KRISHNAN NAIR

Strengthening Corporate Leadership Research

The Relevance of Biological Explanations

Strengthening Corporate Leadership Research: The relevance of biological explanations

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Versterken van onderzoek naar bedrijfsleiderschap:
De relevantie van biologische verklaringen

Thesis

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Preface

I am overcome with various emotions as this PhD journey comes to a close. I wouldn't be where I am today if not for the guidance, counsel, and support of those around me.

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Chapter 1. Introduction

Researchers have long been interested in understanding how corporate executives, who sit at the helm of the modern firm, shape the firm's culture, strategy, and ultimately, its performance (Finkelstein, Hambrick, and Cannella, 2009). While there have been longstanding debates regarding the exact magnitude of executive influence on firm outcomes (Beatty and Zajac, 1987), growing evidence suggests that managerial effects on performance are significant (e.g., Bertrand and Schoar, 2003; Hambrick and Quigley, 2014; Mackey, 2008) and have been increasing over the last several decades (Quigley, Crossland, and Campbell, 2017; Quigley and Hambrick, 2015). Accordingly, a large stream of research has examined the effect of executive characteristics on firm strategy and performance; and on how executives are evaluated by stakeholders such as the board of directors, financial analysts, and journalists (for reviews, see Finkelstein, Hambrick, and Canella, 2009 and Westphal and Zajac, 2013).

Although this large body of literature on corporate leadership is diverse in many dimensions, the studies in this area typically

share an underlying (if implicit) belief that social forces are the primary driver of cognition and behavior. In Hambrick and Mason's (1984) influential early conceptualization of upper echelons theory, the actions of corporate executives are rooted in personalized interpretations of their environment that are formed from personal experiences and socialization processes. It therefore follows that observable sociodemographic variables would be viewed as useful proxies for the actual psychological processes shaping executive behavior. Consistent with this notion, upper echelons scholars have found that executive characteristics such as age, education, functional background, and social class background are predictive of firm strategy and corporate outcomes (Finkelstein et al., 2009). The behavioral theory of corporate governance formalized by Westphal and Zajac (2013) similarly stresses the importance of socialization and personal experience in shaping behavior, while also highlighting the importance of social context. In this vein, behavioral governance scholars have demonstrated that the institutions, networks, and social relationships in which individuals are embedded play an important role in shaping both executive actions and stakeholder evaluations of those actions (Westphal and Zajac, 2013).

1.1 Formidability signals in the executive realm

While acknowledging the relevance of these social factors, I suggest that there is the potential to substantially advance our understanding of executive behavior by considering a very different perspective; namely, one that is rooted in biological rather than social forces. Indeed, recent years have witnessed a burgeoning body of research that uses an evolutionary biology perspective to examine leadership-relevant behaviors, perceptions, and outcomes, showing (among other things) that they are significantly a function of biological signals of fighting ability, known as formidability signals.

Although such signals, which are present in the voice, face, and body of individuals (Sell et al., 2009a; Sell et al., 2010), may at first appear relevant only in humanity's more primitive, distant past, evidence suggests that their evolutionary significance continues to influence decision-making in the modern context. Indeed, very recent research has argued that possessing formidability signals is associated with a variety of tendencies, including aggressiveness, deceptiveness, uncooperativeness, proneness to anger, and social dominance orientation; and furthermore, that naive evaluators tend to associate formidability signals with these tendencies (e.g., Carré

et al., 2009; Deska, Loyd, and Hugenberg, 2017; Geniole, MacDonell, and McCormick, 2017; Haselhun et al., 2014; Price et al., 2011; Sell et al., 2009b; Stirrat and Perrett, 2010). Additionally, recent research in the political realm has found that individuals who exude formidability are preferred as leaders, especially when evaluators perceive their environment to be highly threatening or competitive (e.g., Blaker and Van Vugt, 2014; Spisak et al., 2012; Tigue et al., 2012). As evidence of the potential significance of these biological signals in the executive realm, a study examining CEO facial width-to-height-ratio—an important formidability signal in the face—found that it was positively related to firm performance, and that this effect is strengthened when the CEO is heading a cognitively simple leadership team (Wong, Ormiston, and Haselhun, 2011).

