CEO Facial Width Predicts Firm Financial Policies

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Abstract

Facial width-to-height ratio (fWHR) is a proxy for testosterone levels and has been linked to aggressive behavior and increased risk tolerance. This study is the first to examine the relationship between a proxy for CEO testosterone levels and firm financial policies. Using data hand-collected from images of 968 male CEOs of S&P 500 firms, I find that CEO facial width is positively correlated with leverage and negatively correlated with cash holdings during the 2002-2013 period. The relationship between CEO fWHR and financial policies is also observed for CEOs who go on to attain longer tenures with their firms, as well as when post-turnover firm-year observations are removed from the sample. Overall, it appears that CEO testosterone levels have a significant impact on corporate financial management decisions, as higher testosterone levels may induce CEOs to pursue more aggressive financial policies.

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1. 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 more aggressive firm financial policies.

Because obtaining saliva samples from or measuring digit lengths (another proxy for testosterone levels) of a large number of CEOs would be highly impractical, 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 S&P 500 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.

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 (2010)
5. Malmendier, Tate, and Yan (2010); Benmelech and Frydman (2014)
6. Graham and Narasimhan (2004); Malmendier, Tate, and Yan (2010)

Specifically, I find that higher CEO facial width is associated higher leverage and lower cash holdings in the firms they manage. 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 effect of testosterone levels on CEOs' managerial preferences, it is also possible that high-fWHR, high-testosterone CEOs might naturally sort into firms that already have 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 is expected that the financial characteristics of a firm will more accurately represent a CEO's managerial preferences after the third year than during earlier parts of his or her tenure since 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 go onto 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, although the effect of CEO fWHR on leverage choice is attenuated in long-term CEOs. The relationship between CEO fWHR and firm cash holdings is increased among CEOs with greater influence. 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 higher testosterone levels may induce CEOs to pursue more aggressive financial policies.

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 the boardrooms of large S&P 500 firms.

The remainder of the paper is organized as follows. Section 2 provides a review of relevant literature. Section 3 describes the data collection procedure, variable definitions, and summary statistics. Section 4 presents results regarding the relationship between CEO fWHR and firm financial outcomes. Section 5 concludes.

2. Facial Width and Testosterone

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 at a speed-dating event. 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 previously examined by Wong, Ormistion, and Haselhuhn (2011), who show that fWHR in male CEOs is positively related to firm performance in firms classified as having cognitively simple leadership teams.

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; 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.

3. Data

To examine the relationship between CEO fWHR and firm financial policies, I constructed a manager-firm matched panel data set that spans from 2002 to 2013. 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). The final data set contains 512 firms and 4,837 firm-year observations.

Next, CEOs of each firm were identified on an annual basis using the Execucomp database, 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.

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 1 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 tend to have facial widths greater than graduate and undergraduate students, but lower than U.S. Presidents, which suggests that men in more powerful positions tend to have higher testosterone levels.

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. Acquisitions, capital expenditures, and R&D are set to zero in cases where observations are missing. 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 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)*. Net working capital is current assets *(act)* minus current liabilities *(lct)*. 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. Table 2 reports summary statistics for sample and industry firms. In terms of medians, firms for which CEO fWHR data is available tend to have higher leverage and profitability, lower cash holdings, and more assets relative to U.S. Compustat firms from which industry-adjusted measures are derived. Since all firms for which CEO fWHR data was collected were listed on the S&P 500 for at least a portion of the sample period, it is unsurprising that these firms tend to be larger and more profitable than their industry counterparts. Larger firms tend to have higher leverage and lower cash holdings, as

shown in multivariate regressions later in the paper, which might explain the observed differences between sample and industry firms in these regards.

4. 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 provides a simple measurement of the economic magnitude of the relationship between CEO fWHR and firm financial outcomes. For example, Table 3a shows that market leverage in firms managed by high-fWHR CEOs is .0216 higher than in firms managed by low-fWHR CEOs, an increase of 9.1% 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, which in some instances results in large decreases in statistical significance of regression coefficients due to high within-firm correlations of several financial policy measures. It should also be noted that the regressions do not contain firm-level fixed effects, and, therefore, any results cannot be considered evidence that CEO fWHR explains difference in financial policies within firms. Regressions including firm fixed effects, the results of which are not reported in this paper, indicate that CEO fWHR does not reliably explain within-firm differences in financial management for CEOs in this sample. It may simply be the case that differences in testosterone levels do not cause CEOs within the same firm to pursue different financial policies. However, it may be that statistically significant within-firm effects are not found due in part to characteristics of the sample. For example, the maximum number of annual observations for each firm (12) is somewhat small compared to other papers that study the effects of CEO characteristics on firm financial policies. Photos are generally more difficult to obtain for CEOs whose tenures occurred further into the past, which contributes to the somewhat short horizon used in this study. For firms with no CEO turnover during the sample period, the inclusion of firm fixed effects will result in no observed relationship between CEO fWHR and financial policies, since CEO fWHR in that case would also be a firm fixed effect. Too much turnover within a firm could also be problematic if CEOs do not quickly "make their mark" on the firm's financial management. The ideal case to test the within-firm effects of CEO fWHR on financial outcomes would be an instance in which a firm had two CEOs during the sample period, each having a six firm-year observations as CEO and having sizeable differences in their fWHR measurements. Although

some firms in the sample have ideal or nearly-ideal distributions of firm-years between CEOs with substantially different facial widths, many do not.

