

# CEO FACIAL MASCULINITY AND FIRM FINANCIAL OUTCOMES

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## Abstract

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In this paper, we explore relationships between CEO facial width, a proxy for testosterone levels during adolescence, and financial management decisions. Using methodology from prior research, we collect a sample of 968 S&P 500 CEO profiles and analyze them to determine the facial width-to-height ratio (fWHR). We expect that greater CEO facial width will be associated with riskier, more aggressive financial policies. We find that higher CEO facial width-to-height ratio (fWHR) is associated with more aggressive financial management decisions. Specifically, we 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. We 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. We show that high-fWHR CEOs tend to own a smaller fraction of their firms. This suggests an increased priority for more masculine CEOs on pursuing their own best interests (diversification in their personal portfolios) ahead of signaling alignment with shareholders, while the reverse is true for CEOs with lower fWHRs. The results are robust to the inclusion of industry and year fixed effects and firm-year controls. This paper adds to the literature that shows individual differences in CEOs, in this case, CEO masculinity, can predict differences in the financial managerial characteristics of firms and financial policies.

**Keywords:** Financial, Policies, Firm, CEO, Masculinity, Facial

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## 1. INTRODUCTION

A growing body of literature indicates that certain observable CEO characteristics, including age<sup>1</sup>, education<sup>2</sup>, gender<sup>3</sup>, overconfidence<sup>4</sup>, military

service<sup>5</sup>, and early-life experiences<sup>6</sup>, can have substantial impacts on corporate finance policies. In an effort to determine whether CEOs' testosterone levels might play a role in determining financial

<sup>1</sup> Yim (2013)

<sup>2</sup> Bertrand and Schoar (2003); Malmendier and Tate (2005)

<sup>3</sup> Huang and Kisgen (2013)

<sup>4</sup> Malmendier and Tate (2005, 2008); Malmendier, Tate, and Yan (2011)

<sup>5</sup> Malmendier et al. (2011); Benmelech and Frydman (2014)

<sup>6</sup> Graham and Narasimhan (2004); Malmendier et al. (2011)

management decisions, we 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, & Penke, 2013). As the majority of studies on the subject have concluded that high testosterone levels are associated with increased risk tolerance and aggression, we expect that greater CEO facial width will be associated with riskier, more aggressive financial policies. Across a sample of 968 S&P 500 CEOs, we find that firms managed by CEOs with higher fWHR 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 could sort into firms that already exhibit a propensity for aggressive financial policies. To examine whether the relationship between CEO fWHR and financial policies reflects managerial preferences, we construct two subsamples where CEOs might have greater influence on the financial policies of their firms. In the first subsample, we remove the first two years of firm-year observations following a new CEO being hired. We expect 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 their tenure, as CEOs will have had ample time to implement their desired financial policies by their third year. A second subsample is comprised of CEOs who achieve tenures of at least eight years with their firms during the sample period. These long-tenured CEOs are likely to be more influential figures in their firms than shorter-tenured CEOs, and the financial policies of their firms should more strongly reflect 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 we do not find any evidence of a relationship between fWHR of newly appointed CEOs and prior firm characteristics, it appears that association between CEO fWHR and firm financial policies may be a result of differences in managers' risk preferences.

We also examine the relationship between CEO fWHR 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 we do not find evidence of a significant relationship between CEO fWHR and the level or type of compensation received, we document that high-fWHR CEOs tend to own a smaller fraction of their firms compared to lower-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.

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 remaining structure of this paper is as follows. Section 2 reviews the relevant literature. Section 3 details the algorithm used to construct the dataset used in the analysis. Section 4 analyses the methodology used to test our hypotheses and elucidate the results. Section 5 offers some conclusions.

## 2. LITERATURE REVIEW

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 et al. (2013) show that males with greater facial width tend to have higher testosterone levels.

Carré and McCormick (2008) first suggested that testosterone could explain links between fWHR and certain behavioral traits. 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. Other subsequent studies also found support between facial width and aggressive and antisocial behavior related traits, see (Stirrat & Perrett, 2010; Özener, 2012; Haselhuhn & Wong, 2012; Tsujimura & Banissy, 2013; Hehman, Leitner, Deegan, & Gaertner, 2013; Goetz, Shattuck, Miller, Campbell, Lozoya, Weisfeld, & Carré, 2013).

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.