While the recent studies mentioned above are tantalizing in suggesting that formidability signals may play an important role in shaping both executives' behavior and evaluators' assessment of executives, there is currently very little research that examines their effect in the corporate leadership context. I suggest that attention to explaining how and why formidability signals may influence

leadership-relevant behaviors and perceptions – based on principles from evolutionary biology – can complement corporate leadership research that is based on more social explanations. Accordingly, the three chapters in this dissertation shed greater light on the role of formidability signals in the executive realm.

1.2 Chapters

1.2.1 Chapter 2. Facial width-to-height ratio and behavioral tendencies

The study in Chapter 2 examines whether the facial width-to-height ratio (fWHR)—a formidability signal in the face—is predictive of behavioral tendencies in a sample of business executives. A large number of studies have found that high fWHR is predictive of antisocial behavior, and that naïve observers rate high fWHR individuals as being more antisocial (Anderl et al., 2016; Carré & Mccormick, 2008; Geniole et al., 2014; Geniole et al., 2015; Goetz et al., 2013; Haselhun & Wong, 2011; Stirrat & Perett, 2010). However, research examining the link between fWHR and behavior has been criticized for relying on small samples and for being mostly laboratory-based (Kosinski, 2017). Addressing these limitations, Kosinski (2017) examined the link between fWHR and antisocial

behavior using real-world data on self-reported behavioral tendencies for a large sample of participants and failed to find significant relationships. However, Kosinski's study suffers from its own important limitation, namely, a reliance on self-reported data, which may suffer from social desirability bias (Atkins & Woods, 2002). To address the limitations of both Kosinski's research, as well as other prior research, we utilize self- and other-reported ratings of behavioral tendencies for a large sample of executives. We were also able to avoid the problem of naïve raters, i.e., that naïve raters could be biased by the target's fWHR when making evaluations of behavioral tendencies, because the other-ratings we examine were provided by colleagues who reported knowing the focal executive well.

Over all, we find very little evidence for a link between fWHR and behavioral tendencies in our sample of executives. We argue that our results present the possibility of an evolutionary mismatch (Li Van Vugt & Colarelli, 2017), whereby fWHR may predict social perceptions, but not behavior. In other words, since the modern world differs markedly from the violent ancestral conditions in which human psychological mechanisms evolved, social evaluations

formed based on fWHR, which likely served an adaptive function in the evolutionary past, may no longer be accurate. Our results also indicate that research exploring the link between formidability signals and outcomes at the corporate level should focus on how these signals affect social perceptions rather than behavior.

1.2.2 Chapter 3. CEO vocal masculinity and CEO compensation

The study in Chapter 3 explores how CEO vocal masculinity—a formidability signal referring to the deepness of the CEO's voice—shapes the board's decisions on CEO compensation. A large stream of research in evolutionary psychology indicates that having a masculine voice is beneficial to individuals in leadership roles. However, how this plays out at the apex of the corporate hierarchy is not clearly understood. We contend that CEO vocal masculinity positively influences CEO compensation through two primary mechanisms—influencing directors' perception of CEO quality, and directors' perception of the CEO's willingness to retaliate against board members critical of CEO compensation. We identify these mechanisms by testing the effects of two moderating conditions that strengthen each of these mechanisms—industry competitiveness and CEO power. We also examine the moderating

effect of female directors on the compensation committee, arguing that a greater proportion of female directors on the compensation committee reduces the effect both the quality and the threat biases.

