment portfolio to be under-diversified, CEO's have an incentive to seek to reduce their ownership of the firm through the exercise of stock options and the sale of stock. As the two motivations regarding firm ownership are conflicting, CEOs may vary in the weight that they assign to each one.

Despite the fact that Panel B of Table 8 indicates that CEO fWHR is not related to significant differences in terms of the level or type of compensations, Table 9 shows that low-fWHR CEOs maintain a considerably larger ownership share of their firms than do high-fWHR CEOs. Panel A of Table 9 presents a univariate analysis of the relationship between CEO fWHR and firm ownership. The ownership share of CEOs from the low-fWHR group is on average .484% less than that of high-fWHR CEOs, a difference of 26.2% relative to the average firm ownership of all CEOs (1.847%). When options are excluded from this analysis, the difference between groups is .573%, equivalent to 19.8% of the average ownership share of all CEOs (2.891%). Both measures of firm ownership are significantly negatively correlated with CEO fWHR. Panel B reports results of regressions of CEO fWHR on firm ownership. In Models 1 and 2, the dependent variable for firm ownership (*tdc1*) includes stock options, while stock options are excluded from firm ownership in Models 3 and 4. Models 1 and 3 contain dummies for firm fixed effects, while Models 2 and 4 instead include firm fixed effects. The coefficient for CEO fWHR is negative in all models and statistically significant in all models except for Model 4. This confirms the findings from univariate tests that higher CEO fWHR is associated with lower firm ownership. The interpretation of this result is that higher fWHR CEOs may place relatively more importance on reducing their exposure to the idiosyncratic risk of their firms, an action that is in their own best interests, while CEOs with lower fWHR place relatively more emphasis on signaling alignment with shareholders, even at the expense of diversification in their personal portfolios.

V CEO fWHR and M&A Negotiation

I also examine the relationship between CEO fWHR and negotiating outcomes in the context of mergers and acquisitions (M&A). Haselhuhn et al. (2014) find that facial width can predict negotiating outcomes of MBA students in experimental settings. Specifically, high-fWHR men demonstrated an ability to claim more value in negotiations than low-fWHR men. However, high-fWHR men were also shown to be less cooperative, a trait that led to a decreased ability "to discover creative agreements that benefit all negotiating parties." I test to see whether these negotiating characteristics manifest in CEOs' M&A negotiations. I expect that if CEO fWHR affects M&A negotiations, high-fWHR CEOs will tend to pay lower premiums for target firms, have a larger percentage of acquisition attempts fail, and be more likely to conduct unsolicited acquisitions in which the target firm is not actively seeking a buyer. CEO fWHR might also be expected to affect the number of days required to complete the acquisition, although the expected direction of this effect is unclear. One one hand, high-fWHR CEOs might be expected to take longer to complete acquisitions if they are less willing to compromise on factors such as the price paid for target shares. However, this decreased willingness to compromise could result in fewer rounds of bargaining, reducing the time spent negotiating each merger.

I collect data from SDC Platinum for M&A deals between 2000 and 2013. I require target firms to be based in the United States. Additionally, deals are excluded if deal value is less than $1 million and if the proportion of target shares sought by the acquiring firm is less than 50%. Finally, SDC Platinum M&A data includes a significant number of transactions in which the acquiring and target firms are listed as having the same CUSIP number. I exclude these transactions. I then merge this data with Compustat accounting data and CEO fWHR measurements for the acquiring firm. A total of 1,959 M&A deals are

included in the analysis. However, important data items are missing in many of these transactions. For example, the premium paid by the acquiring firm for target shares can only be calculated in 448 out of 1,824 deals. Many observations also have missing data for target financial characteristics, such as total assets and market-to-book. Unfortunately, Compustat can provide this missing data for only a very small number of target firms. This missing data restricts the sample size of most tests of the relationship between CEO fWHR and M&A outcomes in this paper.

Table 10 provides results of multivariate analysis of the relationship between CEO fWHR and M&A negotiating outcomes. All models contain dummy variables for acquirer industry and year fixed effects, as well as controls for acquiring firm size. Standard errors in Table 10 are clustered by acquiring firm. In Models 1 and 2, the dependent variable is the premium paid for target shares in completed M&A deals. If high-fWHR is a predictor of negotiating ability, the expected coefficient for CEO fWHR in these models would be negative. Model 2 adds controls for target size and market-to-book, as well as controls for deal characteristics including percentage of deal value paid in cash, percentage of target shares acquired in transaction, number of bidders for target firm, and a dummy representing if the deal was not solicited by the target firm. In both Models, the coefficient for CEO fWHR is negative, indicating that higher-fWHR CEOs pay lower premiums for target firms. Although this result is consistent with my expectation based on the findings of Haselhuhn et al. (2014), the coefficients are not statistically significant in either model ($p=.177$ in Model 2).

In Models 3 and 4 of Table 10, I examine whether CEO fWHR predicts the length of time (number of days) required for M&A negotiations to be completed successfully. As discussed previously, it is unclear if the effect of CEO fWHR should be expected to be positive or negative in these models. The coefficients for CEO fWHR in both models is

negative, suggesting that high-fWHR CEOs complete negotiations more quickly, but are not statistically significant. Model 4 shows that negotiations finish more quickly when the acquiring firm is larger and pays for target shares with a larger percentage of cash.

In Models 5 and 6 of Table 10, CEO fWHR is examined as a potential determinant of the likelihood of an acquisition attempt failing. I consider any deal that is not completed to be a failure. Several deals in SDC Platinum have more than one observation that are listed as being announced on the same day. Frequently, one or more of these duplicate observations will categorize the deal as being incomplete. However, if a corresponding daily observation shows that the deal was in fact completed successfully, I exclude the duplicate observation that indicates failure. If high-fWHR CEOs are more aggressive negotiators who are less inclined to find creative agreements with target management, I expect that the effect of CEO fWHR on the probability of deal failure will be positive. In Model 5, the coefficient for CEO fWHR is negative, but not statistically significant. Model 6 adds controls for target and deal characteristics such as the percentage offered in cash and a dummy for if the acquisition attempt was unsolicited. I find that CEO fWHR is associated with an increased likelihood of failure in M&A negotiations, as its coefficient is positive and significant at the 10% level in Model 6. I interpret this result with caution, however, due to the small sample size. Model 6 also shows that the probability of deal failure is higher when the acquiring firm is smaller and when the target firm is larger. Unsolicited acquisition attempts are also found to be more likely to fail.

Finally, I examine if high-fWHR CEOs are more likely to engage in unsolicited acquisition attempts. I would expect that if CEO fWHR is related to this behavior, high-fWHR CEOs might be more likely to attempt to acquire a firm that is not seeking a buyer. However, Models 7 and 8 show that CEO fWHR is not a significant predictor of this behavior, as its coefficients are statistically insignificant in both models. Model 8 shows

that acquisition attempts are more likely to be unsolicited when acquiring firms are smaller and when target firms are larger.

Overall, CEO fWHR is not found to be a strong predictor of outcomes in M&A negotiations. While there is some evidence that higher CEO fWHR predicts lower acquisition premiums and a higher probability of deal failure, the evidence is fairly weak. However, as the intersection of CEO fWHR and SDC Platinum data resulted in a relatively small number of transactions which provide detailed target firm characteristics, it could be worthwhile for a future researcher to investigate this relationship further by collecting additional CEO fWHR data for both acquiring and target CEOs in SDC M&A transactions.

VI CEO fWHR and Forced Turnover

I now investigate whether CEOs' facial masculinity predicts the likelihood of facing forced turnover. Results from this paper have shown that CEOs with greater facial masculinity are more likely to pursue aggressive financial policies, such as increased leverage and reduced holdings of liquid assets, and that these riskier financial policies are not rewarded with greater profitability. Additionally, Jia, van Lent, and Zhang (2014) find that high-fWHR CEOs are more likely to be involved in legal troubles brought on by unethical managerial practices. As a result, one might expect that high-fWHR CEOs will face a greater risk of being removed from their positions. However, Mayew, Parsons, and Venkatachalam (2013) find that CEOs with deeper-pitched voices, a trait associated with greater masculinity, are less likely than other CEOs to be fired. An empirical analysis of the relationship between CEO fWHR and forced turnover is presented in Table 11.

I use a modification of the procedure outlined in Campbell et al. (2011) to identify forced turnover events. If a firm in the sample replaces its CEO, I classify the event as a

forced turnover if several criteria are met. Specifically, if the outgoing CEO is less than 60 years old, does not remain employed by the firm, and does not serve as CEO for another firm in the year immediately succeeding the replacement, the change in management is classified as a forced turnover event. Using these criteria, I identify 103 such instances of forced turnover in the sample used in this paper.

Table 11 reports the results of logit regressions modeling the likelihood of a CEO facing forced turnover. The dependent variable is set equal to 1 if a CEO is fired, 0 otherwise. Since a managerial change can only be considered to be forced if the CEO is less than 60 years old, only observations in which the CEO is under 60 are included in these regressions. In addition to CEO fWHR, Table 11 examine the effects of several firm characteristics on the likelihood of a CEO facing forced turnover. Higher leverage is associated with significantly greater risk of forced turnover in Models 1 through 4. Models 2, 4, and 6 show that firms with worse recent stock performance are more likely to fire their CEOs. Higher cash levels, somewhat surprisingly, are associated with greater turnover risk in Model 1, but its coefficient is not significant elsewhere in Table 11. Larger firms are found to be less likely to fire their CEOs in Models 1 through 3, though the relationship is not significant in Models 4 through 6. Profitability is negatively related to turnover risk in all models of Table 11, though the relationship is significant only in Model 5. In Model 3, CEOs with lower firm ownership shares are found to face greater risk of forced turnover. Models 5 and 6 examine the relationship between CEO fWHR and forced turnover directly and find that CEO fWHR is not a significant predictor of forced turnover.

Though CEO fWHR is found not to predict the likelihood of forced turnover directly, it is interesting to note that several characteristics associated with high-fWHR CEOs do predict a greater likelihood of forced turnover. Specifically, higher leverage and lower firm

ownership are associated with an increased likelihood of forced turnover. However, I fail to find a direct link between CEO fWHR and forced turnover risk.

VII Conclusion

This paper is the first to explore relationships between CEO facial width (a proxy testosterone levels during adolescence) and financial management decisions. I find that higher CEO facial width-to-height ratio (fWHR) is associated with more aggressive financial policies. Specifically, I find a positive relationship between CEO fWHR and firm leverage and a negative relationship between CEO fWHR and firm cash holdings. These relationships are also observed among subsamples where CEOs are likely to wield substantial influence over financial management policies, such as long-tenured CEOs. I do not find evidence that CEO selection process explains the observed relationship between fWHR and financial policies. Thus it appears that the relationships documented between CEO fWHR and firm financial policies are likely consistent with managerial preference and that high testosterone levels may induce CEOs to pursue aggressive financial policies.

Additionally, although facial does not predict the level or type of compensation received by CEOs, high-fWHR CEOs tend to own a smaller fraction of their firms. This indicates an increased priority for more masculine CEOs on pursuing their own best interests (diversification) relative to the importance of signaling alignment with shareholders. This result is robust to the inclusion of industry and firm fixed effects. I also examine the outcomes of high- and low-fWHR CEOs in M&A negotiations. Since previous research has shown that facial width predicts aggression in negotiations, it is not surprising that acquisition bids led by high-fWHR CEOs have an increased likelihood of failure. I also find weak evidence that high-fWHR CEOs may pay lower premiums in

acquiring target firms, consistent with high-fWHR males claiming more value in negotiations. I find no relationship between CEO fWHR and length of M&A negotiations or the likelihood that an acquisition attempt will be unsolicited.

Overall, I find evidence that suggest that facial width can predict differences in behavior between CEOs in a number of different contexts. The financial policies of firms managed by high-fWHR CEOs are consistent with increased risk tolerance. Outcomes in M&A negotiations are consistent with increased aggression in high-fWHR CEOs. The decision of high-fWHR CEOs to maintain lower ownership shares of their firms suggests that more masculine CEOs pursue their own best interests ahead of showing solidarity with shareholders. These results are largely consistent with previous findings relating facial width in males to various behavioral tendencies.

Despite the fact that high-fWHR CEOs manage firms that have higher leverage and lower cash holdings, but are not more profitable, and considering that previous literature has linked high-fWHR CEOs to an increased likelihood of SEC enforcement action, I do not find direct evidence that high-fWHR CEOs face greater forced turnover risk. However, in an expanded sample which includes CEOs for which fWHR measurements are not collected, I do find that CEOs face greater forced turnover risk when leverage is higher and CEO firm ownership share is lower, characteristics which are more commonly associated with high-fWHR CEOs.