Looking at financial literature, facial width in CEOs has been examined in several studies. Wong, Ormiston, 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 Zeng (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. He, Yin, Zeng, Zhang, and Zhao (2019) looked at the correlation between facial structure and achievement drive for a large sample of male Chinese Financial Analysts. The research showed that high-fWHR analysts are more likely to exhibit better performance. The authors conclude that their results suggest that the fWHR has a direct correlation with achievement drive.

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, & Little, 2008; Stanton, Lienen, & Schultheiss, 2011; Stanton, Mullette-Gillman, McLaurin, Kuhn, LaBar, Platt, & Huettel, 2011; Sapienza, Zingales, & Maestripieri, 2009). Testosterone levels have also been linked to trading success in financial markets (Coates & Herbert, 2008). Recently, Ahmed, Sihvonen, and Vähämaa (2019) investigate CEO masculinity and bank risk-taking. They found banks led by CEOs with higher fWHR were more likely to choose stocks that were more volatile and had inherently more idiosyncratic risk.

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. Manning, Scutt, Wilson, and Lewis-Jones (1998) 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 & Hill, 2009; Manning & Taylor, 2001), aggression (Bailey & Hurd, 2005), and sensation seeking (Fink, Neave, Laughton, & 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, Mittrocker, Gunz, Schaefer, Bookstein, & Manning, 2005).

Coates, Gurnell, and Rustichini (2009) find that lower 2D:4D 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. 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.

Overall, prior research has suggested that

individuals with greater fWHR or lower 2D:4D positively correlates with higher levels of testosterone. This relationship has subsequently been used to suggest that individuals with higher fWHR or lower 2D:4D tend to be more aggressive, have higher risk tolerance, and demonstrate higher levels of risk-taking behavior that may not be aligned with firm value enhancing actions. As a result, we hypothesize that firms led by CEO's who exhibit higher fWHR will be associated with riskier and more aggressive financial policies.

### 3. DATA

To examine the relationship between CEO fWHR and firm financial policies, we match first CEO 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, we exclude firms with SIC codes within the ranges of 4900-4999 (regulated utilities) and 6000-6999 (financial firms). Execucomp provides the full name, gender, and age of each executive. Following previous studies relating fWHR to behavioral characteristics (Carré & McCormick, 2008; Carré et al., 2009; Wong et al., 2011; Leferve et al., 2013), the sample was restricted to male subjects. Our final data set consists of 510 firms and 7,087 firm-year observations.

We obtain images of each CEO through Google Image searches and selected in accordance with Carré 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 we were careful to ensure that all photos correctly identified their intended subjects when photos were obtained from other sources. We measure each CEO's fWHR 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, & Liò, 2007). The final data set includes fWHR measurements for 968 CEOs. Summary statistics are presented in Table 1.

**Table 1.** CEO and firm financial characteristics - summary statistics

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Median</i>	<i>Max</i>
CEO fWHR	968	1.91	0.13	1.52	1.92	2.36
Total Assets (\$mil)	7078	16547.2	43738.7	46.5	5821.9	797769
Market Leverage	6997	0.19	0.18	0.00	0.14	1.00
Cash & Short-term Investments	7077	0.14	0.15	0.00	0.08	0.92
Acquisitions	6421	0.03	0.06	-0.17	0.00	1.00
Capital Expenditures	7035	0.05	0.05	-0.03	0.04	0.46
R&D	6990	0.00	0.01	0.00	0.00	0.59
ROA	7078	0.06	0.14	-5.78	0.06	0.99
Operating ROA	7071	0.16	0.09	-0.60	0.15	0.97
Tangibility	6956	0.54	0.37	0.01	0.43	2.75
Depreciation	6986	0.04	0.03	0.00	0.04	0.78
Dividends	6975	0.02	0.04	0.00	0.01	1.27
Cash Flow	6986	0.10	0.13	-1.16	0.09	0.53
Pct. of Shares Owned (Excl. Options)	3656	2.89	6.59	0.00	0.33	72.30
Pct. of Shares Owned (As Reported)	2305	1.85	4.18	0.00	0.42	36.60

Note: Annual firm accounting data was obtained from Compustat. Compustat variable names are in parentheses. Market leverage is defined as long-term debt divided 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). Cash and short-term investments (che), capital expenditures (capx), acquisitions (aqc), depreciation (dp), and R&D (rd) are scaled by total assets (at). Return-on-assets (ni/at) and operating return-on-assets (ebitda/at) measure profitability. Cash flow is defined as operating profit (ebitda) minus interest expense (xint), income taxes (txt), and dividends (dvc), scaled by total assets. Asset tangibility is PP&E (ppegt) scaled by total assets. CEO share ownership data is from Execucomp.