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 observaions 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.

These tests, however, do not directly rule out the possibility that high-fWHR managers might sort into already aggressive firms, which could explain the observed relationship between CEO fWHR and financial outcomes. To address this possibility, I examine firms' financial policies in the two years before hiring new CEOs and find no evidence of a relationship between pre-existing firm financial characteristics and fWHR of newly-hired CEOs. Thus, it appears that high-fWHR CEOs do not necessarily sort into aggressive firms.

4.1. CEO fWHR and Firm Leverage:

A univariate analysis of the relationship between CEO fWHR and firm leverage is presented Table 3a. I expect that, if CEO testosterone levels affect leverage choice, a positive relationship between CEO facial width and firm leverage will be observed. Panel A of Table 3a relates book and market leverage to CEO facial width for the full sample of CEOs. In firms managed by high-fWHR CEOs, book leverage is .0159 higher than in firms managed by low-fWHR managers, which represents an increase of 6.7% relative to the unconditional mean. For market leverage, the difference between high- and low-fWHR groups is .0216, an increase of 10.9% 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 .0215 greater than those with low-fWHR CEOs, an increase of 9.1% 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 13.6% 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.

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. Panel B of Table 3a reexamines 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. For this subsample, the difference in leverage between high- and low-fWHR CEO groups remains positive for all four measures of firm leverage, though the magnitude of the difference is smaller in each case. This implies that high- and low-fWHR CEOs differ in their leverage choices to a greater extent early in their tenures than later, which could suggest that some of the effect might be a result of high-fWHR CEOs sorting into already highly-leveraged firms, though I find no direct evidence to support this notion. It could also be the case that some CEOs who adopt extreme leverage policies may not last long in their positions, but that possibility is not directly examined in this study. Although the difference in means between groups is smaller across all measures of firm leverage when excluding CEOs' first two years at their firms, the correlation coefficients are slightly larger for all four measures. As is the case in the full sample, correlations between CEO fWHR and leverage are stronger for market leverage than for book leverage and for industry-adjusted measures than for unadjusted measures in this subsample.

I also consider the possibility that longer-tenured CEOs may have greater influence over firm policies than less-experienced managers. In the subsample of "long-term" CEOs (8+ years as CEO), I find that firms managed by high-fWHR CEOs have higher leverage, both in terms of book and market leverage and for industry-adjusted as well as unadjusted measures. The magnitude of the differences in leverage policies between high- and low-fWHR CEOs reported in Table 3a are generally smaller in the long-term subsample than in other samples, though the

correlations between leverage and CEO fWHR in the long-term sample are comparable in magnitude to those seen in the full sample.

Regression results for the effect of CEO fWHR on firm leverage are found in Table 3b. Panel A reports results for the full sample of CEOs. Regressions in columns 1 and 4 contain only regressors for CEO fWHR along with industry and year dummies, with book leverage and market leverage as the dependent variables, respectively. In column 1, the coefficient of .0645, statistically significant at the 10% level, indicates a positive effect of CEO fWHR on book leverage. Columns 2 and 5 add controls for firm size, while columns 3 and 6 add firm-level controls for profitability, asset tangibility, and depreciation. Coefficients for CEO fWHR in columns 2 and 3 indicate a positive effect of CEO fWHR on book leverage, but the coefficient is not statistically significant in either model. Market leverage is the dependent variable in columns 4-6. In column 4, the coefficient for CEO fWHR is .0815 and is statistically significant at the 5% level. Including regressors for firm size in column 5 and additional firm-year financial characteristics in column 6 result in a slight decrease in the magnitude of the CEO fWHR coefficient (.0744 and .0534, respectively), but both are statistically significant at the 10% level.

Panels B and C examine the relationship between CEO fWHR and firm leverage for two subsamples. In panel B, the effect of CEO fWHR on book leverage from managers in at least their third year as CEO of their firms is found to be positive but not statistically significant across all specifications. For market leverage, the CEO fWHR coefficient is positive and statistically significant at the 10% level in columns 4 and 5, but is not found to be statistically significant in column 6 when additional firm-year controls are included (t=1.62). Panel C presents results of regressions of CEO fWHR on firm leverage for long-term CEOs (tenure at least 8 years). For long-term CEOs, the coefficients for CEO fWHR in all specifications are positive but not statistically significant.

Overall, the results indicate that higher CEO fWHR is generally associated with greater firm leverage. This result persists after controlling for industry and year effects and firm-year financial characteristics, as well as clustering of observations within firms. The effect appears to be stronger for market leverage than for book leverage. These results do not suggest, however, that CEO fWHR plays a role in explaining differences in leverage choices between managers within the same firms, but rather CEO fWHR plays a role in predicting differences in leverage between firms. Though the possibility that highly leverage firms tend to hire CEOs with greater fWHR cannot be ruled out entirely, which would attribute the observed differences in leverage to hiring decisions instead of (or in addition to) CEO influence, it does appear that leverage choices are likely consistent with managerial preferences, as evidenced by the effect of CEO fWHR as a determinant of market leverage in a subsample removed of post-turnover observations, which is consistent with results from the full sample. Results from Panel C indicate that testosterone levels may not play as important a role in the leverage choices of managers who go on to achieve longer tenures with their firms, as the relationship between CEO fWHR and leverage is positive but not statistically significant for this subsample. In general, it appears that higher testosterone levels may induce CEOs to pursue more aggressive leverage policies.