This paper also adds to the literature that shows individual differences in CEOs to predict differences in financial characteristics in their firms. While prior research has related CEO age, education, gender, overconfidence, and life experience to observable firm characteristics, I show that CEO masculinity is another factor that can influence firm financial policies.

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Table 1a: fWHR Statistics

Source	Subjects	N	Mean	Med.	SD	Min	Max
Mills (2015)	CEOs	968	1.91	1.92	0.13	1.52	2.36
Jia, Van Lent, and Zhang (2014)	CEOs	1,136	2.01	2.01	0.15	-	-
Carre and McCormick (2008), Study 1	Undergraduate students	37	1.86	-	0.13	-	-
Wong et al. (2011)	CEOs	55	1.96	-	0.15	1.61	2.25
Haselhung and Wong (2012), Study 1	MBA students	115	1.78	-	0.12	1.48	1.98
Haselhung and Wong (2012), Study 2	Undergraduate students	50	1.79	-	0.15	1.44	2.08
Lewis et al. (2012)	U.S. Presidents	29	1.99	-	0.11	1.78	2.30
Özener (2012), Study 1	Turkish university students	230	1.89	-	0.12	-	-

Statistics referenced are for male test subjects only.

Table 1b: CEO fWHR across Industries

Industry	N	CEO fWHR
Consumer Nondurables	102	1.90
Consumer Durables	35	1.90
Manufacturing	127	1.91
Energy	74	1.93
Chemicals	43	1.91
Tech.	232	1.91
Telecommunications	51	1.87
Wholesale and Retail Sales	138	1.94
Healthcare	98	1.93
Other	94	1.91

Fama-French 12-industry classification (financials and utilities excluded)

Table 2: Summary Statistics

	Full Sample			High-fWHR			Low-fWHR						Corr. w/	
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Diff.	t-stat	p-value	fWHR	p-value
Capital Structure														
Book Leverage	7064	0.236	0.177	3590	0.244	0.170	3474	0.228	0.183	0.017	3.99	<0.0001	0.0289	0.0152
Market Leverage	6997	0.191	0.178	3555	0.203	0.184	3442	0.179	0.171	0.024	5.76	<0.0001	0.0487	<0.0001
Industry Adjusted														
Book Leverage	7064	0.040	0.175	3590	0.050	0.170	3474	0.030	0.178	0.020	4.77	<0.0001	0.0458	0.0001
Market Leverage	6997	0.041	0.170	3555	0.054	0.178	3442	0.027	0.161	0.027	6.62	<0.0001	0.0613	<0.0001
Liquidity														
Cash	6967	0.096	0.096	3533	0.090	0.090	3434	0.103	0.101	-0.013	-5.62	<0.0001	-0.0633	<0.0001
Cash & Short-term Invst.	7077	0.138	0.151	3597	0.129	0.147	3480	0.148	0.156	-0.020	-5.43	<0.0001	-0.0574	<0.0001
Industry Adjusted														
Cash	6967	0.004	0.093	3533	-0.004	0.090	3434	0.012	0.096	-0.016	-7.37	<0.0001	-0.0806	<0.0001
Cash & Short-term Invst.	7031	0.000	0.142	3597	-0.011	0.143	3434	0.012	0.096	-0.023	-7.53	<0.0001	-0.0807	<0.0001
Investment														
Acquisitions	6421	0.028	0.064	3296	0.028	0.064	3125	0.028	0.063	0.000	0.01	0.9940	-0.0066	0.5969
Capital Expenditures	7035	0.054	0.049	3574	0.054	0.048	3461	0.055	0.051	-0.001	-0.91	0.3608	0.0019	0.8749
R&D	6990	0.001	0.015	3548	0.001	0.012	3442	0.002	0.017	0.000	-0.57	0.5674	-0.0072	0.5459
Industry Adjusted														
Acquisitions	6421	0.028	0.064	3296	0.028	0.064	3125	0.028	0.063	0.000	0.01	0.9940	-0.0066	0.5969
Capital Expenditures	7035	0.012	0.041	3574	0.012	0.039	3461	0.013	0.042	-0.001	-0.97	0.3311	0.0086	0.4696
R&D	6990	0.001	0.015	3548	0.001	0.012	3442	0.002	0.017	0.000	-0.57	0.5674	-0.0072	0.5459
Profitability														
ROA	7078	0.059	0.138	3598	0.058	0.133	3480	0.060	0.144	-0.002	-0.72	0.4714	0.0014	0.0962
Operating ROA	7071	0.159	0.091	3597	0.158	0.082	3474	0.161	0.099	-0.003	-1.19	0.2344	-0.0035	0.7690
Industry Adjusted														
ROA	7078	0.066	0.151	3598	0.067	0.150	3480	0.064	0.153	0.003	0.71	0.4794	0.0082	0.4480
Operating ROA	7071	0.090	0.117	3597	0.091	0.117	3474	0.088	0.118	0.004	1.29	0.1987	0.0108	0.3642

Table 3: CEO fWHR and Leverage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CEO fWHR	0.0967***	0.0915***	0.0824***	0.0437	0.0351	0.0783**	0.0965**	0.0701**	0.0865***
	(0.0350)	(0.0349)	(0.0299)	(0.0285)	(0.0274)	(0.0334)	(0.0400)	(0.0308)	(0.0304)
CEO fWHR x D(Δunemployment>0)									-0.0111
									(0.0277)
ln(Assets)		0.0330***	0.0244***	0.0259***	0.0230***	0.0242***	0.0264***	0.0228***	0.0244***
		(0.00511)	(0.00456)	(0.00395)	(0.00667)	(0.00490)	(0.00549)	(0.00515)	(0.00456)
Operating ROA			-0.696***	-0.661***	-0.414***	-0.671***	-0.640***	-0.769***	-0.696***
			(0.0667)	(0.0563)	(0.0465)	(0.0657)	(0.0781)	(0.0662)	(0.0667)
Tangibility			0.0913***	0.0931***	0.0483*	0.0945***	0.0757***	0.104***	0.0913***
			(0.0180)	(0.0179)	(0.0254)	(0.0188)	(0.0230)	(0.0198)	(0.0180)
Depreciation			0.136	0.0397	0.217	0.0961	0.156	0.208	0.136
			(0.181)	(0.174)	(0.186)	(0.165)	(0.291)	(0.203)	(0.181)
Constant	-0.0279	-0.295***	-0.114	-0.208***	-0.0386	-0.0962	-0.170*	0.00198	-0.122*
	(0.0729)	(0.0792)	(0.0706)	(0.0606)	(0.0779)	(0.0780)	(0.0878)	(0.0761)	(0.0708)
Observations	6,997	6,773	6,734	6,602	6,734	5,162	4,669	4,991	6,734
R-squared	0.181	0.226	0.356	0.418	0.158	0.359	0.356	0.358	0.356
Firm FE	no	no	no	no	yes	no	no	no	no
Industry FE	ff12	ff12	ff12	ff49	no	ff12	ff12	ff12	ff12
Year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

The dependent variable in these regressions is market leverage, defined as total long-term debt divided to market value (see section III for more detail). Industry fixed effects are based off the Fama-French 12-industry classfication (financials and utilities excluded), except in Model 4 (Fama-French 49-industry classification). Robust standard errors (reported in parentheses) are clustered by firm.

Table 4: CEO fWHR and Cash Holdings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CEO fWHR	-0.0817**	-0.0708**	-0.0571**	-0.0356	0.0231	-0.0784**	-0.100***	-0.0719**	-0.0436
	(0.0333)	(0.0313)	(0.0276)	(0.0279)	(0.0244)	(0.0305)	(0.0356)	(0.0284)	(0.0272)
CEO fWHR x D(Δunemployment>0)									-0.0358*
									(0.0202)
ln(Assets)		-0.0286***	-0.0282***	-0.0304***	-0.0414***	-0.0285***	-0.0284***	-0.0251***	-0.0282***
		(0.00393)	(0.00393)	(0.00413)	(0.00656)	(0.00419)	(0.00469)	(0.00395)	(0.00393)
Capital Expenditures			-0.311***	-0.343***	-0.217***	-0.332***	-0.349***	-0.339***	-0.311***
			(0.0751)	(0.0837)	(0.0770)	(0.0826)	(0.0894)	(0.0878)	(0.0750)
Acquisitions			-0.340***	-0.306***	-0.128***	-0.376***	-0.407***	-0.324***	-0.340***
			(0.0328)	(0.0286)	(0.0175)	(0.0359)	(0.0443)	(0.0363)	(0.0328)
Dividends			0.204**	0.138	-0.122*	0.146	0.116	0.345***	0.206**
			(0.102)	(0.102)	(0.0676)	(0.113)	(0.136)	(0.129)	(0.103)
R&D			0.183**	0.0844	-0.0453	0.212**	0.288***	0.177**	0.184**
			(0.0760)	(0.0628)	(0.0387)	(0.0839)	(0.0994)	(0.0738)	(0.0761)
Cash flow			0.141*	0.101	-0.128**	0.142	0.151	0.228***	0.141*
			(0.0841)	(0.0777)	(0.0558)	(0.0989)	(0.112)	(0.0752)	(0.0842)
Constant	0.232***	0.405***	0.354***	0.399***	0.391***	0.405***	0.450***	0.415***	0.327***
	(0.0712)	(0.0699)	(0.0661)	(0.0643)	(0.0664)	(0.0728)	(0.0840)	(0.0696)	(0.0651)
Observations	7,077	6,833	5,772	5,642	5,772	4,453	4,004	4,370	5,772
R-squared	0.301	0.358	0.376	0.441	0.120	0.390	0.413	0.371	0.376
Firm FE	no	no	no	no	yes	no	no	no	no
Industry FE	ff12	ff12	ff12	ff49	no	ff12	ff12	ff12	ff12
Year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

The dependent variable in these regressions is cash & short-term investments, scaled by total assets. Capital expenditures, acquisitions, dividends, and R&D are also scaled by total assets. Industry fixed effects are based off the Fama-French 12-industry classfication (financials and utilities excluded), except in Model 4 (Fama-French 49-industry classification). Robust standard errors (reported in parentheses) are clustered by firm.

Table 5: CEO fWHR and Investment

	(1)	(2)	(3)	(4)	(5)	(6)
	Capital Expenditures		Acquisitions		R&D	
CEO fWHR	-0.00291	0.00405	-0.00357	0.00170	-0.00148	0.00245
	(0.00976)	(0.00563)	(0.00668)	(0.0106)	(0.00127)	(0.00198)
ln(Assets)	-0.00235**	-0.00365**	-0.00304***	-0.00945***	-0.000177	-0.00107**
	(0.000912)	(0.00155)	(0.000776)	(0.00284)	(0.000135)	(0.000460)
Operating ROA	0.106***	0.101***	0.0357***	0.102***	0.00557**	0.0138***
	(0.0120)	(0.0114)	(0.0119)	(0.0157)	(0.00249)	(0.00430)
Tangibility	0.0607***	0.00515	-0.0114***	0.0196**	-0.00136**	-0.000774
	(0.00382)	(0.00585)	(0.00300)	(0.00801)	(0.000555)	(0.00107)
Dividends	-0.128***	-0.0232	-0.0499**	-0.0159	-0.00824**	-0.00414*
	(0.0364)	(0.0173)	(0.0222)	(0.0235)	(0.00402)	(0.00239)
Constant	0.0299	0.0728***	0.0509***	0.0606*	0.00328	0.00266
	(0.0190)	(0.0196)	(0.0171)	(0.0343)	(0.00289)	(0.00452)
Observations	6,743	6,743	6,140	6,140	6,743	6,743
R-squared	0.540	0.203	0.042	0.030	0.047	0.011
Firm FE	no	yes	no	yes	no	yes
Industry FE	ff12	no	ff12	no	ff12	no
Year FE	yes	yes	yes	yes	yes	yes

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

The dependent variables in these regressions are measures of firm investment and are scaled by total assets. Industry fixed effects are based off the Fama-French 12-industry classfication (financials and utilities excluded). Robust standard errors (reported in parentheses) are clustered by firm.

Table 6: CEO fWHR and Profitability

	(1)	(2)	(3)	(4)
	ROA		Operating ROA	
CEO fWHR	0.00217	-0.0250	-0.00471	-0.00969
	(0.0125)	(0.0261)	(0.00424)	(0.00753)
ln(Assets)	-0.00105	-0.0443***	-0.00297***	-0.00782***
	(0.00183)	(0.0160)	(0.000579)	(0.00220)
Tangibility	-0.0200***	0.0170	0.00647***	0.00205
	(0.00512)	(0.0234)	(0.00203)	(0.00597)
Dividends	0.0752*	-0.0238	0.0892***	0.0327*
	(0.0455)	(0.0368)	(0.0308)	(0.0195)
Constant	-0.0390	0.334**	0.0660***	0.144***
	(0.0343)	(0.152)	(0.0106)	(0.0247)
Observations	6,777	6,777	6,776	6,776
R-squared	0.218	0.121	0.739	0.438
Firm FE	no	yes	no	yes
Industry FE	ff12	no	ff12	no
Year FE	yes	yes	yes	yes

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

The dependent variables in these regressions are measures of firm profitability. ROA is net income divided by total assets. Operating ROA is EBITDA divided by total assets. Industry fixed effects are based off the Fama-French 12-industry classfication (financials and utilities excluded). Robust standard errors (reported in parentheses) are clustered by firm.