We conducted longitudinal analyses in a unique dataset consisting of CEO interviews and speeches for UK FTSE 100 firms from 2004 to 2013 and found support for our predictions. Our study offers three key contributions. First, we contribute to the corporate governance literature more broadly by introducing a novel evolutionary psychology perspective to study how CEO vocal masculinity influences CEO compensation. In particular, our examination of the boundary conditions that characterize the CEO vocal masculinity-CEO compensation relationship contributes to a non-deterministic understanding of how vocal masculinity influences governance outcomes. Second, we contribute to the executive compensation literature by examining the link between CEO vocal masculinity and directors' perceptions of threat as a mechanism by which CEO vocal masculinity influences CEO compensation. While past research has examined how the CEO's past behavior and the CEO's objective ability to retaliate affect formal evaluations issued by salient stakeholders such as financial analysts (Westphal &

Clement, 2008) and journalists (Westphal & Deephouse, 2011), prior research has not explored how seemingly trivial factors—such as the masculinity of the CEO's voice—could also have a similar affect. Third, our research contributes to the literature on gender diversity in the corporate elite. While some scholars have argued that gender differences play a significant role at the apex of the organization (Chen, Crossland, & Huang, 2016; Huang & Kisgen, 2013; Levi, Li, & Zhang, 2014), other scholars have argued that male and female corporate leaders differ greatly from their counterparts in the general population and are in fact, more similar to each other (Adams & Ragunathan, 2013; Bertrand & Hollock, 2001; *Economist*, 2015). By showing evidence that gender differences are important in explaining board decision-making, our results lend support to the view that gender differences matter even at the very top of the corporation.

1.2.3 Chapter 4. Board political ideology and the selection of masculine CEOs

The study in Chapter 4 explores whether the benefits that accrue to CEOs who possess formidability signals are contingent on differences in audience beliefs. Specifically, we study how directors' political ideologies, or in other words, their positions on the conservative-liberal spectrum, affect their preference for CEO

successors who possess more masculine faces and voices. Integrating research on evolutionary psychology, political ideology, and behavioral corporate governance, we argue that conservative directors are more threat sensitive than liberal directors, which will in turn shape their proclivity to pick masculine CEOs. We also examine whether the effect of political conservatism on the preference for masculine CEOs is amplified by contextual conditions that connote actual threat, specifically, poor firm performance and low industry munificence.

We tested our predictions using a sample of CEO succession events at S&P 1500 firms from 2007 to 2013 and found general support. Our study makes three major contributions. First, we contribute to the CEO succession literature by exploring a research question that is surprisingly understudied: Why do CEOs look the way they do? By illustrating that directors' political ideologies affect their leadership preferences, our study offers novel insight into the psychological process behind CEO selection decisions. Second, we contribute to the corporate diversity literature. While much of the existing research has focused almost exclusively on factors such as social class background, gender, and race as the basis of

preferential treatment for some executives over others, we add to this conversation by highlighting that differences in masculinity can affect outcomes even among those who are generally assumed to be the most privileged in the corporate world (white, upper-class, males). Third, we contribute to implicit leadership theory by arguing that susceptibility to specific leadership prototypes with deep evolutionary roots vary among individuals. While the importance of individual variation in evolutionary adaptations has been recognized since the time of Charles Darwin, this notion has only received limited attention in the leadership literature.

Chapter 2. A Case of Evolutionary Mismatch? Why Facial Width-to-Height Ratio May Not Predict Behavioral Tendencies

ABSTRACT

This study contributes to the growing literature linking physical characteristics and behavioral tendencies by addressing the current debate on whether a person's facial width-to-height ratio (fWHR) predicts antisocial tendencies. In particular, we avoid the social desirability bias that may result from the use of self-reports regarding behavioral tendencies, and instead capture behavioral tendencies that are both self- and other-rated. Our other-rated measures, drawn from a large sample of business executives, come from raters who reported knowing the focal individual well, thus also reducing the biased judgments that fWHR might trigger among naïve raters. With this improved research design, we find little evidence for a link between fWHR and antisocial tendencies, consistent with Kosinski's (2017) study. We discuss the implications of our robust findings as suggestive of a potential evolutionary mismatch.