4.2. CEO fWHR and Cash Holdings:

The relationship between firm cash holdings and CEO fWHR is documented in Tables 4a and 4b. If testosterone levels affect a CEO's decision of how much cash to hold, I expect that high-fWHR CEOs will have lower cash holdings than low-fWHR CEOs, since holding less cash would be considered a more risky financial policy. The results presented in Tables 4a and 4b are consistent with this hypothesis. Table 4a presents results of a univariate analysis of the relationship between firm cash holdings and CEO fWHR. In Panel A, high-fWHR CEOs are shown to hold less cash than low-fWHR CEOs. For both the cash-to-assets measure and when including short-term cash equivalents, the negative relationship between CEO fWHR and firm

cash holdings is larger in magnitude for industry-adjusted measures. For industry-adjusted cash-to-assets, the difference between high-fWHR and low-fWHR groups is -.0196, a decrease of 18.8% relative to the unconditional cash-to-assets mean. When including short term cash equivalents, the difference of -.0301 between high- and low-fWHR groups for the industry-adjusted measure represents a 20.8% decrease relative to the unconditional sample mean for cash & short-term equivalents. The correlations between CEO fWHR and firm cash holdings in Panel A are all negative and statistically significant at the 1% level, with larger magnitudes for the industry-adjusted measures.

Panels B and C of Table 4a show that the relationship between CEO facial width and firm cash holdings is larger for more-influential CEOs. In Panel B, the difference between high-fWHR and low-fWHR CEOs, after removing observations from the first 2 years of each CEO's tenure, is negative across all measures of firm cash levels. As in Panel A, the effect is larger when controlling for industry-year trends. For industry-adjusted cash and short-term equivalents scaled by assets, the difference between high- and low-fWHR groups of -.0338 represents a decline of 23.3% relative to the unconditional mean. In Panel C, the negative relationship between CEO fWHR and cash holdings is shown to be even stronger than seen in Panels A and B. For industry-adjusted cash and short-term equivalents, the difference between high- and low-fWHR groups of -.0439 represents a decline of 30.3% relative to the unconditional mean. The correlations between cash holdings and facial width for long-term CEOs in Panel C are nearly twice as large as those observed in the full sample of CEOs in Panel A. Thus, it appears that CEO testosterone levels may have a strong influence on firm cash holdings, particularly since the effect is larger amongst CEOs who are likely to have greater influence on firm financial policies.

Results of multivariate regressions of CEO fWHR on firm cash holdings are presented in Table 4b. The framework for these tests is similar to that used in multivariate tests for leverage in Table 3b. Columns 1 and 4 contain regressors for only CEO fWHR along with industry and year

fixed effects. Columns 2 and 5 add controls for firm size, while Columns 3 and 6 add controls for capital expenditures, acquisitions, dividend payout, R&D expenditures, net working capital, and cash flow. In Panel A of Table 4b, the relationship between CEO fWHR and firm cash holdings is confirmed to be negative and statistically significant across all specifications. Results from Panel B indicate that the negative effect of CEO fWHR on firm cash levels is slightly larger across all regression specifications after removing post-turnover observations. Panel C shows that the strongest relationship between facial width and cash holdings is observed for long-term CEOs, as the coefficients for CEO fWHR are nearly twice as large in most cases in Panel C when compared to those in Panel A. The CEO fWHR coefficients are statistically significant for all models in Panels B and C. As a whole, the results from Tables 4a and 4b suggest that CEO testosterone levels play an important role in determining firm cash levels. The notion that the negative relationship between CEO fWHR and cash levels might be driven by managerial influence is supported by the observation that the relationship is stronger for more-influential CEOs.

4.3. CEO fWHR, Investment, and Profitability:

A univariate analysis of the relationship between CEO fWHR and firm investment is presented in Table 5a. 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 more aggressive. However, I find no meaningful relationship between CEO fWHR and three forms of investment. Table 5a compares investment activity for firms managed by high-fWHR CEOs against that of firms managed by low-fWHR CEOs. I examine capital expenditures, acquisitions, and R&D expenditures between fWHR groups, with both industry-adjusted and unadjusted measures. The sole statistically significant relationship between CEO fWHR and investment is observed for industry-adjusted capital expenditures in the full sample of CEOs. The difference in means of -.0022 means that high-fWHR managers invest an average of

4.5% less in capital expenditures relative to the unconditional mean than low-fWHR managers, statistically significant at the 10% level. However, the corresponding correlation coefficient suggests a positive relationship between CEO fWHR and capital expenditures which, though not statistically significant, suggests the observed difference in means may not be indicative of an overall negative trend between CEO fWHR and capital expenditures. Panels B and C repeat the procedures from Panel A for a subsample removed of post-transition observations and a subsample for long-term CEOs, respectively. No statistically significant relationships between CEO fWHR and investment are observed in either subsample. Table 5b presents the results of multivariate regressions analyzing the relationship between CEO fWHR and investment. All models contain industry and year fixed effects, as well as controls for firm size. In every model for each sample, the coefficients for CEO fWHR on investment are not statistically significant. Overall, there is little evidence of a clear relationship between CEO fWHR and investment levels.