## 4. RESULTS

### 4.1. CEO fWHR and firm leverage

We report regression results for the effect of CEO fWHR on firm leverage in Table 2. As stated before, our hypothesis is that higher fWHR in CEOs will be associated with more aggressive financial policies, and we find support for that hypothesis when examining the relationship between CEO fWHR and firm leverage.

The dependent variable across all models in Table 2 is market leverage. In Model 1, we regress market leverage on CEO fWHR, including a control for firm size and dummy variables for industry and year fixed effects. We add controls for profitability, asset tangibility, and depreciation in Model 2. We find that greater CEO facial width is associated with higher firm leverage, as the coefficient for CEO fWHR is positive and statistically significant at the 1% level in both models. In terms of economic magnitude, the difference in market leverage

between a firm managed by a CEO with fWHR in the 90th percentile and a firm managed by a CEO with fWHR in the 10th percentile would be predicted to be .0283 according to the coefficient from Model 2, which represents an increase of 14.8% relative to the sample mean. Increased firm size and asset tangibility are associated with higher leverage, while more profitable firms tend to have lower leverage.

While we hypothesize that this increase in leverage is due to higher risk tolerance in CEOs with greater fWHR, we also consider the possibility that the relationship observed between CEO fWHR and firm leverage could be a byproduct of high-fWHR CEOs being hired by firms with higher leverage, rather than high-fWHR CEOs implementing more aggressive capital structure policies for their firms once in charge. To examine whether the relationship between CEO fWHR and firm leverage observed in the full sample regressions might be a product of actual managerial influence, we look at the relationship between firm leverage and CEO fWHR in two subsamples.

**Table 2.** CEO fWHR and leverage – fixed effect regressions

	(1)	(2)	(3)	(4)
CEO fWHR	0.0915*** (0.0349)	0.0824*** (0.0299)	0.0783** (0.0334)	0.0965** (0.0400)
ln(Assets)	0.0330*** (0.00511)	0.0244*** (0.00456)	0.0242*** (0.00490)	0.0264*** (0.00549)
Operating ROA		-0.696*** (0.0667)	-0.671*** (0.0657)	-0.640*** (0.0781)
Tangibility		0.0913*** (0.0180)	0.0945*** (0.0188)	0.0757*** (0.0230)
Depreciation		0.136 (0.181)	0.0961 (0.165)	0.156 (0.291)
Constant	-0.295*** (0.0792)	-0.114 (0.0706)	-0.0962 (0.0780)	-0.170* (0.0878)
Observations	6,773	6,734	5,162	4,669
R-squared	0.226	0.356	0.359	0.356

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The dependent variable in these regressions is market leverage, defined as total long-term debt divided by market value. Models 1 and 2 include the full sample of CEOs. Model 3 excludes firm-year observations during the CEO's first two years. Model 4 includes only CEOs whose tenures reach 8 years or more during the sample period. All models include year and industry fixed effects. Industry fixed effects are based off the Fama-French 12-industry classification (financials and utilities excluded). Robust standard errors (reported in parentheses) are clustered by firm.

Model 3 of Table 2 examines the relationship between CEO fWHR and firm leverage for instances 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. Model 4 indicates that the positive relationship between CEO fWHR and firm leverage persists when examining only CEOs whose tenures extend to at

least 8 years during the sample period. This result also supports the managerial influence hypothesis, since longer-tenured CEOs should have greater influence on the financial policies of their firms.

### 4.2. CEO fWHR and cash holdings

Since greater facial width is associated with increased risk tolerance, we expect 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 3.** CEO fWHR and cash holdings – fixed effect regressions

	(1)	(2)	(3)	(4)
CEO fWHR	-0.0708** (0.0313)	-0.0571** (0.0276)	-0.0784** (0.0305)	-0.100*** (0.0356)
ln(Assets)	-0.0286*** (0.00393)	-0.0282*** (0.00393)	-0.0285*** (0.00419)	-0.0284*** (0.00469)
Capital Expenditures		-0.311*** (0.0751)	-0.332*** (0.0826)	-0.349*** (0.0894)
Acquisitions		-0.340*** (0.0328)	-0.376*** (0.0359)	-0.407*** (0.0443)
Dividends		0.204** (0.102)	0.146 (0.113)	0.116 (0.136)
R&D		0.183** (0.0760)	0.212** (0.0839)	0.288*** (0.0994)
Cash Flow		0.141* (0.0841)	0.142 (0.0989)	0.151 (0.112)
Constant	0.405*** (0.0699)	0.354*** (0.0661)	0.405*** (0.0728)	0.450*** (0.0840)
Observations	6,833	5,772	4,453	4,004
R-squared	0.358	0.376	0.390	0.413