2.1 Introduction

As part of the burgeoning body of evolutionary psychology research linking physical characteristics and behavioral tendencies, a consensus appeared to emerge suggesting that facial width-to-height ratio (fWHR) predicts a host of antisocial tendencies in males, including threat behavior (Geniole et al., 2015), deception and exploitation (Geniole et al., 2014; Haselhun & Wong, 2011; Stirrat & Perett, 2010), trait dominance (Carré & Mccormick, 2008), physical aggression (Goetz et al., 2013), and overall psychopathy (Anderl et al., 2016). An evolutionary explanation emphasizes that in violent ancestral environments, high fWHR males were more protected from fatal blows to the face and thus more likely to prevail in physical altercations (Stirrat, Stulp, & Pollet, 2012). This suggests further that high fWHR individuals were more effective ancestrally in garnering social influence through threat and intimidation, leading humans to develop psychological adaptations that calibrate antisocial tendencies to fWHR. Evidence showing the relevance of fWHR in shaping male behavior (but not female behavior) can be explained in

terms of males disproportionately representing both the perpetrators and victims of violent conflicts in cultures across time and space (Daly & Wilson, 1988). Researchers have also proposed that the relationship between fWHR and antisocial tendencies is mediated by testosterone (Carré & McCormick, 2008), but this prediction has only received mixed support (Bird et al., 2016; Lefevre et al., 2013).

Although various studies have reported a positive relationship between fWHR and antisocial tendencies, a recent large-scale study by Kosinski (2017) has called into question this growing consensus on the significance of fWHR. Kosinski's (2017) study is noteworthy insofar as it found very little evidence linking fWHR and self-reported behavioral tendencies (e.g., cooperativeness, militarism, trustworthiness, sympathy, and morality), and that little evidence was generally stronger for females than for males. What makes Kosinski's (2017) study particularly compelling is that his (non)findings were obtained using a large real-world sample, in contrast to prior work, which relied on a small number of participants, and was mostly laboratory-based. Indeed, Kosinski (2017) speculated that the frequency of marginally significant *p* values observed in prior published studies on fWHR and behavioral

tendencies may reflect degrees of freedom and “file drawer” problems.

2.2 Contribution

Kosinski’s (2017) contribution is undoubtedly important in both highlighting an alternative position on the relevance of fWHR for behavioral tendencies, and identifying specific limitations of prior research in this area. If there is little evidence supporting the notion that fWHR predicts behavioral tendencies, this would open the possibility of an evolutionary mismatch (Li Van Vugt & Colarelli, 2017), whereby fWHR may predict differences in social judgments of naïve evaluators (as found in prior research; Deska, Lloyd, & Hugenberg, 2017; Deska, Lloyd, & Hugenberg, 2018; Efferson & Vogt, 2013; Geniole et al., 2017; Lefevre & Lewis, 2014), but not behavioral tendencies. In other words, because the modern world differs in important ways from the violent ancestral environments in which human psychological mechanisms developed, naïve social judgments formed based on fWHR, which may have been adaptive in the evolutionary past, may no longer be accurate. However, we suggest that before advancing such a concept with confidence, it is

necessary to first address an additional important but under-examined limitation found in some of the studies examining the link between fWHR and behavioral tendencies (including Kosinski, 2017); namely, a reliance on self-reports with its attendant social desirability bias [cf. the discussion of Kosinski's (2017) results in Eisenbruch et al. (2017)]. Indeed, some researchers suggest that this bias can explain the persistently low or even negative correlation between self-reported vs. other-reported ratings of behavioral tendencies (Atkins & Woods, 2002).