Though 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 6a. Though high-fWHR CEOs demonstrate lower operating profitability than low-fWHR CEOs across all three subsamples, these differences are eliminated when considering industry-adjusted measures. Results of multivariate regressions of CEO fWHR on firm profitability, reported in Table 6b, indicate that there is not a clear relationship between CEO testosterone levels and firm profitability. All regressions in Table 6 include industry and year fixed effects, as well as controls for firm size. 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 overall relationship between CEO facial width and firm profitability, despite differences in some important financial policies.

4.4. Do Aggressive 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 8. For CEOs in the sample hired after 2002, I collect values of each financial measure for the two years before their tenure begins and relate these values to their fWHR measurements. If the relationship between CEO fWHR and financial policies are explained by sorting into certain firms, I would expect to see greater leverage and lower cash holdings for firms that subsequently hire high-fWHR CEOs. However, although high-fWHR CEOs are hired to firms with somewhat higher leverage than firms that choose low-fWHR CEOs, the difference between groups is not statistically significant for any leverage measure.

Furthermore, all coefficients for correlation between CEO fWHR and pre-tenure firm leverage are not statistically significant. Although there may be instances where particularly highly-leverage firms hire high-fWHR CEOs, there is little evidence of a consistent relationship between CEO fWHR and pre-tenure leverage. Pre-hire cash holdings and investment levels appear to be mostly unrelated to the facial width of subsequently-hired CEOs, though the negative correlation between pre-tenure R&D expenditures and new CEO fWHR is statistically significant at the 5% level. Firms that hire high-fWHR CEOs tend to be somewhat more profitable than those that select low-fWHR CEOs, but none of the correlation statistics or differences in means relating CEO fWHR to pre-tenure profitability are statistically significant.

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 some kind of sorting effect cannot be ruled out completely since only CEOs hired after 2002 are included in these tests, I find 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.

5. Conclusion

This paper is the first to document a relationship between CEO testosterone levels (proxied by facial width) and financial management decisions. 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.

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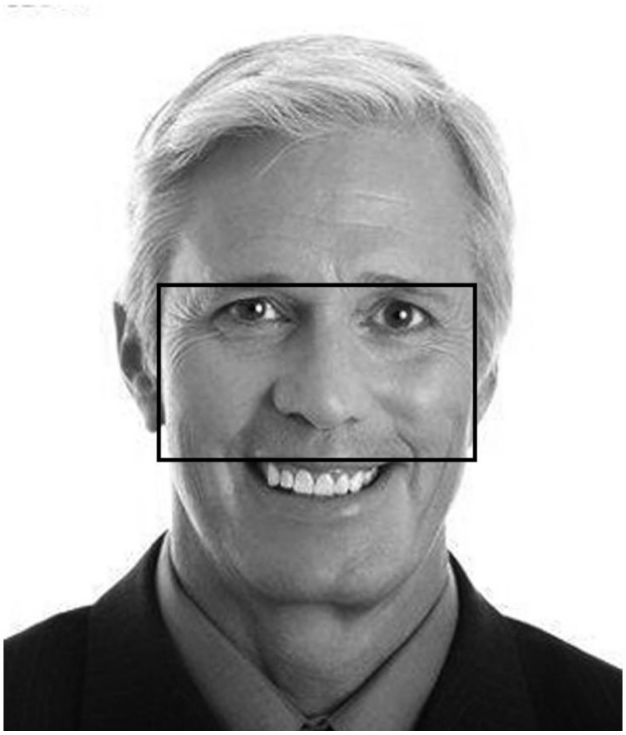

Figure 1
fWHR Measurement Example (fWHR=1.79)

Table 1
fWHR statistics

Statistics referenced are for male test subjects only.

Source	Subjects	N	Mean	Median	SD	Min	Max
Mills (2014)	CEOs	968	1.91	1.92	0.13	1.52	2.36
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	-	-

Table 2
Summary Statistics

fWHR sample consists of firms listed on S&P 500 during at least 3 years during 2002 to 2013. Data from U.S. Compustat firms is used to compute industry-adjusted measures. Firms with SIC codes between 4900-4999 (utilities) and 6000-6999 (financials) are excluded.