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The dependent variable in these regressions is cash holdings, defined as cash and short-term investments scaled by total assets. Models 1 and 2 include the full sample of CEOs. Model 3 excludes firm-year observations during the CEO's first two years. Model 4 includes only CEOs whose tenures reach 8 years or more during the sample period. All models include year and industry fixed effects. Industry fixed effects are based off the Fama-French 12-industry classification (financials and utilities excluded). Robust standard errors (reported in parentheses) are clustered by firm.

Results of multivariate regressions of firm cash holdings on CEO fWHR are presented in Table 3. In Model 1, we regress cash holdings levels (cash and short-term investments divided by total assets) on CEO fWHR along with industry and year dummies. Model 2 adds controls for capital expenditures, acquisitions, dividend payout, R&D expenditures, and cash flow. In both models, the coefficient for CEO fWHR is negative and significant at the 5% level, indicating that greater fWHR predicts lower cash holdings levels.

Using the coefficient from Model 2, the difference in cash holdings between a firm managed by a CEO with fWHR in the 90th percentile and a firm managed by a CEO with fWHR in the 10th percentile would be predicted to be .0196, a decrease of 14.2% relative to the sample mean. Firm size and investment in capital expenditures and acquisitions are negatively related to cash holdings levels, while increases in dividend payout, R&D expenditures, and cash flow generally exhibit a positive effect on cash holdings.

To better assess whether the relationship between CEO fWHR and firm liquidity is a product of managerial choice, Model 3 uses a sample in which post-turnover observations are removed. Model 4 examines the relationship between CEO fWHR and cash holdings for a subsample consisting of CEOs whose tenures reached at least 8 years during the sample period. In both models, the coefficient for fWHR is negative and statistically significant, at the 5% level in Model 3 and at the 1% level in Model 4. Using the coefficient from Model 4 for longer-tenured CEOs, the difference in cash holdings

between CEOs at the 10th and 90th fWHR percentiles would be .0344, a decrease of 24.9%. These results continue to support the notion that high-fWHR CEOs choose to hold less cash than their low-fWHR counterparts, even well into their tenures.

#### 4.3. Which firms hire high-fWHR CEOs?

We have two possible explanations for the observed relationship between CEO fWHR and firm financial policies. One is that high-fWHR CEOs have higher risk tolerance and therefore pursue riskier financial policies, such as higher leverage and lower cash holdings. That we see more aggressive financial policies 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 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, which 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 result of the CEO selection process and not necessarily a product of managers choosing policies that reflect their risk preferences.

**Table 4.** Pre-existing firm financial characteristics and fWHR of new CEOs – OLS regressions

	(1)	(2)	(3)	(4)	(5)
(Assets)	0.0020 (0.0043)				0.0017 (0.0047)
Market Leverage		-0.0237 (0.0323)			-0.0479 (0.0359)
Cash & Short-term Investments			-0.0179 (0.0417)		-0.0638 (0.0480)
ROA				-0.0240 (0.0436)	-0.0596 (0.0504)
Constant	1.896*** (0.0384)	1.917*** (0.0060)	1.914*** (0.0055)	1.917*** (0.00500)	1.906*** (0.0413)
Observations	595	545	586	587	544
R-squared	0.0004	0.0010	0.0003	0.0005	0.0058

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The dependent variable in these regressions is fWHR of newly-hired CEOs. Regressors for market leverage, cash & short-term investments, and return on assets are averages of the two years prior to a new CEO being hired. These regressors are also industry-adjusted and scaled by total assets. Standard errors are reported in parentheses.

We investigate the relationship between firm financial policies and facial width of subsequently hired CEOs in Table 4. The fWHR of newly hired CEOs is regressed on the firm size prior to their first year, as well as lagged and industry-adjusted values for market leverage, cash & short-term investments, and ROA. We do not find a significant relationship between CEO fWHR and the pre-existing financial characteristics of the firms that hire them.