Therefore, in this study, we seek to extend current understanding on the relevance of fWHR and behavioral tendencies by explicitly addressing the above-mentioned limitations in prior research, i.e., a reliance on small-sample sizes and/or self-reported data. Specifically, we offer a large-scale study on the association between fWHR and behavioral tendencies that employs both self- and other-rated measures in a sample of business executives. An additionally positive and original feature of our study is that we obtain our other-rated measures of behavioral tendencies from raters who reported knowing the focal individual well, thus reducing the potential problem associated with naïve raters, i.e., the possibility

that fWHR would bias the judgment of naïve raters (e.g., Efferson & Vogt, 2013; Geniole, MacDonell, & McCormick, 2017). Taken together, we see our study's use of a very large sample and other-reported ratings from non-naïve raters as providing the foundation for a clearer assessment of whether fWHR predicts antisocial tendencies or whether it may be an example of an evolutionary mismatch.

Furthermore, by relying on a sample of corporate leaders, our study also directly addresses the extent to which fWHR is relevant in predicting behavioral tendencies in the executive realm. If fWHR is indeed predictive of antisocial behavior among executives, this could have downstream consequences for firm strategy and outcomes.

2.3 Sample and Methods

2.3.1 Sample

The source of our data is the Center for Creative Leadership's (CCL) flagship executive development program. CCL is a non-profit organization headquartered in Greensboro, North Carolina that specializes in leadership training. The initial sample in this proprietary dataset consisted of 1,305 executives who participated in

a 360° feedback survey called the Campbell Leadership Index (CLI) from 2014 to 2017. Consistent with the 360° feedback approach, we were able to capture not only self-reported ratings, but also ratings from others who reported knowing the focal executives well (subordinates, peers, and supervisors). In terms of the self-reported data, the focal executives were surveyed at the start of the CCL leadership program. For the other-reported data, colleagues of the focal executives from the executives' firms were surveyed anonymously prior to the start of the program.

Our final sample, after accounting for missing pictures of the executives (n = 126) and averaging ratings within rater category for categories that included multiple raters per person (Atwater et al., 2009), totaled 1,179 executives (873 males and 306 females), consisting of 1,179 self-, peer-, subordinate-, and superior-ratings. The inter-rater reliability is acceptable (α = 0.72 for peer-ratings, α = 0.61 for subordinate-ratings, and α = 0.66 for superior-ratings).

2.3.2 Estimating fWHR

We ensured that the pictures of the executives that were collected were forward facing. Some of the facial images were slightly tilted to the right or left, which would have affected our fWHR

measurements. In order to correct for this, we rotated the pictures such that the eyes are on a horizontal plain. We then standardized the pictures to 8-bit gray scale images with a height of 400 pixels (Carré, McCormick, and Mondloch, 2009). Next, two research assistants independently measured the facial width (distance between the right and left zygion) and facial height (distance between the mid-brow and upper lip) of every executive using the NIH ImageJ software. FWHR was computed as facial width divided by facial height. Given that the reliability score was high (r = 0.90 for fWHR; r = 0.94 for both width and height), we averaged the scores between the two raters. We sought to further validate the results by measuring fWHR using the Facial Attributes function of Face++, an online artificial intelligence (AI) application (cf. Kosinski 2017) and found strong reliability between human raters and AI raters (0.81), giving us greater confidence in our fWHR measurements.

In terms of descriptive statistics, the mean of human-rated fWHR for males is 1.81 (CI = 1.81 ± 0.008) and for females is 1.70 (CI = 1.7 ± 0.013); whereas the mean of AI-rated fWHR for males is 1.90 (CI = 1.9 ± 0.009) and for females is 1.85 (CI = 1.85 ± 0.0134). This indicates that fWHR is sexually dimorphic in our sample.