	fWHR Sample				All U.S. Compustat Firms			
	Mean	Median	SD	N	Mean	Median	SD	N
Book Leverage	0.237	0.216	0.180	4824	1.524	0.186	37.287	79969
Market Leverage	0.198	0.152	0.182	4766	0.220	0.120	0.258	72458
Cash-to-assets	0.104	0.077	0.096	4766	0.171	0.089	0.211	79753
Cash(& Short-Term Equiv.)-to-assets	0.145	0.094	0.147	4837	0.227	0.121	0.256	80233
CapEx-to-assets	0.049	0.035	0.047	4837	0.062	0.030	1.224	80242
Acquisitions-to-assets	0.025	0.001	0.062	4837	0.019	0.000	0.675	80242
R&D-to-assets	0.001	0.000	0.016	4837	0.005	0.000	0.488	80242
Return on assets	0.057	0.064	0.109	4837	-5.080	0.008	487.824	79883
Operating return on assets	0.155	0.148	0.087	4822	-2.107	0.081	97.358	79586
Control Variables								
Assets ($mil)	19010.3	6901.0	48636.9	4837	3327.9	165.4	18061.4	80765
CashFlow-to-assets	0.092	0.090	0.066	4610	-	-	-	-
NetWorkingCapital-to-assets	0.170	0.146	0.170	4678	-	-	-	-
R&D-to-sales	0.003	0.000	0.038	4837	-	-	-	-
Depreciation-to-assets	0.041	0.037	0.027	4822	-	-	-	-
Depreciation-to-sales	0.060	0.041	0.064	4822	-	-	-	-
Tangiability	0.516	0.411	0.363	4809	-	-	-	-

Table 3a
CEO fWHR and firm leverage

Industry-adjusted measures are based on Fama-French 12 industry classification. Long-term CEOs are those whose tenure with their firms is at least 8 years. Statistical significance for difference in means tests are derived from t-statistics (not reported).

	Correlation with CEO fWHR		High-fWHR CEOs (fWHR ≥ median)			Low-fWHR CEOs (fWHR < median)			Difference in means	
Panel A: Full Sample			Mean	SD	N	Mean	SD	N		
Book leverage	0.0276	*	0.2449	0.1749	2381	0.2290	0.1841	2443	0.0159	***
Market leverage	0.0393	***	0.2088	0.1871	2348	0.1872	0.1760	2418	0.0216	***
Book leverage (ind. adj.)	0.0494	***	0.0631	0.1749	2381	0.0416	0.1817	2443	0.0215	***
Market leverage (ind. adj.)	0.0578	***	0.0699	0.1797	2348	0.0429	0.1646	2418	0.0270	***
Panel B: Excluding CEOs' First 2 Years										
Book leverage	0.0318	**	0.2402	0.1698	1879	0.2290	0.1826	1947	0.0112	**
Market leverage	0.0434	***	0.2035	0.1838	1864	0.1844	0.1684	1938	0.0191	***
Book leverage (ind. adj.)	0.0517	***	0.0588	0.1713	1879	0.0424	0.1804	1947	0.0164	***
Market leverage (ind. adj.)	0.0603	***	0.0651	0.1781	1864	0.0412	0.1580	1938	0.0239	***
Panel C: Long-term CEOs										
Book leverage	0.0368	**	0.2304	0.1591	1398	0.2187	0.1750	1470	0.0117	*
Market leverage	0.0431	**	0.1915	0.1716	1387	0.1775	0.1627	1468	0.0140	**
Book leverage (ind. adj.)	0.0511	***	0.0458	0.1655	1398	0.0331	0.1684	1470	0.0127	**
Market leverage (ind. adj.)	0.0527	***	0.0512	0.1675	1387	0.0363	0.1501	1468	0.0149	**

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 3b
CEO fWHR and firm leverage, OLS results

All regressions include year fixed effects and industry dummies, defined according to the Fama-French 12-industry classification. Columns 3 and 6 include controls for profitability, asset tangibility, and depreciation. Regressions in Panel B exclude observations where a CEO is in the first two years of his tenure. Panel C includes only CEOs who acheive tenures of at least eight years at their firms. Robust standard errors are clustered at the firm level and reported in parentheses.

Panel A: Full Sample

	Book Leverage			Market Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO fWHR	0.0645 *	0.0610	0.0464	0.0815 **	0.0744 *	0.0534 *
	(0.0388)	(0.0384)	(0.0364)	(0.0387)	(0.0380)	(.0305)
log(assets)	-	0.0129 **	0.0117 **	-	0.0299 ***	0.0215 ***
		(0.0061)	(0.0059)		(0.0056)	(0.0052)
Other controls	[ ]	[ ]	[x]	[ ]	[ ]	[x]
Observations	4824	4824	4794	4766	4766	4736
R	0.1136	0.1203	0.1646	0.1655	0.1619	0.3883

Panel B: Excluding CEOs' First 2 Years

	Book Leverage			Market Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO fWHR	0.0631	0.0602	0.0440	0.0818 *	0.0752 *	0.0561
	(0.0446)	(0.0442)	(0.0420)	(0.0430)	(0.0421)	(0.0346)
log(assets)	-	0.0124 *	0.0109 *	-	0.0312 ***	0.0025 ***
		(0.0066)	(0.0062)		(0.0059)	(0.0055)
Other controls	[ ]	[ ]	[x]	[ ]	[ ]	[x]
Observations	3826	3826	3797	3802	3802	3773
R	0.1071	0.1136	0.1478	0.1760	0.2171	0.3790

Panel C: Long-term CEOs

	Book Leverage			Market Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO fWHR	0.0597	0.0529	0.0323	0.0666	0.0516	0.0439
	(0.0539)	(0.0533)	(0.0509)	(0.0553)	(0.0540)	(0.0443)
log(assets)	-	0.0137 *	0.0112	-	0.0317 ***	0.0223 ***
		(0.0075)	(0.0071)		(0.0068)	(0.0061)
Other controls	[ ]	[ ]	[x]	[ ]	[ ]	[x]
Observations	2868	2868	2841	2855	2855	2828
R	0.1075	0.1162	0.1454	0.1792	0.2261	0.3899

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 4a
CEO fWHR and firm cash holdings

Industry-adjusted measures are based on Fama-French 12 industry classification. Long-term CEOs are those whose tenure with their firms is at least 8 years. Statistical significance for difference in means tests are derived from t-statistics (not reported).