Table 7: Who Hires High-fWHR CEOs?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Assets)	0.00207						
	(0.00365)						
Market leverage		0.0272					
		(0.0244)					
Cash & Short-term Invsestments			-0.000246				
			(0.0357)				
ROA				0.00213			
				(0.0348)			
Age					0.000261		
					(0.000701)		
GDP growth						-0.00372	
						(0.00272)	
Unemployment							0.00624**
							(0.00275)
Constant	1.899***	1.916***	1.917***	1.917***	1.903***	1.925***	1.880***
	(0.0324)	(0.00484)	(0.00468)	(0.00500)	(0.0368)	(0.00795)	(0.0167)
Observations	793	782	793	793	883	885	885
R-squared	0.000	0.002	0.000	0.000	0.000	0.002	0.006

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

The dependent variable in these regressions is fWHR of newly-hired CEOs. Market leverage and cash & short-term investments are industy-adjusted (see section III for more detail) and scaled by total assets. Standard errors are reported in parentheses.

Table 8: CEO fWHR and Executive Compensation

Panel A

	Full Sample			High-fWHR			Low-fWHR						Corr. w/	
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Diff.	t-stat	p-value	fWHR	p-value
TDC1 (total comp incl. value of option grants)	7055	9416.3	14044.4	3582	9078.1	12855.9	3473	9765.2	15166.9	-687.1	-2.05	0.0404	-0.02035	0.0874
TDC2 (total comp incl. value of opts. exercised)	7080	10354.6	21242.1	3600	9996.8	20121.7	3480	10724.7	22339.0	-727.9	-1.44	0.1502	-0.01460	0.2193
Salary (thousands of dollars)	7087	947.9	519.0	3603	943.9	519.5	3484	952.0	518.4	-8.1	-0.65	0.5147	-0.02411	0.0424
Value of Option Grants	7058	4123.3	11208.6	3584	3855.6	9790.2	3474	4399.4	12499.9	-543.8	-2.03	0.0423	-0.01879	0.1144
Value of Stock Awards	3278	3540.1	4264.5	1648	3406.7	4113.0	1630	3674.9	4409.6	-268.2	-1.80	0.0718	-0.01245	0.4760

Table 8: CEO fWHR and Executive Compensation

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ln(TDC1)		ln(TDC2)		ln(Salary)		ln(Value of Option Awards)		ln(Value of Stock Grants)	
CEO fWHR	-0.0824	-0.205	0.0353	-0.0286	0.0282	-0.227	-0.284	-0.109	-0.138	0.364
	(0.232)	(0.282)	(0.250)	(0.293)	(0.222)	(0.205)	(0.183)	(0.228)	(0.220)	(0.307)
ln(Assets)	0.264***	0.295***	0.249***	0.343***	0.104**	0.123*	0.349***	0.362***	0.334***	0.263***
	(0.0498)	(0.0497)	(0.0493)	(0.0473)	(0.0471)	(0.0721)	(0.0290)	(0.0536)	(0.0272)	(0.0745)
ROA	0.277	0.257	0.442	0.225	0.0422	0.154	0.316	0.0315	0.634**	0.302
	(0.191)	(0.161)	(0.298)	(0.244)	(0.143)	(0.100)	(0.220)	(0.204)	(0.286)	(0.262)
Stock return	0.0935	0.135**	0.294***	0.313***	-0.0648	0.00545	0.0674	-0.00347	0.0648	0.0664
	(0.0816)	(0.0556)	(0.0740)	(0.0514)	(0.0676)	(0.0470)	(0.0439)	(0.0407)	(0.0534)	(0.0510)
Stock return(t-1)	0.196***	0.236***	0.406***	0.412***	0.0346	0.107**	0.250***	0.205***	0.211***	0.164***
	(0.0682)	(0.0464)	(0.0808)	(0.0615)	(0.0621)	(0.0453)	(0.0362)	(0.0306)	(0.0525)	(0.0427)
Constant	5.727***	5.821***	5.380***	4.748***	5.601***	5.804***	4.553***	4.349***	4.682***	4.465***
	(0.563)	(0.757)	(0.582)	(0.702)	(0.603)	(0.787)	(0.516)	(0.606)	(0.491)	(0.898)
Observations	6,502	6,502	6,509	6,509	6,498	6,498	4,938	4,938	2,584	2,584
R-squared	0.146	0.119	0.188	0.200	0.070	0.051	0.224	0.143	0.260	0.153
Firm FE	no	yes	no	yes	no	yes	no	yes	no	yes
Industry FE	ff12	no	ff12	no	ff12	no	ff12	no	ff12	no
Year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

The dependent variables in these regressions are measures of executive compensation. TDC1 is total compensation including the value of option grants. TDC2 is total compensation including the value of exercised options. Industry fixed effects are based off the Fama-French 12-industry classfication (financials and utilities excluded). Robust standard errors (reported in parentheses) are clustered by firm.

Table 9: CEO fWHR and Firm Ownership

Panel A

	Full Sample			High-fWHR			Low-fWHR						Corr. w/	
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Diff.	t-stat	p-value	fWHR	p-value
Pct. of Shares Owned (Excl. Options)	3656	2.891	6.586	1823	2.604	5.905	1833	3.177	7.191	-0.573	-2.63	0.0085	-0.11229	<0.0001
Pct. of Shares Owned (As Reported)	2305	1.847	4.180	1171	1.609	3.767	1134	2.092	4.557	-0.484	-2.77	<0.0001	-0.09653	<0.0001

Table 9: CEO fWHR and Firm Ownership

Panel B

	(1)	(2)	(3)	(4)
	Percentage of Total Shares Owned - As Reported		Percentage of Total Shares Owned - Options Excluded	
CEO fWHR	-2.972*	-2.391***	-5.767**	-2.716
	(1.791)	(0.819)	(2.654)	(1.841)
ln(Assets)	0.338	-0.515	0.883*	-0.164
	(0.280)	(0.685)	(0.464)	(0.433)
Constant	5.813*	11.10**	19.99***	12.68**
	(3.237)	(4.971)	(5.356)	(5.281)
Observations	2,304	2,304	3,654	3,654
R-squared	0.160	0.117	0.221	0.115
Firm FE	no	yes	no	yes
Industry FE	ff12	no	ff12	no
Year FE	yes	yes	yes	yes

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

The dependent variables in these regressions measure CEOs' ownership stales in their firms. Industry fixed effects are based off the Fama-French 12-industry classfication (financials and utilities excluded). Robust standard errors (reported in parentheses) are clustered by firm.

Table 10: CEO fWHR and M&A Negotiations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Premium		Days to Complete		P(Failed)		P(Unsol.)	
CEO fWHR	-0.0178	-0.0294	-15.11	-6.403	0.191	2.961*	0.275	-1.831
	(0.0161)	(0.0217)	(18.36)	(27.75)	(0.826)	(1.714)	(1.678)	(1.926)
Acquiror Characteristics								
ln(Assets)	0.00159	0.00586	7.181***	-0.945	-0.0710	-0.353*	0.143	-0.556**
	(0.00157)	(0.00436)	(1.868)	(2.994)	(0.0766)	(0.206)	(0.128)	(0.240)
MB		-0.000172		-0.0436		0.0342		0.0326
		(0.000177)		(0.182)		(0.0500)		(0.0683)
Target Characteristics								
ln(Assets)		-0.00617		14.14***		0.390***		0.805***
		(0.00517)		(2.827)		(0.133)		(0.219)
MB		-0.00278		-3.535		-0.912		0.407
		(0.00515)		(8.993)		(1.507)		(0.375)
Deal Characteristics								
% Cash		-0.000706		-0.616***		0.0189		0.00226
		(0.000587)		(0.169)		(0.0128)		(0.0106)
% of Shares Acq.		0.000209		-0.933				-0.0457
		(0.000409)		(0.589)				(0.0289)
Number of Bidders		-0.00164		20.23				
		(0.00534)		(24.07)				
Unsolicited (dummy)		0.00652		53.56		2.988***		
		(0.00795)		(38.52)		(0.564)		
Constant	0.0341*	0.0959	44.93	162.9*	-2.131	-9.888**	-5.211*	4.551
	(0.0206)	(0.0612)	(39.03)	(85.49)	(1.703)	(3.914)	(3.143)	(5.069)
Observations	448	356	1,824	368	1,959	392	1,547	368
R-squared	0.090	0.154	0.065	0.262	0.031	0.280	0.038	0.198
Industry FE	ff12	ff12	ff12	ff12	ff12	ff12	ff12	ff12
Year FE	yes	yes	yes	yes	yes	yes	yes	yes

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

M&A deal data is from SDC Platinum. Deals with values of greater than $1m from 2000 to 2013 are included in the analysis. Premium is defined as the valuation implied by the purchase price divided by the target firm's market value before the deal is announced. Models 5, 6, 7, and 8 are logit regressions. Industry fixed effects are based on the Fama-French 12-industry classification (financials and utilities excluded). Robust standard errors (reported in parentheses) are clustered by firm.

Table 11: CEO fWHR and Forced Turnover

	(1)	(2)	(3)	(4)	(5)	(6)
CEO fWHR					-0.498	-0.548
					(0.778)	(0.787)
Market Leverage (Ind.-Adj.)	1.559***	1.181***	1.501***	1.027**		
	(0.173)	(0.187)	(0.397)	(0.432)		
Cash & Short-term Investments (Ind.-Adj.)	0.417*	0.437	0.692	0.452		
	(0.254)	(0.267)	(0.584)	(0.605)		
Percentage of Total Shares Owned			-0.0401*	-0.0349		
			(0.0228)	(0.0225)		
ROA (Ind.-Adj.)	-0.466	-0.334	-0.350	-0.348	-0.773*	-0.336
	(0.318)	(0.302)	(0.481)	(0.424)	(0.396)	(0.543)
Ln(Assets)	-0.105***	-0.0917***	-0.123*	-0.101	0.0890	0.0969
	(0.0281)	(0.0285)	(0.0642)	(0.0645)	(0.0865)	(0.0906)
Stock Return (t-1)		-0.438***		-0.430***		-0.756***
		(0.0764)		(0.156)		(0.200)
Stock Return (t-2)		-0.188**		-0.374*		0.280
		(0.0864)		(0.191)		(0.201)
Constant	-2.887***	-3.021***	-2.650***	-2.765***	-4.033**	-4.032**
	(0.407)	(0.422)	(0.691)	(0.703)	(1.971)	(2.015)
Observations	23,790	22,481	7,319	6,926	3,934	3,780
Industry FE	ff12	ff12	ff12	ff12	ff12	ff12
Year FE	yes	yes	yes	yes	yes	yes

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

The dependent variable in these logit regressions is forced turnover, set equal to 1 if a CEO faces forced turnover in a given year, 0 otherwse. Industry fixed effects are based on the Fama-French 12-industry classification. Robust standard errors (reported in parentheses) are clustered by firm.

Chapter 2

Overconfidence or Optimism? A Look at CEO Option-Exercise Behavior

I Introduction

A broad literature in corporate finance ascribes the retention of exercisable, deep in-the-money stock options to CEOs' overconfidence in their ability to increase firm value. While overconfidence has generally been considered to be an intrinsic personal characteristic that some CEOs have, while others do not, I argue that the retention of deep in-the-money might more accurately be attributed to a CEO's level of optimism regarding his firm's near-term financial prospects, and that optimism in this context does not necessarily reflect a CEO's overconfidence in his managerial skill.

I consider the possibility that the decision of chief executives to retain deep in-the-money exercisable stock options is a function of firm financial characteristics and macroeconomic factors. Specifically, I examine whether the exhibition of this behavior is influenced by financial characteristics of the firm, including profitability, financial constraint, and investment opportunities, as well as macroeconomic conditions such as GDP growth, unemployment, and inflation. If the retention of deep in-the-money stock options is

solely a result of a CEO's overconfidence in his personal abilities, it should be expected that this behavior would not be influenced by these firm financial characteristics and macroeconomic factors. I find evidence, however, that this is not the case.