We also conducted two-stage instrument variable regressions to examine possible endogeneity between CEO fWHR and pre-existing firm financial characteristics, since our concern is that some firms may have a natural propensity for financial risk that does not vary significantly over time and which could be related to both financial policies and CEO selection. The independent variables (excluding CEO fWHR) from Tables 2 and 3, respectively, were used as instruments for market leverage and cash holdings. While we do not report the results of these regressions, postestimation tests did not indicate the presence of endogeneity in the relationship between CEO fWHR and pre-existing firm financial characteristics, while the coefficients for the instrumented variables were statistically insignificant in the second stage regressions.

Although we cannot rule out entirely the contributing influence of a sorting effect, we find more evidence that managerial influence explains

the observed relationships between CEO fWHR and firm financial policies.

#### 4.4. CEO fWHR and firm ownership

Several competing factors influence the amount of equity that CEOs choose to hold of the firms they manage. Holding large equity stakes in their firms signals that CEOs are confident in the prospects of their firms and that their incentives are aligned with shareholders' incentives. However, a CEO's wealth will tend to be disproportionately affected by the financial outcomes of his firm. An adverse change to the value of his firm is likely to have disproportionately large effect on his personal net worth. If the firm performs poorly, the CEO can be fired and experience a significant negative shock to his wealth as a result. Since CEOs' relative overinvestment in the outcomes of their firms causes their investment portfolios to be under-diversified, CEOs 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 signaling and diversification motivations regarding firm ownership are in conflict, CEOs may vary in the weight that they assign to each one, with some choosing to hold substantially larger stakes in their firms than others.

**Table 5.** CEO fWHR and firm ownership – fixed effect regressions

	(1)	(2)	(3)	(4)
	Percentage of Total Shares Owned – As Reported		Percentage of Total Shares Owned – Options Excluded	
CEO fWHR	-2.972* (1.791)	-2.391*** (0.819)	-5.767** (2.654)	-2.716 (1.841)
ln(Assets)	0.338 (0.280)	-0.515 (0.685)	0.883* (0.464)	-0.164 (0.433)
Constant	5.813* (3.237)	11.10** (4.971)	19.99*** (5.356)	12.68** (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

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

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

The relationship between CEO fWHR and firm ownership is documented in Table 5. While we do not find evidence that fWHR predicts either the type or level of compensation across our sample of CEOs,

regression results in Table 5 show that higher CEO fWHR is associated with a significantly smaller ownership share of their firms compared to CEOs with lower fWHR. In Models 1 and 2, the metric for

firm ownership includes CEOs' stock options, while stock options are excluded from firm ownership totals in Models 3 and 4. Models 1 and 3 include industry 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. Our interpretation of this result is that higher fWHR CEOs place relatively more importance on acting in their own best interests by reducing their exposure to the idiosyncratic risk of their firms, while CEOs with lower fWHR place relatively more emphasis on signaling alignment with shareholders at the expense of reduced diversification in their personal portfolios.

## 5. CONCLUSION

In this paper, we explore relationships between CEO facial width, a proxy for testosterone levels during adolescence, and financial management decisions. We find that higher CEO facial width-to-height ratio fWHR is associated with more aggressive financial policies. Specifically, we 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. We 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.

These policies, such as higher leverage and lower cash holdings, could lead the firm to experience difficulties managing regular or unforeseen operational expenses, thus jeopardizing independent firm viability or longevity. Companies that are economically cyclical and/or consumer preference dependent should consider not only CEO

experience as a potential variable in their choice of leadership, but should also consider potential inherent psychological traits that may be present in CEO's who exhibit higher fWHR. These additional psychological traits may open the firm up to potential negative volatility. Boards that choose CEOs who exhibit higher fWHR should be diligent in their corporate governance practices to monitor CEO performance and actions making sure targeted financial variables such as leverage, etc. are maintained in the level that the board feels is optimal. Additionally, monitored compliance to industry specific or federal regulations, such as SOX, will be paramount. Requiring a higher level of firm ownership as tied to executive compensation could mitigate the adverse agency effects that could potentially exist.

Although we find that facial width does not predict the level or type of compensation received by CEOs, we show that high-fWHR CEOs tend to own a smaller fraction of their firms. This suggests an increased priority for more masculine CEOs on pursuing their own best interests (diversification in their personal portfolios) ahead of signaling alignment with shareholders, while the reverse is true for CEOs with lower fWHRs. This result is robust to the inclusion of industry and firm fixed effects.

Overall, we find evidence that suggests 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. These results are largely consistent with previous findings relating facial width in males to an assortment of behavioral tendencies. This paper 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, we show that a CEO masculinity is another factor that can influence firm financial policies.

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