	Correlation with CEO fWHR	High-fWHR CEOs (fWHR ≥ median)			Low-fWHR CEOs (fWHR < median)			Difference in means
Panel A: Full Sample		Mean	SD	N	Mean	SD	N	
Cash-to-assets	-0.0535 ***	0.0984	0.0893	2348	0.1100	0.1024	2418	-0.0116 ***
Cash(& short-term equiv.)-to-assets	-0.0565 ***	0.1355	0.1398	2389	0.1551	0.1532	2448	-0.0196 ***
Cash-to-assets (ind. adj.)	-0.0835 ***	-0.0054	0.0885	2348	0.0123	0.0977	2418	-0.0177 ***
Cash(& short-term equiv.)-to-assets (ind. adj.)	-0.0940 ***	-0.0181	0.1373	2389	0.0120	0.1405	2448	-0.0301 ***
Panel B: Excluding CEOs' First 2 Years								
Cash-to-assets	-0.0746 ***	0.0986	0.0865	1851	0.1115	0.1036	1926	-0.0129 ***
Cash(& short-term equiv.)-to-assets	-0.0731 ***	0.1351	0.1402	1885	0.1580	0.1569	1950	-0.0229 ***
Cash-to-assets (ind. adj.)	-0.1063 ***	-0.0074	0.0862	1851	0.0135	0.0986	1926	-0.0209 ***
Cash(& short-term equiv.)-to-assets (ind. adj.)	-0.1145 ***	-0.0191	0.1372	1885	0.0147	0.1417	1950	-0.0338 ***
Panel C: Long-term CEOs								
Cash-to-assets	-0.1197 ***	0.0908	0.0846	1372	0.1131	0.1054	1456	-0.0223 ***
Cash(& short-term equiv.)-to-assets	-0.1206 ***	0.1295	0.1433	1400	0.1661	0.1647	1474	-0.0366 ***
Cash-to-assets (ind. adj.)	-0.1542 ***	-0.0091	0.0813	1372	0.0174	0.0974	1456	-0.0265 ***
Cash(& short-term equiv.)-to-assets (ind. adj.)	-0.1643 ***	-0.0187	0.1332	1400	0.0252	0.1436	1474	-0.0439 ***

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 4b
CEO fWHR and firm cash holdings, OLS results

All regressions include year fixed effects and industry dummies, defined according to the Fama-French 12-industry classification. Columns 3 and 6 include controls for capital expenditures, acquisitions, dividends, R&D-to-sales, cash flow, and net working capital. Regressions in Panel B exclude observations where a CEO is in the first two years of his tenure. Panel C includes only CEOs who acheive tenures of at least eight years at their firms. Robust standard errors are clustered at the firm level and reported in parentheses.

Panel A: Full Sample

	Cash-to-Assets			Cash (& short-term equiv.)-to-Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO fWHR	-0.0478 **	-0.0435 *	-0.0321 *	-0.0836 **	-0.0767 **	-0.0701 ***
	(0.0231)	(0.0224)	(0.0190)	(0.0328)	(0.0320)	(0.0255)
log(assets)	-	-0.0189 ***	-0.0066 ***	-	-0.0253 ***	0.0024
		(0.0023)	(0.0023)		(0.0040)	(0.0031)
Other controls	[ ]	[ ]	[x]	[ ]	[ ]	[x]
Observations	4766	4766	4415	4837	4837	4464
R	0.1895	0.2405	0.4128	0.3129	0.3519	0.6508

Panel B: Excluding CEOs' First 2 Years

	Cash-to-Assets			Cash (& short-term equiv.)-to-Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO fWHR	-0.0622 **	-0.0590 **	-0.0374 *	-0.1024 ***	-0.0965 ***	-0.0754 **
	(0.0271)	(0.0261)	(0.0219)	(0.0383)	(0.0373)	(0.0299)
log(assets)	-	-0.0195 ***	-0.0074 ***	-	-0.0256 ***	0.0016
		(0.0024)	(0.0023)		(0.0042)	(0.0032)
Other controls	[ ]	[ ]	[x]	[ ]	[ ]	[x]
Observations	3777	3777	3492	3835	3835	3530
R	0.1841	0.2386	0.4199	0.3209	0.3597	0.6677

Panel C: Long-term CEOs

	Cash-to-Assets			Cash (& short-term equiv.)-to-Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO fWHR	-0.0926 ***	-0.0850 ***	-0.0552 *	-0.1549 ***	-0.1424 ***	-0.0988 **
	(0.0339)	(0.0327)	(0.0282)	(0.0485)	(0.0473)	(0.0393)
log(assets)	-	-0.0182 ***	-0.0062 **	-	-0.0249 ***	0.0035
		(0.0029)	(0.0029)		(0.0052)	(0.0041)
Other controls	[ ]	[ ]	[x]	[ ]	[ ]	[x]
Observations	2828	2828	2608	2874	2874	2638
R	0.2159	0.2623	0.4358	0.3558	0.3893	0.6918

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 5a
CEO fWHR and firm investment

Industry-adjusted measures are based on Fama-French 12 industry classification. Long-term CEOs are those whose tenure with their firms is at least 8 years. Statistical significance for difference in means tests are derived from t-statistics (not reported).