Using a CEO optimism measure developed by Campbell et al. (2011), I find that, after controlling for idiosyncratic firm stock returns which affect option moneyness, S&P 1500 CEOs are more likely to exhibit high levels of optimism when firms have greater growth opportunities and reduced financial constraint. Specifically, CEO optimism levels are positively related to firm profitability, cash holdings, and investment and negatively related to leverage and dividend payouts. These results persist even after accounting for the possibility of endogeneity in the relationship between CEO optimism and firm financial characteristics. These financial characteristics also predict variation in CEO optimism levels within a CEO's tenure, as CEOs exhibit increased optimism during years in their tenure when growth and profitability are relatively high and when financial constraints are relatively low. Furthermore, macroeconomic conditions affect CEO optimism levels, as CEOs are more likely retain deep in-the-money stock options when GDP growth, interest rates, inflation, and employment levels are high.

While the retention of deep in-the-money exercisable stock options has generally been considered to be a signal of a CEO's overestimation of his own managerial ability, the fact it is more likely to be seen when firms are more profitable, less financially constrained, and have more investment opportunities, as well as during periods of macroeconomic expansion, suggests that to a large extent this behavior is simply a reaction to a firm's positive circumstances. Although the results in the paper do not in any way exclude the possibility that overconfidence in CEOs can have a causal effect on firms' investment and financial policies, the reactionary nature of CEO option-exercise decisions suggests that

variation in this behavior is primarily a reflection of changes in CEOs' optimism regarding firms' near-term prospects due to observable firm-specific and macroeconomic factors.

Though year-to-year changes in a CEO's option-exercise behavior likely reflect optimism rather than overconfidence, CEOs who habitually retain deep in-the-money stock options beyond what would be expected given the actual quality of their firms might do so as a result of being overconfident in their managerial skill. To determine whether overconfidence is truly a managerial fixed effect, I examine option-exercise decisions in executives who served as CEO in multiple firms. While I find some evidence that CEOs who demonstrated excessively high levels of optimism at a previous jobs were more likely to exhibit the same behavior at other firms, the predictive power of past overconfident behaviors on future overconfidence is weak at best. I also find that female CEOs are less prone to overconfidence, while managers who become CEO at a younger age are more overconfident. Finally, I find that managers tend to become less overconfident as their tenures progress.

II Related Literature

CEO overconfidence has been cited as a cause of numerous differences in corporate financial policies. Malmendier and Tate (2005) develop the first empirical measures of CEO overconfidence and find that investment by CEOs classified as overconfident, who "overestimate returns to their investment projects," exhibits greater sensitivity to cash flow compared to the investment decisions of other CEOs. Malmendier and Tate (2008) again relate CEO overconfidence to corporate investment, finding that overconfident managers make more acquisitions and are more likely to overpay to acquire target firms. Malmendier, Tate, and Yan (2011) link CEO overconfidence to capital structure policy. They find that,

believing their firms are undervalued, overconfident CEOs are more hesitant to issue equity compared to other CEOs and, as a result, cause firms to be more highly levered. Galasso and Simcoe (2011) find that overconfident CEOs are more likely to invest in innovation and obtain more patents, especially in competitive industries. Deshmukh, Goel, and Howe (2013) find that overconfident CEOs, who view external financing as excessively costly, build financial slack in their firms by reducing dividend payouts to shareholders. Campbell et al. (2011) find that CEOs with high or low levels of optimism face a greater likelihood of forced turnover compared to CEOs with moderate levels of optimism.

III Data

III.1 Sample Selection

Data on S&P 1500 CEO stock option holdings and exercises is sourced from the Execucomp database, which also provides information regarding personal characteristics such as age, gender, tenure as CEO, and when executives joined their firms. The "CEOANN" identifier in Execucomp indicates which individual served as the CEO for all of or the majority of the fiscal year for each firm. The Execucomp data is then merged with annual accounting data from Compustat, and observations with missing values for total assets (*at*) are deleted from the sample. The final dataset consists of annual observations from 1992 to 2013 and includes 7,226 unique firm-CEO pairs and 37,182 firm-CEO-year observations.

III.2 Measuring CEO Optimism

Although overconfidence is not a readily observable trait, several methods for identifying overconfidence in CEOs have been used in corporate finance literature. Malmendier and Tate (2005) develop measures of CEO overconfidence based on option holdings behavior,

where CEOs are classified as overconfident when they choose to hold deep in-the-money stock options that could have otherwise been exercised. However, these measures are derived from proprietary grant-specific data and, as such, cannot be exactly replicated. Campbell et al. (2011) develop an optimism measure that closely approximates the *Holder67* measure from Malmendier and Tate (2005) using aggregate, rather than grant-specific, CEO option ownership and exercise data, available from Execucomp. While the grant-specific data used in measures from Malmendier and Tate (2005) allows for greater precision in observing stock option holding and exercise decisions, aggregated stock option data from Execucomp is available for a much larger sample of executives.

Following Malmendier and Tate (2005), Campbell et al. (2011) develop a measure of CEO optimism that classifies a CEO as having high optimism when she holds, rather than exercises, deep in-the-money stock options. Specifically, Campbell et al. (2011) identify CEOs as overconfident in a given year if the average moneyness of unexercised stock options that could have been exercised by the CEO is greater than 100%. Campbell et al. (2011) define average moneyness as realizable value per option divided by average strike price, where realizable value per option is calculated as the total realizable value of unexercised exercisable options (*opt_unex_exer_est_val*) divided by the number of unexercised exercisable options (*opt_unex_exer_num*), and average strike price is the fiscal year-end stock price (*prcc_f*) minus realizable value per option.

Campbell et al. (2011) also develop a procedure for identifying pessimism in CEOs. CEOs are classified as having low levels of optimism when they exercise, rather than hold, stock options that are only slightly in the money, specifically when the average moneyness of exercised options is less than 30%. To be classified as having low optimism, Campbell et al. (2011) also require as a secondary condition that a CEO does not hold exercisable stock options whose average moneyness exceeds 30%. For exercised options, average moneyness

is also equal to the realized value per exercised option divided by the average strike price of exercised stock options. However, since the low optimism measure is based on the moneyness of CEOs' exercised stock options, the realized value per exercised option is calculated as the total value realized from exercising stock options (*opt_exer_val*) divided by the number of options exercised (*opt_exer_num*).

III.3 Summary Statistics

Table 1 provides a statistical summary of financial information for the full sample and several subsamples of firm-CEO-year observations, allowing for comparison between observations in which CEOs exhibit optimistic, non-optimistic, pessimistic, and non-pessimistic behaviors. High levels of CEO optimism are exhibited in 7,782 annual observations, or 20.9% of the time, while CEOs exhibit pessimism in 921 observations (2.5%). Firm size is measured by taking the natural log of total assets (*at*). On average, firm size is smaller for the high optimism category relative to the full sample and in observations where the CEO displays a pessimistic outlook. Market leverage is defined as total debt divided by market value, where total debt equals the sum of long-term debt *(dltt)* and debt in current liabilities *(dlc)*, and market value is total debt plus the product of the number of common shares outstanding *(csho)* and the share price at the close of the fiscal year *(prcc_f)*. It is interesting to note that, while Malmendier, Tate, and Yan (2011) find that overconfident CEOs maintain higher leverage than non-overconfident CEOs, market leverage for the low optimism subsample is nearly twice as high as for the high optimism sample. Additionally, liquidity levels (cash & short-term investments, *che*, scaled by total assets, *at*) are substantially higher for the high optimism sample compared to the low optimism sample. Greater profitability (as measured by return-on-assets) is seen in high

optimism observations compared to that of the low optimism sample, though both subsamples exhibit relatively greater profitability when compared to the full sample of firm-CEO-year observations. The latter observation may be due to the fact that, even for CEOs with low optimism classifications, prior stock returns must be sufficiently positive such that these CEOs' stock options have attained positive exercise values. For observations where the CEO exhibits neither high nor low optimism, there are no necessary criteria for prior stock returns, and it is likely that firms with the lowest levels of profitability will have low stock returns and, therefore, CEOs who are classified as neither optimistic nor pessimistic in these years. Consistent with Deshmukh, Goel, and Howe (2013), higher levels of CEO optimism are seen in firms with decreased dividend payouts, though both subsamples have higher dividend payouts relative to the full sample. Investment in capital expenditures (*capx*), acquisitions (*aqc*), and research and development (*rdip*) is positively related to CEO optimism levels. Compared to the low optimism subsample, capital expenditure levels are 52.8% higher, expenditure totals on acquisitions are 91.6% higher, and R&D expenditures are 475% higher for the high optimism subsample.

To summarize, higher levels of CEO optimism are seen in less financially constrained firms where leverage is lower and profitability, cash levels, and prior stock returns are higher. Optimistic CEOs are more likely to manage smaller firms who invest more in capital expenditures, acquisitions, and R&D while paying out less to shareholders in the form of dividends. These results suggest the possibility that high optimism in CEOs may, at least in part, be a consequence of managing a "good" firm and that managing a "bad" firm could contribute to an increased likelihood of a CEO exhibiting pessimistic option-exercise behavior.

Table 2 shows a breakdown of CEO optimism by Fama-French 12-industry groups. There are large differences in the exhibition of high confidence and low confidence levels across different industries. Table 2 indicates that, generally speaking, industries with larger proportions of highly optimistic CEOs tend to have fewer incidences of low CEO optimism. For example, the three industries with the most frequent occurrence of high CEO optimism (Healthcare, Tech, and Energy) are each in the bottom four in terms of incidence of low CEO optimism. Additionally, the two industries in which low optimism behavior is most common, Utilities and Chemicals, respectively, have the lowest incidence of high optimism CEO behavior. Several models of CEO optimism in this paper include industry dummies to account for the possibility that these systematic differences in optimism levels across different industries might a result of unobserved heterogeneity between firms and CEOs in different industries.

IV Determinants of CEO Optimism

In Tables 3a and 3b, CEO optimism levels are modeled as a function of factors which reflect a firm's financial circumstances, specifically its investment opportunities, profitability, and level of financial constraint. Since the measure for CEO Optimism is defined as a binary variable, equal to 1 if a CEO exhibits optimism in that year, 0 otherwise, logit and probit regressions are used to analyze the ways in which a firm's financial circumstances affect a CEO's level of optimism. Because a CEO cannot be identified as optimistic in a year if his stock options are not sufficiently in the money, recent stock returns are included as a proxy for the likelihood that a CEO's stock options are far enough in the money that a CEO would be classified as optimistic if he chose not to exercise them. As expected, CEOs are much more likely to exhibit high levels of optimism when current and past-year stock returns are

higher, as greater returns enable the levels of option moneyness required to meet the high optimism designation.

IV.1 CEO Optimism and Firm Investment

While other research has explored the ways in which CEOs' optimism levels, assumed to be exogenously determined, affect firms' financial and investment decisions, this paper will examine the possibility that CEOs' optimism levels are, in part, a reaction to the circumstances faced by their firms. Malmendier and Tate (2005) consider the possibility that the decision of a CEO to retain deep in-the-money stock options could be affected by his inside information. They find that CEOs are more likely to exercise their stock options when their firms are overvalued. This paper, then, is not the first to consider that the decision to retain stock options might be influenced by firm-specific factors and not necessarily purely a measure of a CEO's self-perceived managerial skill, although Malmendier and Tate (2005) are somewhat dismissive of this notion.

It is important to note that the relationship between a firm's financial circumstances and its CEO's level of optimism could be endogenous. For example, if a CEO is overconfident, he might perceive a given set of investment opportunities as being more profitable or less risky than would an unbiased CEO. In that case, a CEO's overconfidence could cause the firm to increase investments in capital expenditures, acquisitions, and R&D. However, it could be the case that some firms might legitimately have better investment opportunities (e.g. more profitable, less risky, higher quantity of positive NPV projects) than others in certain years. In this case, firms' increased levels of investment in capital expenditures and acquisitions would reflect the higher quality of available investment opportunities.

The potential of an endogenous relationship between CEO optimism and firm investment (and other financial circumstances) is addressed in two ways. First, several models in Tables 3a and 3b use lagged, rather than contemporaneous regressors. While in a given year a CEO's optimism and his firm's investment might be endogenously determined, it is less likely that a firm's investment decisions would be affected by its CEO's future optimism, or lack thereof. It is, however, highly possible that previous investments made by the firm could cause a CEO to currently feel optimistic about his firm's future prospects and therefore retain, rather than exercise, his stock options, even if they are deep in the money. Secondly, instrument variable estimation is used to address concerns of potential reverse causality between the independent variables (firm characteristics, specifically investment) and the dependent varable (CEO optimism).

Models 1 and 2 of Table 3a report the results of logit regressions of CEO optimism on several firm-year variables. Both regressions include industry (defined using 2-digit SIC) and year dummies. For measures of firm investment and financial constraint, Model 1 uses contemporaneous variables as regressors, while Model 2 uses lagged regressors for all variables except for firm size. The results of these regressions confirm that CEOs are more likely to exhibit optimistic behavior when capital expenditures and acquisitions levels are high in the current and previous year. In both regressions, the coefficients for capital expenditures and acquisitions are statistically significant at the 1% level. In Model 2, CEOs of firms with higher prior R&D expenditures are also more likely to exhibit high levels of optimism, though the relationship is statistically significant at only the 10% level. The coefficient for R&D in Model 1 is negative but not significant.

In addition to investment, Models 1 and 2 of Table 3a examine the relationship between dividend payouts and CEO optimism. Recall that Deshmukh, Goel, and Howe (2013) find that overconfident CEOs tend to reduce dividend payments in order to build

financial slack. Paying dividends to shareholders can be viewed as an alternative to reinvesting funds into investments in capital expenditures or the acquisition of other firms. All else being equal, firms would tend to pay higher dividends when fewer worthwhile investments were available and vice versa. The negative coefficients for dividends in both regressions are consistent with this viewpoint, although the coefficient is not statistically significant in Model 1. Taken together with the positive coefficients for firm investment, this result reinforces the notion that CEOs are more optimistic when investment opportunities are better and less so when the quality of available investment opportunities is lower. An alternative explanation is that, if the non-exercise of deep-in-the-money stock options signals overconfidence rather than optimism, high levels of overconfidence could cause a CEO overestimate his ability to choose profitable investment projects, causing overconfident CEOs to forego paying dividends in favor of increasing investment. In this case, CEO overconfidence would cause higher firm investment, rather than the increased availability of profitable investments causing optimism. It is possible, however, that both explanations could be simultaneously valid, and the possibility of an endogenous relationship between CEO optimism and firm investment will be addressed later through the use of instrument variable regressions.

In Table 3b, results from Models 1 and 2 further illustrate the relationship between firm investment and CEO optimism levels. While in Table 3a CEOs are more likely to demonstrate high levels of optimism when firm investment is high, CEOs in Table 3b are more likely to exhibit pessimistic behavior, characterized by the early exercise of low moneyness options, when firm investment is low. The coefficient for capital expenditures in both Models 1 and 2 of Table 3b is negative and significant at the 1% level. While the coefficient for acquisitions is positive in both Models 1 and 2, it is significant only in Model 1 where regressors are not lagged. Similarly, the coefficient for dividends is positive and

significant at the 1% level in Model 1 but is insignificant in Model 2 with lagged regressors. For R&D, the coefficient is negative but not significant in Model 1 but is significant at the 1% level in Model 2. All together, the results provide further evidence that CEOs optimism levels are positively related to investment and negatively related to dividend payouts. Again, the relationship between CEO pessimism and firm investment decisions could be endogenous, a possibility which will be addressed later through the use of instrument variable regressions.

An important limitation of using logit regressions to model CEO optimism, as in Models 1 and 2 of Tables 3a and 3b, rather than probit regressions is that there is not a readily available instrument variable estimation procedure for use with logit regressions. Instrument variable estimation is easily done with probit regressions through Stata's *ivprobit* command. However, probit models are limited as well in that they do not allow for the inclusion of large numbers of dummy variables as regressors. As a result, the probit models included in this paper cannot control for industry, firm-CEO, or year fixed effects. Since these fixed effects allow a researcher to control for unobserved differences between industries, CEOs, and years that may not be fully accounted for by other regressors, a potential concern is that their absence might have an effect on the coefficient estimates that describe the relationship between CEO optimism levels and firm financial characteristics. In other words, a tradeoff exists. Logit regressions can include CEO, industry, and year fixed effects but cannot accommodate instrument variable estimation, while probit regressions allow for instrument variable estimation but cannot include fixed effects. A potential concern is that the absence of these fixed effects might cause inconsistency in the estimated coefficients in instrument variable probit regressions.

Models 3 and 4 of Table 3a use probit regressions to estimate the effects of firms' financial characteristics on CEO optimism levels. Although these regressions, unlike

Models 1 and 2, do not contain industry or year fixed effects, their results are largely consistent in terms of the sign and significance of coefficient estimates with those from logit regressions including industry and year dummies in Models 1 and 2. As tends to be the case when comparing coefficients of logit and probit regressions (see Amemiya, 1981), the coefficients in Models 3 and 4 are somewhat smaller in magnitude than their counterparts in Models 1 and 2, though this does not necessarily imply a reduced effect of each regressor on CEO optimism levels in the probit models. Even with the removal of industry and year fixed effects, the previously observed positive relationships between CEO optimism and firm investment decisions remain. Higher levels of capital expenditures and acquisitions are again shown to have highly-significant positive effects on contemporaneous CEO optimism levels, as well as optimism in the near-term future. Additionally, the coefficient for R&D is positive and significant at the 1% level in Model 4, in which regressors are lagged one period, but insignificant in Model 3. Consistent with estimates from Models 1 and 2, the coefficients for dividends are negative in both Models 3 and 4, although statistically significant only in Model 4, again indicating that CEOs tend to be less optimistic in firms with higher dividend payouts.

In Table 3b, Models 3 and 4 report the results of probit regression of CEO pessimism on firm financial characteristics. CEO pessimism is found to be negatively related to firm investment, especially capital expenditures. The coefficients for capital expenditures are negative and statistically significant at the 1% level in both models. Acquisitions has a negative coefficient in both models, though it is significant only in Model 3 and only at the 10% level. In Model 4, the coefficient for R&D is negative and significant at the 5% level. While its coefficient is also negative in Model 3, it is not significant. Models 3 and 4 of Table 3b also explore the relationship between CEO pessimism and dividends. CEOs are shown to be more likely to exhibit pessimism when dividend payouts are high. These results further

reinforce the idea that CEOs are more optimistic in firms which forego dividend payouts in favor of pursuing growth opportunities.

An important takeaway from Models 3 and 4 of Tables 3a and 3b is that the removal of industry and year fixed effects has a negligible impact on the coefficients for investments, dividends, and other financial characteristics. This alleviates concerns that the absence of industry and year fixed effects might affect the consistency of coefficient estimates in instrument variable probit regressions, which proceed in Models 5 and 6.

Models 1 through 4 of Tables 3a and 3b are estimated under the assumption that observable firm financial characteristics such as investment and financial constraint are exogenous determinants of CEO optimism levels. However, the possibility that CEO optimism and these factors are simultaneously determined must be considered. The most obvious potentially endogenous relationship is that of CEO optimism and investment. For example, a CEO could demonstrate high levels of optimism as a response to the high quality of his firm's investment opportunities, whether more plentiful, more profitable, or less risky. However, the quality of investment opportunities can only be inferred from available data with a low degree of certainty. A higher investment rate does not necessarily reflect a higher quality of a firm's investment opportunities. For instance, an overconfident CEO might habitually overestimate the returns (or underestimate the risks) to his firm's investment opportunities, causing the firm to overinvest relative to the optimal level of investment. In this case, a CEO's overconfidence causes a higher level of investment. To address the possibility of dual-causality in the relationship between CEO optimism and firm investment, instrument variable estimation is used.

It is also possible that the relationships between CEO optimism and other financial factors could be endogenously determined. Malmendier, Tate, and Yan (2011) show that overconfident CEOs pursue more aggressive leverage policies relative to other CEOs. If a

positive coefficient for leverage was observed in Table 3a, it could not be assumed that high leverage causes optimism instead of the other way around, even though the model implies that optimism is dependent on leverage. However, the coefficient for leverage is persistently negative in Models 1 through 4 of Table 3a. Since there is little reason to believe that CEO optimism would cause firms to have lower leverage, the most likely interpretation of this result is that firms having lower levels of leverage, which are indicative of a relative lack of financial constraint, causes CEOs to be more optimistic about their firms' near-term financial prospects. Similarly, there is little reason to believe that CEOs simply having high optimism would directly cause their firms to be more profitable. If this were the case, rational CEOs would never exercise options before expiration. Instead, CEOs would always choose to retain their stock options, as doing so would cause their firms to become more profitable. As this notion is lacking in terms of logical soundness, a more reasonable interpretation is that CEOs feel more optimistic simply as a result of their firms being more profitable and less financially constrained. For these reasons, the exploration of endogeneity issues in this paper focuses on the relationship between CEO optimism and firm investment.

In Models 5 and 6 of Table 3a, instrument variable probit regressions are used to analyze the causal effect of firm investment on CEO optimism under the assumption that the relationship between the two variables may be endogenous. In Model 5, annual median values of capital expenditures for all Compustat firms with the same 2-digit SIC code are used as instrumental variables for firm capital expenditures. The results of the first stage regression in Model 5 indicate that industry-median values are a strong instrument for firm capital expenditures, as the coefficient for the instrument is positive and statistically significant at the 1% level. To the extent that a firm's investment increases along with other firms in within the same industry in a given year, this increase would likely reflect

actual improvements in investment opportunities for the firm. The first stage regression results in Model 5 also show that firm capital expenditure levels are negatively related to leverage, cash holdings, and firm size, as the coefficients for these variables are all negative and statistically significant at the 1% level. The probit regression in Model 5 replaces the actual values for capital expenditures with fitted values from the first stage regression. The coefficient for capital expenditures remains positive and significant at the 1% level when using these fitted values, consistent with the results from Models 1 through 4. Acquisitions, R&D, and dividends are all factors that could potentially be endogenous with CEO optimism. Rather than instrumenting each variable individually, the three investment variables and dividends are combined into a single measure called "Net Investment," which is calculated as the sum of capital expenditures, acquisitions, and R&D minus dividends. Since an increase in funds paid out to shareholders rather than reinvested by the firm could reflect a lack of worthwhile investment opportunities, net investment is set to decrease when dividends are paid out. These variables are instrumented jointly instead of individually because median annual values for acquisitions, R&D, and dividends are zero for a significant number of industries, so median industry values for these variables exhibit a lack of exogenous variation and, as such, are not suitable instruments on their own. The first stage regression in Model 6 shows that net investment is determined similarly to capital expenditures in Model 5, as the coefficients for cash holdings and firm size are negative and significant at the 1% level. The coefficient for the fitted values of net investment in Model 6 is positive and significant at the 1% level. Models 5 and 6 of Table 3b show that CEOs pessimism is increased when firms are projected to have reduced investment opportunities, evidenced by the negative coefficients for capital expenditures in Model 5 and net investment in Model 6. A final consideration is whether instrument variable estimation is necessary in examining the relationship between CEO optimism

levels and firm investment. P-values of Wald tests of exogeneity in Models 5 and 6 in Table 3a suggest that the relationship is weakly endogenous. Since these p-values are slightly higher than the normally-referenced 5% level, the null hypotheses of no endogeneity cannot be clearly rejected. The Wald tests in Table 3b strongly suggest that CEO pessimism and firm investment are not endogenously determined. Whether the relationship between CEO optimism is considered to be endogenous or not, these results lend support to the notion that CEO optimism is, to an extent, a reaction to improved investment opportunities for the firm.

IV.2 CEO Optimism and Firm Financial Constraint

Tables 3a and 3b also examine the effects of firm financial constraints on CEO optimism levels. Specifically, leverage, cash levels, profitability, and firm size are considered as potential factors that might affect a CEO's optimism levels. Malmendier, Tate, and Yan (2011) find that overconfident CEOs, who believe their firms are undervalued and are reticent to issue equity as a result, pursue higher levels of leverage. It might then be expected that high optimism CEOs would tend to be found in firms with more aggressive capital structures. However, the opposite relationship between leverage and CEO optimism is documented in Table 3a. CEOs are more likely to exhibit highly optimistic behavior in firms with lower leverage, a result that is statistically significant at the 1% level in all specifications other than Models 2 and 4, in which lagged regressors are used. Since higher leverage generally implies that a firm has reduced capacity to raise additional funding through the issuance of new long-term debt, greater leverage causes firms to be relatively more financially constrained, and this financial constraint could cause CEOs to be less optimistic about their firms' future prospects.

The positive coefficients for cash & short-term investments in Table 3a also support the notion that CEOs from less financially constrained firms are more likely to exhibit high optimism behaviors. The coefficients for cash & short-term investments are significant at the 1% level in Models 1 through 6. In addition to cash and leverage levels, Table 3a also shows that firm profitability is a significant positive predictor of optimism levels in CEOs. The coefficient for ROA is positive and statistically significant at the 1% level in Models 2 through 6 (significant at 5% level in Model 1), though it is interesting to note that the magnitude of these coefficients is substantially larger in models where the regressors are lagged. Finally, firm size is examined as a potential determinant of CEO optimism levels. While Beck et al. (2005) show that large firms tend to face fewer financial constraints than small firms, after controlling other factors, firm size is not a strong predictor of CEO optimism in Table 3a. The coefficient for firm size in Model 1, however, is positive and significant at the 10% level.