	Correlation with CEO fWHR	High-fWHR CEOs (fWHR ≥ median)			Low-fWHR CEOs (fWHR < median)			Difference in means
Panel A: Full Sample		Mean	SD	N	Mean	SD	N	
CapEx-to-assets	-0.0010	0.0477	0.0451	2389	0.0495	0.0489	2448	-0.0018
Acquisitions-to-assets	0.0022	0.0251	0.0629	2389	0.0240	0.0602	2448	0.0011
R&D-to-assets	-0.0057	0.0012	0.0122	2389	0.0016	0.0193	2448	-0.0004
CapEx-to-assets (ind. adj.)	0.0055	0.0101	0.0369	2389	0.0123	0.0391	2448	-0.0022 *
Acquisitions-to-assets (ind. adj.)	0.0022	0.0251	0.0629	2389	0.0240	0.0602	2448	0.0011
R&D-to-assets (ind. adj.)	-0.0057	0.0012	0.0122	2389	0.0016	0.0193	2448	-0.0004
Panel B: Excluding CEOs' First 2 Years								
CapEx-to-assets	-0.0076	0.0483	0.0467	1885	0.0501	0.0501	1950	-0.0018
Acquisitions-to-assets	0.0030	0.0258	0.0639	1885	0.0250	0.0613	1950	0.0008
R&D-to-assets	-0.0052	0.0012	0.0130	1885	0.0018	0.0215	1950	-0.0006
CapEx-to-assets (ind. adj.)	0.0048	0.0103	0.0378	1885	0.0123	0.0392	1950	-0.0020
Acquisitions-to-assets (ind. adj.)	0.0030	0.0258	0.0639	1885	0.0250	0.0613	1950	0.0008
R&D-to-assets (ind. adj.)	-0.0052	0.0012	0.0130	1885	0.0018	0.0215	1950	-0.0006
Panel C: Long-term CEOs								
CapEx-to-assets	-0.0013	0.0506	0.0493	1400	0.0520	0.0544	1474	-0.0014
Acquisitions-to-assets	0.0050	0.0254	0.0599	1400	0.0259	0.0641	1474	-0.0005
R&D-to-assets	-0.0152	0.0010	0.0097	1400	0.0017	0.0192	1474	-0.0006
CapEx-to-assets (ind. adj.)	0.0168	0.0103	0.0393	1400	0.0124	0.0419	1474	-0.0021
Acquisitions-to-assets (ind. adj.)	0.0050	0.0254	0.0599	1400	0.0259	0.0641	1474	-0.0005
R&D-to-assets (ind. adj.)	-0.0152	0.0010	0.0097	1400	0.0017	0.0192	1474	-0.0006

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 5b
CEO fWHR and firm investment, OLS results

All regressions include controls for firm size, year fixed effects, and industry dummies, defined according to the Fama-French 12-industry classification. Regressions in Panel B exclude observations where a CEO is in the first two years of his tenure. Panel C includes only CEOs who acheive tenures of at least eight years at their firms. Robust standard errors are clustered at the firm level and reported in parentheses.

Panel A: Full Sample

	Capital Expenditures	Acquisitions	R&D
	(1)	(2)	(3)
CEO fWHR	0.0008	-0.0012	-0.0017
	(0.0116)	(0.0070)	(0.0017)
Observations	4837	4837	4837
R	0.3764	0.0340	0.0512

Panel B: Excluding CEOs' First 2 Years

	Capital Expenditures	Acquisitions	R&D
	(1)	(2)	(3)
CEO fWHR	0.0022	-0.0024	-0.0021
	(0.0138)	(0.0081)	(0.0021)
Observations	3835	3835	3835
R	0.3923	0.0357	0.0547

Panel C: Long-term CEOs

	Capital Expenditures	Acquisitions	R&D
	(1)	(2)	(3)
CEO fWHR	0.0076	0.0003	-0.0029
	(0.0182)	(0.0094)	(0.0023)
Observations	2874	2874	2874
R	0.4113	0.0371	0.0671

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 6a
CEO fWHR and firm performance

Industry-adjusted measures are based on Fama-French 12 industry classification. Long-term CEOs are those whose tenure with their firms is at least 8 years. Statistical significance for difference in means tests are derived from t-statistics (not reported).