The results from Table 3b further suggest that CEOs are more likely to exhibit pessimistic behaviors when firms are more financially constrained, though the effects of financial constraint are weaker for CEO pessimism than optimism. The coefficients for cash & short-term investments are negative and significant at the 1% level in Models 3, 5, and 6, and at the 5% level in Models 1, 2, and 4, implying that CEOs are more likely to be pessimistic when firms face potential liquidity problems. Though pessimistic CEOs are associated with higher leverage in Table 1, the coefficients for leverage are not statistically significant in Table 3b. Firm profitability is also not found to be a significant predictor of pessimistic behavior in CEOs in Models 1 through 6 of Table 3b. Firm size, however, is a statistically significant predictor of CEO pessimism, as CEOs of larger firms are more likely to exhibit pessimistic attitudes about their firms' near-term prospects. Although larger firms tend to be less financially constrained, CEOs could perhaps be more likely to exhibit

pessimism in large firms due to larger firms being more mature and tending to be less growth-oriented. The coefficient for firm size is positive and statistically significant at the 1% level for Models 1 through 6 of Table 3b.

IV.3 Within-Tenure Variation in CEO Optimism Levels

Models 7 and 8 of Tables 3a and 3b use conditional logit regressions with firm-CEO fixed effects to examine how CEOs' optimism levels vary in response to changes in their firms' profitability, financial constraints, and investment opportunities during their tenures. The use of firm-CEO fixed effects accounts for time-invariant differences between individuals regarding their bias toward or away from optimistic attitudes. While a CEO's level of optimism can change during their tenure, whether as predicted by financial circumstances or otherwise, the time-invariant predisposition for optimism, a managerial fixed effect, could be considered a more accurate measure of a CEO's level of overconfidence than year-to-year variation in option-exercise behavior. This time-invariant bias toward optimism, or overconfidence, would likely reflect a manager's belief in his own abilities, while year-to-year variation in option-exercise behavior would reflect a CEO's continually changing assessment of his firm's near-term future prospects. These conditional logit regressions control for a CEO's level of overconfidence and show how his optimism regarding his firm's prospects evolves in response to changes in investment opportunities and financial constraint. Note that, as these regressions model variation in optimism levels across a CEO's tenure, if there is no variation in optimism during a CEO's tenure (i.e., a CEO always exhibit high levels of optimism, or low optimism), observations for that CEO will not be included in the regression. This explains why the sample sizes for the conditional logit models are smaller than in other models included in this paper. This effect is particularly

noteworthy in Models 7 and 8 of Table 3b, which model variation in pessimism across a CEO's tenure. Many CEOs never exhibit pessimism, and as a result, the sample size for these models is significantly reduced.

In Table 3a, the coefficients for capital expenditures and acquisitions in Models 7 and 8 indicate that a CEO is likely to exhibit high levels of optimism during periods in which his firm's investment is high relative to other times during his tenure. The coefficients for capital expenditures and acquisitions in these models are positive and statistically significant at the 1% level. Since the inclusion of firm-CEO fixed effects in these regressions controls for a CEO's predisposition toward optimism, it is likely that the observed relationship between changes in investment and a CEO's level of optimism during his tenure are predominantly a reflection of changes in the quality and availability of investment opportunities for the firm. In years where his firm's investment opportunities are relatively plentiful, a CEO is more likely to exhibit optimistic behavior. An alternative interpretation of this result is that a CEO's level of optimism varies exogenously over the course of his tenure with the firm, that investment decisions follow these random variations in the CEO's optimism levels, and that a CEO's optimism levels are not affected by observable factors such as the firm's current profitability or financial constraints. This, however, seems unlikely. Interestingly, the coefficient for dividends is positive and significant at the 1% level in Model 7 of Table 3a. This result indicates that, while firms with lower dividends are generally more likely to have high optimism CEOs, the likelihood of CEOs that demonstrate high optimism at some point during their tenures doing so in a given year is positively related to dividend payouts, after controlling for investment and other factors. Although an optimistic CEO may have a lower baseline payout of dividends during his tenure, he will be more likely to exhibit optimism when his firm is able to increase dividend payouts without experiencing a reduction in investment and cash levels

relative to other years during his tenure. In this context, an increased dividend payout reflects a lower degree of financial constraint rather than a dearth of investment opportunities. Models 7 and 8 of Table 3b show that firm investment is a weak predictor of changes in the probability of a CEO exhibiting pessimism during his tenure, as only the negative coefficient for capital expenditures in Model 7 is statistically significant. Though weak, the coefficients in Model 7 of Table 3b are generally consistent with the relationship between changes in within-tenure optimism and investment outlined in Models 7 and 8 of Table 3a.

Changes in the level of a firm's financial constraint are also examined as potential determinants of variation of a CEO's within-tenure optimism levels. In both Models 7 and 8 of Table 3a, the coefficients for book leverage are negative and statistically significant at the 1% level. According to this result, CEOs become more optimistic as debt levels decrease in their firms. Again, these regressions control for a CEO's time-invariant propensity to exhibit optimism, in other words his overconfidence, so in addition to predicting differences in optimism between CEOs of different firms, lower levels of leverage predict variation in a CEO's optimism levels within his tenure as CEO of his firm, as CEOs exhibit increased optimism in years during which their firms are less levered. Furthermore, CEOs are more likely to exhibit high levels of optimism during years in their tenures when their firms' cash balances are high, as the coefficients for cash & short-term investments in both Models 7 and 8 in Table 3a are positive and statistically significant. Profitability is also predictor of variation in optimism levels within a CEO's tenure, as CEOs demonstrate higher levels of optimism following years in which their firms were more profitable. The coefficient for ROA, while significant at the 1% level in Model 8, is not significant in Model 7. The results in Table 3b largely corroborate the relationship between financial constraint and within-tenure variations in CEO optimism outlined in Table 3a. CEOs are more likely to exhibit

pessimistic behavior both during and following years within their tenure in which profitability is relatively low, as the coefficient for ROA is negative and significant at the 10% level in both Models 7 and 8 in Table 3b. Leverage is also positively related to variation of within-tenure CEO pessimism, though the coefficient for book leverage is statistically significant only in Model 8 and only at the 10% level. The coefficients for cash & short-term investments in Models 7 and 8 of Table 3b are negative, suggesting that CEOs are more pessimistic in years during their tenure where liquidity levels are relatively low, though the effect is not significant in either regression.

Taken together, the results from Tables 3a and 3b provide further evidence that CEOs are more optimistic when their firms have greater investment opportunities are less financially constrained, even after controlling for time-invariant differences between CEOs in their propensity for optimism. While CEOs of firms with higher levels of investment and less financial constraint are more likely to exhibit optimistic behavior, Models 7 and 8 in Tables 3a and 3b indicate that CEOs are more likely to be optimistic during "good" years in which investment is greater and financial constraint lesser relative to other years during their tenures. Since a CEO's assessment of his own managerial ability is not likely to vary wildly during his tenure, these results show that changes in CEO optimism can be a result of changing financial circumstances, rather than a cause.

IV.4 CEO Optimism and Macroeconomic Conditions

The relationship between CEO optimism levels and macroeconomic conditions is examined in Tables 4a and 4b. While CEO optimism and some firm financial policies may be endogenously determined, no such concerns exist for the relationship between CEO optimism and macroeconomic factors. A CEO might take consider macroeconomic

conditions when evaluating his firm's near-term future prospects, but a singular CEO's optimism or lack thereof regarding his own firm's prospects will almost certainly have no perceptible effect on the aggregate economy. For example, if macroeconomic factors suggest expansionary activity on an aggregate scale, this could influence CEOs to exhibit behavior optimistic with having optimistic attitudes with greater frequency. Conversely, less favorable macroeconomic conditions could influence CEOs to demonstrate less optimism for the near-term futures of their firms, both in terms of less frequent exhibition of high optimism attitudes and more frequent exhibition of pessimistic outlooks, characterized by the early exercise of stock options with low moneyness. To analyze the effect of macroeconomic conditions on CEO optimism, data for several macroeconomic factors was collected. Annual statistics for unemployment and inflation were obtained from the Bureau of Labor Statistics. GDP growth data was sourced from the World Bank. Interest rates for 3-month and 10-year constant-maturity Treasury bills were retrieved from the Federal Reserve, along with S&P 500 annual returns (dividends included). Periods of macroeconomic expansion are generally associated with higher levels of GDP growth, lower unemployment, higher stock market returns, higher inflation, higher interest rates, and a lower spread between long-term and short-term interest rates, since short-term interest rates tend to be more sensitive than long-term rates to changes in macroeconomic conditions.

If the non-exercise of high-moneyness options reflects optimism regarding firm prospects, rather than the overestimation of one's own managerial abilities, CEO optimism levels should be positively related to factors which indicate macroeconomic expansion, even after controlling for firms' idiosyncratic stock returns. The results from Tables 4a and 4b largely support this notion. In Table 4a, the likelihood of a CEO exhibiting high optimism is modeled as a function of macroeconomic factors. Models 1 through 7 include dummy

variables representing two-digit SIC industry codes, while Models 8 through 14 use conditional logit regressions with firm-CEO fixed effects to control for unobserved differences between CEOs in their propensity to exhibit optimistic behavior. In both specifications, greater exhibition of high levels of CEO optimism is predicted by higher GDP growth, lower unemployment, and higher inflation. CEO optimism is also seen more frequently when both short-term and long-term interest rates are higher, as well as when the spread between long-term and short-term rates is greater. In Table 4b, the previous methodology is repeated, except that the dependent variable now measures pessimistic attitudes exhibited by CEOs. The results from Table 4b are consistent with those from Table 4a in that CEOs are shown to be more pessimistic when GDP growth is low, unemployment is high, and inflation is low, all of which are consistent with less expansionary macroeconomic conditions. The relationship between CEO pessimism and interest rates also mirrors previous results, as CEOs show increased pessimism when interest rates are lower and when the spread between long-term and short-term rates is higher. While CEO optimism levels are positively related to S&P 500 return in both Tables 4a and 4b, the coefficients are not statistically significant.

IV.5 CEO Age and Optimism

The relationship between CEO age and optimism is outlined in Table 5. All models in Table 5 include control variables for leverage, cash levels, and profitability, while Models 1 and 3 also include controls for firm size. The coefficient estimates for these controls (not reported) are generally consistent with those found in Tables 3a and 3b. All models in Table 5 also include a regressor for median industry net investment levels, which serves as a proxy for a firm's annual investment opportunities. The coefficient for median industry net

investment (not reported) is positive and significant in Models 1 and 2 but is not significant in Models 3 and 4. To control for the influence of macroeconomic conditions, Models 2 and 4 include regressors for GDP growth, while Models 1 and 3 use year dummies for the same purpose.

Models 1 and 2 of Table 5 explore the effects of CEO age on the exhibition of optimistic behavior. In Model 1, CEO age is not found to be a significant predictor of variation of optimism levels between CEOs in the same industry. The negative coefficient would suggest that older CEOs are less optimistic, but it is not statistically significant. Model 2, however, examines variation of a CEO's optimism levels across his tenure and finds that, although age does not predict difference in optimism levels between CEOs, CEOs tend to exhibit high optimism levels earlier in their tenures and less frequently as they age. Models 3 and 4 indicate that pessimism increases as CEOs grow older, as age predicts variation in pessimistic behavior both between CEOs and within a CEO's tenure. Across all models in Table 5, however, CEO age is a considerably stronger predictor of variation in optimism within a CEO's tenure than of variation in optimism levels between CEOs.

There are several potential explanations as to why CEO optimism decreases with age. First, the trend of decreasing optimism within a CEO's tenure might suggest that CEOs tend to feel a greater belief in their ability to improve their firms during the early periods of their tenures. CEOs may be more active in transforming their firms early in their tenures, while managing more passively once their reforms are implemented. This might cause CEOs to feel that their ability to add value to their firms decreases over their tenure. Since the effect of age on optimism levels is observed independent of changes in profitability, investment opportunities, and financial constraints during a CEO's tenure, the decrease in retention of deep in-the-money stock options as CEOs age is consistent with

declining overconfidence. However, since CEOs are classified as optimistic when they retain options rather than exercise them, the reduction in observed optimism levels with CEOs' increasing age could simply be attributed to a decreased willingness to defer compensation in older CEOs. Lee et al. (2008) find that older individuals tend to exhibit increased risk aversion. The increased early exercise and reduced retention of stock options in older CEOs might then reflect a reduced tolerance of uncertainty regarding their compensation.

V Is Overconfidence a Managerial Fixed Effect?

Tables 3a and 3b show that CEO option-exercise decisions are, to some extent, a reflection of firm quality. Firms with greater performance, less financial constraint, and more investment opportunities have more optimistic CEOs. Firms with these qualities are likely to have better near-term financial prospects, and CEOs in these firms would unsurprisingly exhibit higher levels optimism than other CEOs. Because of this, it seems unreasonable to ascribe the decision to retain deep in-the-money stock options entirely to CEOs' overconfidence in their ability to increase firm value. However, it is possible that some CEOs exhibit levels of optimism beyond what would be expected given their firm's financial characteristics. Though a CEO's belief in his managerial ability cannot be directly observed, a CEO's continued bias toward optimism could be indicative of overconfidence. Therefore, I classify as overconfident CEOs who exhibit higher levels of optimism than would be predicted by the quality of their firms – the greater difference between a CEO's observed and predicted optimism, the greater the overconfidence.

If overconfidence is a managerial fixed effect, an executive who has managed multiple firms would be expected to display a similar bias toward optimism while at each firm. In order to test this hypothesis, it is necessary to develop a procedure to measure

CEOs' bias toward optimism, or overconfidence. First, CEO optimism is modeled as a binary function of firm stock returns, profitability, leverage, liquidity, and size, as well as median industry net investment, which serves a proxy for firms' investment opportunities in a given year. From Model 1 in Table 6, fitted values for expected optimism are calculated, and then compared to the actual observed value for optimism for each CEO-year observation. I calculate *AvgError* as the difference between the observed value and fitted value for optimism in each annual observation. I then compute the average value of this difference for each firm-CEO pair. If a CEO consistently exhibits high (low) levels of optimism beyond what would be expected from his firm's profitability, investment opportunities, and financial constraint, *AvgError* for that CEO will take a positive (negative) value. Therefore, *AvgError* is a measure of CEO overconfidence, with higher values indicating greater overconfidence. Next, I identify CEOs who have managed multiple firms using the *execid* and *co_per_rol* variables in Execucomp. A CEO who has managed multiple firms will have one value for *execid* but multiple values for *co_per_rol*. I find a total of 212 executives that served as CEO for multiple S&P 1500 firms between 1992 and 2013. Two-hundred of these executives managed two firms each, while the remaining twelve executives each managed three firms.

Values of *AvgError* are sorted chronologically for each executive. Then, in Model 2 of Table 6, *AvgError* is regressed on its lagged value for each executive. Note that the twelve executives that managed three firms will each have two observations each in this model, rather than one. If overconfidence is a managerial fixed effect, the coefficient for *AvgError1*, which is the lagged value for *AvgError* for each executive, will be positive and statistically significant. However, although the estimated coefficient for *AvgError1* in Model 2 is in fact positive, it is not statistically significant (p=0.141). This result can be interpreted as mild

support of the idea of overconfidence as a managerial fixed effect, as overconfidence at a previous job is, at best, a weak predictor of future overconfidence.

In Models 3 through 5 of Table 6, *AvgError* is modeled as a factor of several time-invariant firm-CEO characteristics. In Model 3, CEOs who begin their tenure at a younger age are shown to be more overconfident, which is consistent with the results in Table 5 and with the findings of Lee et al. (2008). In Model 4, female CEOs are found to have a reduced bias toward optimism compared to male CEOs. This result is consistent with the findings of Barber and Odean (2001), who suggest that overconfidence explains why men trade more frequently than women, even though their excess trading leads to losses, and Lundeberg, Fox, and Puncochar (1994) who find that men are generally more overconfident than women. Huang and Kigsen (2013) also document managerial tendencies in female CEOs that are consistent with reduced overconfidence relative to male CEOs. In Model 5, the number of years served with a firm before being promoted to CEO is shown not to be a significant predictor of overconfidence, suggesting that CEOs hired from outside the firm are neither more nor less overconfident than those promoted from within the firm.

VI Conclusion

If the retention of deep in-the-money options is solely a reflection of a CEO's overconfidence in the ability of his own managerial skill to add value to his firm, the only factor that should predict this behavior is the firm's equity returns. CEOs of firms with high prior returns would be more likely to exhibit overconfident behavior, simply due to having the opportunity to do so, while CEOs of firms with low prior stock returns would be less likely to exhibit this behavior because their stock options would be unlikely to be deep in-the-money to the extent required to meet the high optimism designation. Most extant literature

considers CEO overconfidence to be a managerial fixed effect, in which a CEO reveals himself to be overconfident at some point during his tenure and remains classified as such for the duration of his tenure. However, the non-exercise of options might more generally reflect a CEO's optimism about his firm's future prospects, in which a CEO's level of optimism might be influenced by factors other than solely his perception of his own managerial skill. If this is the case, the exhibition of optimistic behavior might vary in predictable ways.

I find that the decision of CEOs to retain deep in-the-money stock options is predicted by a number of firm-specific and macroeconomic factors. CEOs exhibit greater optimism when their firms are more profitable and less financially constrained, as well as when investment opportunities are greater for firms in their industries. Additionally, CEOs are more optimistic during periods of macroeconomic expansion, as increased optimism is predicted by higher levels of GDP growth, employment, interest rates, and inflation. Therefore, optimistic behavior is CEOs is, at least to some extent, a reaction to the financial circumstances faced by their firms.

It is possible, however, that after controlling for factors which predict optimistic behavior, the extent to which one CEO is more or less likely than another to exhibit high levels of optimism could be attributed to differences in self-assessments of their own managerial ability. In other words, a CEO could be considered to be more overconfident if he consistently exhibits higher levels of optimism than would be expected given the circumstanced faced by his firm. While optimism does not necessarily imply overconfidence, a continued bias toward optimism could rightly be considered overconfidence. I find some evidence that CEO overconfidence, defined as a bias toward optimism, might be a managerial fixed effect. CEOs who have managed multiple firms exhibit a similar bias

toward optimism across their different jobs, though the relationship of past overconfidence to present is somewhat weak.

The finding that CEO option-exercise behavior can be predicted by firm-specific and macroeconomic factors has important implications for research in the area of CEO overconfidence. Researchers should consider that the retention of deep in-the-money stock options is not necessarily an exogenously determined signal of overconfidence in CEOs. Rather, the decision to retain deep in-the-money stock options likely reflects optimism that is a reaction of CEOs to the financial circumstances of their firms.

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Table 2.1: Summary Statistics

	Full Sample (N=37,182)		High Opt. = 1 (N=7,782)		High Opt. = 0 (N=29,400)		Low Opt. = 1 (N=921)		Low Opt. = 0 (36,261)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
ln(Assets)	7.5492	1.8012	7.3062	1.7022	7.6135	1.8211	8.3386	1.8211	7.5292	1.7962
Book Leverage	0.2409	0.8000	0.1972	0.1984	0.2525	0.8931	0.2537	0.1604	0.2406	0.8094
Market Leverage	0.2422	0.2272	0.1573	0.1820	0.2650	0.2326	0.2844	0.1962	0.2411	0.2278
Cash	0.0950	0.1181	0.1139	0.1298	0.0899	0.1142	0.0719	0.0933	0.0956	0.1186
Cash & Short-term Inv.	0.1397	0.1697	0.1734	0.1899	0.1308	0.1628	0.1022	0.1343	0.1407	0.1704
ROA	0.0273	0.4639	0.0644	0.1494	0.0175	0.5156	0.0370	0.0979	0.0271	0.4695
Dividends	0.0138	0.0473	0.0089	0.0332	0.0150	0.0503	0.0187	0.0231	0.0136	0.0478
Capital Expenditures	0.0528	0.0574	0.0631	0.0680	0.0502	0.0540	0.0413	0.0392	0.0531	0.0577
Acquisitions	0.0259	0.0660	0.0364	0.0787	0.0232	0.0620	0.0190	0.0561	0.0261	0.0662
R&D	0.0012	0.0138	0.0023	0.0207	0.0009	0.0112	0.0004	0.0043	0.0012	0.0139

	(High Opt. = 1) - (High Opt. = 0)		(Low Opt. = 1) - (Low Opt. = 0)		(High Opt. = 1) - (Low Opt. = 1)	
	Diff.	t-stat	Diff.	t-stat	Diff.	t-stat
ln(Assets)	-0.3073	-13.95	0.8094	13.50	-1.0324	-16.38
Book Leverage	-0.0553	-9.73	0.0131	1.93	-0.0565	-9.81
Market Leverage	-0.1077	-43.43	0.0433	6.56	-0.1271	-18.66
Cash	0.0240	14.75	-0.0237	-7.47	0.0420	12.22
Cash & Short-term Inv.	0.0426	18.11	-0.0385	-8.54	0.0712	14.14
ROA	0.0469	13.58	0.0099	-2.44	0.0274	7.51
Dividends	-0.0061	-12.81	0.0051	6.28	-0.0098	11.49
Capital Expenditures	0.0129	15.14	-0.0118	-8.79	0.0218	14.26
Acquisitions	0.0132	13.06	-0.0071	-3.60	0.0174	8.11
R&D	0.0013	4.90	-0.0008	-4.34	0.0018	5.91

Table 2.2: CEO Optimism by Industry

Industry	N	High Optimism	Low Optimism
Healthcare	2,856	29.76%	2.03%
Tech	6,367	27.05%	1.65%
Energy	1,557	23.96%	1.35%
Finance	5,738	21.65%	2.82%
Sales	4,370	21.19%	2.27%
Other	4,301	21.06%	2.21%
Communications	913	18.73%	3.29%
Manufacturing	4,491	16.92%	2.76%
Consumer Nondurables	2,286	15.92%	2.89%
Consumer Durables	1,085	15.21%	1.84%
Chemicals	1,237	14.96%	4.20%
Utilities	1,981	5.96%	4.49%

Industries defined using Fama-French 12-industry classification.

Table 2.3a: CEO Optimism and Firm Circumstances

	(1)	(2)	(3)	(4)	(5)		(6)		(7)	(8)
	Logit		Probit		First Stage (OLS)	IV Probit	First Stage (OLS)	IV Probit	Conditional Logit	
Stock Return	1.813***	1.961***	0.819***	0.912***	-0.00141**	0.876***	0.00222*	0.866***	2.404***	2.760***
	(0.0954)	(0.100)	(0.0467)	(0.0487)	(0.000678)	(0.0444)	(0.00114)	(0.0440)	(0.122)	(0.139)
Stock Return(t-1)	1.482***	1.409***	0.679***	0.637***	0.00620***	0.742***	0.0138***	0.710***	1.681***	1.773***
	(0.0719)	(0.0771)	(0.0335)	(0.0361)	(0.000487)	(0.0331)	(0.000915)	(0.0335)	(0.0925)	(0.100)
Capital Expenditures	6.022***	4.882***	2.833***	2.443***					9.192***	7.581***
	(0.649)	(0.644)	(0.291)	(0.292)					(1.596)	(1.223)
Acquisitions	2.643***	2.710***	1.614***	1.692***					2.342***	2.835***
	(0.288)	(0.302)	(0.163)	(0.170)					(0.481)	(0.459)
R&D	-0.715	2.504*	0.824	2.536***					0.124	1.819
	(1.609)	(1.424)	(0.959)	(0.807)					(3.041)	(2.478)
Dividends	-1.953	-8.258***	-1.091	-3.731***					2.491**	-0.473
	(1.711)	(2.541)	(0.685)	(1.078)					(1.140)	(1.568)
Net Investment										
Instruments										
Median Industry Capital Expenditures					0.949***					
					(0.0373)					
Median Industry Net Investment							0.870***			
							(0.0360)			
Fitted Values										
Capital Expenditures						1.711***				
						(0.460)				
Net Investment								2.634***		
								(0.422)		

Table 2.3a: CEO Optimism and Firm Circumstances

cont…

Book Leverage	-0.783***	-0.434**	-0.312***	-0.145	-0.000733***	-0.236***	-0.000416	-0.294***	-1.850***	-1.827***
	(0.223)	(0.204)	(0.0956)	(0.0939)	(0.000237)	(0.0833)	(0.000735)	(0.0896)	(0.548)	(0.503)
Cash & Short-term Inv.	0.818***	0.756***	0.501***	0.497***	-0.0232***	0.511***	-0.0732***	0.688***	1.350***	1.164**
	(0.206)	(0.214)	(0.104)	(0.108)	(0.00347)	(0.0987)	(0.00618)	(0.105)	(0.498)	(0.535)
ROA	0.158**	3.710***	0.0735***	1.828***	-0.000546	0.0782***	-0.00210	0.0814***	1.670	4.186***
	(0.0688)	(0.439)	(0.0272)	(0.244)	(0.000775)	(0.0279)	(0.00160)	(0.0285)	(1.355)	(0.927)
ln(Assets)	0.0413*	0.0179	0.00836	-0.000418	-0.00337***	-0.00608	-0.00584***	0.00921		
	(0.0215)	(0.0220)	(0.0104)	(0.0107)	(0.000344)	(0.00932)	(0.000482)	(0.00966)		
Constant	-3.198***	-3.162***	-1.285***	-1.309***	0.0425***	-1.138***	0.0799***	-1.341***		
	(0.783)	(1.029)	(0.0916)	(0.0945)	(0.00353)	(0.0908)	(0.00485)	(0.0966)		
Observations	22,575	22,113	22,575	22,113	28,757	28,757	28,757	28,757	10,451	10,070
R-squared										
Industry/CEO FE	sic2	sic2	no	no	no	no	no	no	CEO	CEO
Year FE	yes	yes	no	no	no	no	no	no	yes	yes
Lagged Regressors	no	yes	no	yes	no	no	no	no	no	yes
Wald Test of Exogeneity (p-value)						0.0618		0.1054		

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

The dependent variable in these regressions is CEO optimism, set equal to 1 if a CEO exhibits optimistic behavior in a given year, 0 otherwise (see section III for more detail). Industry fixed effects are based on 2-digit SIC codes. Instrument variables in Models 5 and 6 are based on median annual industry values for all Compustat firms. Robust standard errors (reported in parentheses) are clustered by firm.