	Correlation with CEO fWHR	High-fWHR CEOs (fWHR ≥ median)			Low-fWHR CEOs (fWHR < median)			Difference in means
Panel A: Full Sample		Mean	SD	N	Mean	SD	N	
ROA	-0.0218	0.0537	0.1135	2389	0.0610	0.1046	2448	-0.0073 **
Operating ROA	-0.0311 **	0.1510	0.0813	2376	0.1587	0.0922	2446	-0.0077 ***
ROA (ind. adj.)	-0.0023	0.0592	0.1328	2389	0.0602	0.1180	2448	-0.0010
Operating ROA (ind. adj.)	-0.0005	0.0833	0.1147	2376	0.0837	0.1116	2466	-0.0004
Panel B: Excluding CEOs' First 2 Years								
ROA	-0.0153	0.0579	0.1076	1885	0.0622	0.1014	1950	-0.0043
Operating ROA	-0.0267 *	0.1529	0.0808	1873	0.1600	0.0914	1948	-0.0071 **
ROA (ind. adj.)	0.0038	0.0626	0.1274	1885	0.0610	0.1149	1950	0.0016
Operating ROA (ind. adj.)	0.0037	0.0847	0.1139	1873	0.0847	0.1105	1948	0.0000
Panel C: Long-term CEOs								
ROA	0.0076	0.0636	0.0748	1400	0.0660	0.0977	1474	-0.0024
Operating ROA	-0.0006	0.1542	0.0776	1389	0.1606	0.0966	1472	-0.0064 *
ROA (ind. adj.)	0.0257	0.0672	0.1001	1400	0.0636	0.1107	1474	0.0036
Operating ROA (ind. adj.)	0.0202	0.0837	0.1103	1389	0.0841	0.1140	1472	-0.0004

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 6b
CEO fWHR and firm performance, OLS results

All regressions include controls for firm size, year fixed effects, and industry dummies, defined according to the Fama-French 12-industry classification. Regressions in Panel B exclude observations where a CEO is in the first two years of his tenure. Panel C includes only CEOs who acheive tenures of at least eight years at their firms. Robust standard errors are clustered at the firm level and reported in parentheses.

Panel A: Full Sample

	ROA	Operating ROA
	(1)	(2)
CEO fWHR	-0.0167	-0.0156
	(0.0179)	(0.0186)
Observations	4837	4822
R	0.0626	0.0983

Panel B: Excluding CEOs' First 2 Years

	ROA	Operating ROA
	(1)	(2)
CEO fWHR	-0.0119	-0.0128
	(0.0188)	(0.0202)
Observations	3835	3821
R	0.0609	0.1067

Panel C: Long-term CEOs

	ROA	Operating ROA
	(1)	(2)
CEO fWHR	0.0104	0.0094
	(0.0024)	(0.0257)
Observations	2874	2861
R	0.0794	0.1060

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *

Table 7
Financial characteristics prior to hiring new CEO

Data is collected for observations which fall in the two years prior to a firm hiring a new CEO. Industry-adjusted measures are based on Fama-French 12 industry classification. Statistical significance for difference in means tests are derived from t-statistics (not reported).

	Correlation with CEO fWHR	High-fWHR CEOs (fWHR ≥ median)			Low-fWHR CEOs (fWHR < median)			Difference in means
Leverage		Mean	SD	N	Mean	SD	N	
Book leverage	-0.0309	0.2383	0.1633	469	0.2330	0.2005	460	0.0053
Market leverage	-0.0373	0.2107	0.1924	462	0.2048	0.2093	451	0.0059
Book leverage (ind. adj.)	0.0021	0.0625	0.1597	469	0.0433	0.206	460	0.0192
Market leverage (ind. adj.)	-0.0140	0.0789	0.1807	462	0.0604	0.199	451	0.0185
Cash Holdings								
Cash-to-assets	0.0306	0.1023	0.1048	464	0.0972	0.0875	460	0.0051
Cash(& short-term equiv.)-to-assets	0.0236	0.1389	0.1517	469	0.1370	0.1350	463	0.0019
Cash-to-assets (ind. adj.)	0.0098	-0.0014	0.1048	464	0.0004	0.0854	460	-0.0018
Cash(& short-term equiv.)-to-assets (ind. adj.)	0.0027	-0.0171	0.1497	469	-0.0078	0.1319	463	-0.0094
Investment								
CapEx-to-assets	0.0222	0.0470	0.0478	469	0.0498	0.0417	463	-0.0028
Acquisitions-to-assets	-0.0141	0.0245	0.0719	469	0.0254	0.0745	463	-0.0009
R&D-to-assets	-0.0691 **	0.0009	0.0087	469	0.0022	0.0218	463	-0.0014
CapEx-to-assets (ind. adj.)	0.0005	0.0113	0.0354	469	0.0149	0.0366	463	-0.0036
Acquisitions-to-assets (ind. adj.)	-0.0141	0.0245	0.0719	469	0.0254	0.0745	463	-0.0009
R&D-to-assets (ind. adj.)	-0.0691 **	0.0009	0.0087	469	0.0022	0.0218	463	-0.0014
Profitability								
ROA	0.0400	0.0474	0.1314	469	0.0314	0.1792	463	0.0160
Operating ROA	0.0284	0.1468	0.0879	467	0.1473	0.088	463	-0.0005
ROA (ind. adj.)	0.0289	0.0547	0.1426	469	0.0372	0.1839	463	0.0175
Operating ROA (ind. adj.)	0.0165	0.0806	0.1124	467	0.0773	0.1098	463	0.0033

Significant at 1% level ***
Significant at 5% level **
Significant at 10% level *