Table 2.3b: CEO Pessimism and Firm Circumstances

	(1)	(2)	(3)	(4)	(5)		(6)		(7)	(8)
	Logit		Probit		First Stage (OLS)	IV Probit	First Stage (OLS)	IV Probit	Conditional Logit	
Stock Return	0.0704	0.0581	0.0676***	0.0649**	-0.00141**	0.0730***	0.00222*	0.0804***	0.142	0.0566
	(0.0613)	(0.0639)	(0.0244)	(0.0252)	(0.000678)	(0.0209)	(0.00114)	(0.0215)	(0.157)	(0.159)
Stock Return(t-1)	-0.163**	-0.212**	-0.0611*	-0.0807**	0.00620***	-0.0700***	0.0138***	-0.0522*	-0.163	-0.152
	(0.0815)	(0.0880)	(0.0313)	(0.0348)	(0.000487)	(0.0270)	(0.000915)	(0.0289)	(0.175)	(0.174)
Capital Expenditures	-5.947***	-4.163**	-2.072***	-1.613***					-9.260***	-0.947
	(2.047)	(1.677)	(0.622)	(0.543)					(3.103)	(2.636)
Acquisitions	-1.866*	-0.229	-0.681*	-0.0992					-1.864	0.0448
	(0.991)	(0.718)	(0.381)	(0.292)					(1.220)	(0.841)
R&D	-5.494	-32.98*	-2.863	-13.14**					0.951	-25.44
	(8.855)	(18.77)	(3.545)	(6.573)					(6.988)	(21.13)
Dividends	1.719***	2.150	0.986***	1.205***					-3.969	1.283
	(0.508)	(1.373)	(0.319)	(0.432)					(3.206)	(0.939)
Net Investment										
Instruments										
Median Industry Capital Expenditures					0.949***					
					(0.0373)					
Median Industry Net Investment							0.870***			
							(0.0360)			
Fitted Values										
Capital Expenditures						-1.652**				
						(0.643)				
Net Investment								-1.820***		
								(0.669)		

Table 2.3a: CEO Pessimism and Firm Circumstances

cont…

Book Leverage	0.0123	0.0566	0.00527	0.0299	-0.000733***	-0.00280	-0.000416	-0.0126	0.791	1.500*
	(0.0180)	(0.0649)	(0.00870)	(0.0305)	(0.000237)	(0.0493)	(0.000735)	(0.0899)	(0.756)	(0.792)
Cash & Short-term Inv.	-0.991**	-0.953**	-0.403***	-0.369**	-0.0232***	-0.458***	-0.0732***	-0.563***	-0.0833	-0.0481
	(0.453)	(0.467)	(0.155)	(0.160)	(0.00347)	(0.146)	(0.00618)	(0.160)	(0.847)	(0.967)
ROA	-0.0102	0.210	0.000327	0.124	-0.000546	0.00994	-0.00210	0.00301	-1.653*	-1.267*
	(0.0683)	(0.333)	(0.0234)	(0.146)	(0.000775)	(0.0159)	(0.00160)	(0.0204)	(0.927)	(0.675)
ln(Assets)	0.232***	0.231***	0.0793***	0.0797***	-0.00337***	0.0843***	-0.00584***	0.0770***		
	(0.0384)	(0.0396)	(0.0138)	(0.0142)	(0.000344)	(0.0123)	(0.000482)	(0.0134)		
Constant	-8.249***	-8.327***	-2.427***	-2.474***	0.0425***	-2.457***	0.0799***	-2.359***		
	(1.208)	(1.167)	(0.129)	(0.131)	(0.00353)	(0.120)	(0.00485)	(0.145)		
Observations	22,202	21,953	22,575	22,113	28,757	28,757	28,757	28,757	3,022	2,981
R-squared										
Industry/CEO FE	sic2	sic2	no	no	no	no	no	no	CEO	CEO
Year FE	yes	yes	no	no	no	no	no	no	yes	yes
Lagged Regressors	no	yes	no	yes	no	no	no	no	no	yes
Wald Test of Exogeneity (p-value)						0.7821		0.3071		

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

The dependent variable in these regressions is CEO pessimism, set equal to 1 if a CEO exhibits pessimistic behavior in a given year, 0 otherwise (see section III for more detail). Industry fixed effects are based on 2-digit SIC codes. Instrument variables in Models 5 and 6 are based on median annual industry values for all Compustat firms. Robust standard errors (reported in parentheses) are clustered by firm.

Table 2.4a: CEO Optimism and Macroeconomic Conditions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Stock Return	1.793***	1.945***	1.817***	1.894***	1.863***	1.905***	1.887***	2.366***	2.566***	2.417***	2.471***	2.419***	2.516***	2.485***
	(0.0745)	(0.0772)	(0.0781)	(0.0757)	(0.0749)	(0.0762)	(0.0762)	(0.0971)	(0.101)	(0.0998)	(0.0993)	(0.0973)	(0.101)	(0.0978)
Stock Return(t-1)	1.446***	1.562***	1.558***	1.553***	1.542***	1.570***	1.515***	1.722***	1.841***	1.853***	1.831***	1.818***	1.860***	1.805***
	(0.0584)	(0.0577)	(0.0567)	(0.0576)	(0.0567)	(0.0585)	(0.0566)	(0.0758)	(0.0746)	(0.0726)	(0.0740)	(0.0727)	(0.0749)	(0.0732)
GDP Growth	0.124***							0.117***						
	(0.0153)							(0.0203)						
Unemployment		-0.232***							-0.370***					
		(0.0150)							(0.0259)					
S&P500 Return			0.123							0.234				
			(0.109)							(0.144)				
3mo. T-bill Rate				0.168***							0.247***			
				(0.0105)							(0.0185)			
10yr T-bill Rate					0.222***							0.333***		
					(0.0177)							(0.0403)		
10yr - 3mo T-Bill Spread						-0.310***							-0.372***	
						(0.0171)							(0.0256)	
Inflation							0.160***							0.159***
							(0.0185)							(0.0249)
Constant	-2.687***	-1.112	-2.368***	-2.991***	-3.488***	-1.942***	-2.764***							
	(0.709)	(0.716)	(0.698)	(0.724)	(0.738)	(0.698)	(0.696)							
Observations	29,808	29,808	29,808	29,808	29,808	29,808	29,808	13,457	13,457	13,457	13,457	13,457	13,457	13,457
R-squared														
FE	sic2	sic2	sic2	sic2	sic2	sic2	sic2	CEO	CEO	CEO	CEO	CEO	CEO	CEO

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

The dependent variable in these regressions is CEO optimism, set equal to 1 if a CEO exhibits optimistic behavior in a given year, 0 otherwise (see section III for more detail). Industry fixed effects are based on 2-digit SIC codes. Robust standard errors (reported in parentheses) are clustered by firm.

Table 2.4b: CEO Pessimism and Macroeconomic Conditions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Stock Return	0.182***	0.0959**	0.179***	0.126***	0.131***	0.139***	0.130***	0.311***	0.144	0.260**	0.217*	0.209*	0.242**	0.210*
	(0.0443)	(0.0460)	(0.0430)	(0.0434)	(0.0434)	(0.0433)	(0.0444)	(0.107)	(0.116)	(0.122)	(0.114)	(0.116)	(0.111)	(0.113)
Stock Return(t-1)	-0.0497	-0.103**	-0.151***	-0.106**	-0.126**	-0.109**	-0.104*	-0.0696	-0.113	-0.212	-0.150	-0.189	-0.160	-0.141
	(0.0560)	(0.0512)	(0.0539)	(0.0518)	(0.0532)	(0.0515)	(0.0544)	(0.142)	(0.120)	(0.141)	(0.131)	(0.140)	(0.132)	(0.138)
GDP Growth	-0.0930***							-0.0858***						
	(0.0186)							(0.0266)						
Unemployment		0.175***							0.249***					
		(0.0243)							(0.0322)					
S&P500 Return			-0.203							-0.0183				
			(0.175)							(0.242)				
3mo. T-bill Rate				-0.161***							-0.238***			
				(0.0215)							(0.0297)			
10yr T-bill Rate					-0.232***							-0.444***		
					(0.0333)							(0.0543)		
10yr - 3mo T-Bill Spread						0.248***							0.245***	
						(0.0352)							(0.0397)	
Inflation							-0.120***							-0.114***
							(0.0362)							(0.0423)
Constant	-3.866***	-5.150***	-4.084***	-3.642***	-3.040***	-4.528***	-3.811***							
	(0.959)	(0.976)	(0.948)	(0.975)	(0.980)	(0.970)	(0.957)							
Observations	29,674	29,674	29,674	29,674	29,674	29,674	29,674	4,337	4,337	4,337	4,337	4,337	4,337	4,337
R-squared														
FE	sic2	sic2	sic2	sic2	sic2	sic2	sic2	CEO	CEO	CEO	CEO	CEO	CEO	CEO

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

The dependent variable in these regressions is CEO pessimism, set equal to 1 if a CEO exhibits pessimistic behavior in a given year, 0 otherwise (see section III for more detail). Industry fixed effects are based on 2-digit SIC codes. Robust standard errors (reported in parentheses) are clustered by firm.

Table 2.5: CEO Age and Optimism

	(1)	(2)	(3)	(4)
	Optimism		Pessimism	
Stock Return	1.935***	2.344***	0.0904*	0.325***
	(0.0859)	(0.101)	(0.0511)	(0.115)
Stock Return(t-1)	1.672***	1.652***	-0.188***	-0.106
	(0.0690)	(0.0773)	(0.0653)	(0.155)
CEO Age	-0.00274	-0.0502***	0.0134**	0.132***
	(0.00362)	(0.0129)	(0.00649)	(0.0196)
Constant	-2.639***		-6.871***	
	(0.753)		(1.091)	
Observations	29,563	13,391	29,429	4,305
R-squared				
Firm Controls	yes	yes	yes	yes
CEO FE	no	yes	no	yes
Industry FE	yes	no	yes	no
Year FE	yes	no	yes	no

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

Industry fixed effects are based on 2-digit SIC codes. Robust standard errors (reported in parentheses) are clustered by firm.

Table 2.6: Overconfidence as a CEO Fixed Effect

	(1)	(2)	(3)	(4)	(5)
	Optimism	Overconfidence(AvgError)			
Stock Return	1.939***				
	(0.0860)				
Stock Return(t-1)	1.664***				
	(0.0686)				
Median Industry Net Investment	3.761**				
	(1.563)				
Book Leverage	-0.559***				
	(0.177)				
Cash & Short-term Investments	0.542***				
	(0.183)				
ROA	0.182				
	(0.120)				
ln(Assets)	0.0188				
	(0.0185)				
AvgError1		0.0731			
		(0.0495)			
Age Hired as CEO			-0.00268***		
			(0.000418)		
Female				-0.0467**	
				(0.0212)	
Years Before CEO					0.000186
					(0.000465)
Constant	-2.806***	-0.0479***	0.126***	-0.00778**	-0.0128**
	(0.731)	(0.0141)	(0.0212)	(0.00334)	(0.00624)
Observations	29,672	224	5,908	6,220	2,728
R-squared	0.176	0.010	0.007	0.001	0.000

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

Model 1 includes dummy variables for year and industry fixed effects based on 2-digit SIC codes. Book leverage is total long-term debt divided by total assets. Cash and short-term investments is scaled by total assets. Fitted values from Model 1 are used to determine values for AvgError and AvgError1used in cross-sectional OLS regressions in Models 2, 3, 4, and 5. Standard errors (clustered by firm in Model 1) are reported in parentheses.