2.3.3 Behavioral measures

From the 100 items in the CLI survey, we chose the 25 items that reflected anti/prosocial or (un)desirable behavioral tendencies. These 25 items and their descriptions are reported in the Appendix. To increase interpretability, we ran common factor analysis to extract latent variables from the 25 items. First, the common factor analysis indicated that there are only three factors with Eigenvalues more than 1. A number of items cross-loaded onto multiple factors. We dropped items with loadings that are less than 0.40 and obtained the most optimal model of the three factors. Based on prior research (Fiske et al., 2002; Goodwin, Piazza, and Rozin, 2013; Stavrova and Ehlebracht, 2016) we labeled these factors warmth (items: considerate, sensitive, affectionate, friendly, likeable, insensitive), cynicism (items: suspicious, cynical, temperamental, resentful, sarcastic), and morality (items: ethical, credible, candid, deceptive). The factor loadings are reported in Table 1 below. Table 2, which provides the correlations between self- and other-ratings on these three factors, shows that the correlation between different rater groups is low. This is consistent with our argument that self-reports and other reports are likely to differ.

2.4 Results

Table 3 shows the correlations between fWHR and the three factors (i.e., cynicism, morality, and warmth). We found that both human-rated (p=0.037) and AI-rated (p=0.016) fWHR is positively related to self-rated cynicism, but not to other-rated cynicism, in males. Additionally, we found that AI-rated fWHR is negatively correlated with superior-rated cynicism in females (p=0.048). All other correlations are insignificant. Table 4 shows the partial correlations between fWHR and the three factors after controlling for age, race, and whether the target individual was smiling in the picture. After including these controls, only one significant relationship remains. Whereas human-rated fWHR is positively related to cynicism in males (p=0.048), the significance of the positive relationship between AI-rated fWHR and cynicism in males fell just below the p<0.05 threshold (p=0.052). However, when we apply a more conservative test that adjusts for multiple comparisons (p< 0.05 divided by 24 within-gender comparisons), we fail to find any significant bivariate or partial correlations (Table 5 and Table 6). Thus, our results—using self- and other-reported measures—shows

very little support for a link between fWHR and antisocial tendencies in males.

To assess the robustness of our results, we conducted two additional analyses. First, we conducted subsample analyses to assess whether fWHR would be more strongly related to the three factors when examining only individuals who have extreme fWHR values (below -1 standard deviation and above 1 standard deviation, a sample of 361 executives). We found that none of the correlations are significant except that for males, human-rated fWHR (p=0.018) and AI-rated fWHR (p=0.004) are positively correlated with self-rated cynicism (Table 7). After adjusting for multiple comparisons like the analysis we conducted for our main results (Table 8), none of the results remained significant. Second, we examined the correlations between fWHR and each of the original 25 CLI items (SOM) and failed to find consistent patterns of significance (Table 9). As with our main results, all significant results disappeared once the findings were adjusted for multiple comparisons (Table 10).

2.5 Discussion

We began by noting that while earlier research on the relevance of fWHR and antisocial tendencies suggested a positive relationship (e.g., Anderl et al., 2016; Carré & Mccormick, 2008; Goetz et al., 2013; Haselhun & Wong, 2011; Stirrat & Perett, 2010), Kosinski's (2017) important study, which avoided some limitations of prior work, found little evidence supporting this relationship. In our study, we sought to advance this emerging debate by extending Kosinski (2017) and other work in several important ways. Specifically, we conducted a large-scale study on the relationship between fWHR and behavioral tendencies, but without the exclusive reliance on self-reported data (and its attendant social desirability bias). Our survey data was provided by focal individuals *and* by other non-naïve evaluators, i.e., they knew the focal individuals well. With this improved research design, we found, similar to Kosinski (2017), very little evidence supporting a presumed positive relationship between fWHR and antisocial tendencies.

We interpret our finding as more consistent with the notion of an evolutionary mismatch, whereby fWHR, once reliably tied to antisocial tendencies in ancestral environments where violence was

far more pervasive, may no longer be predictive of these tendencies in modern environments, leading to biased perceptions (Li Van Vugt & Colarelli, 2017). Indeed, we suggest that the lack of a reliable link between fWHR and behavior does not necessarily mean that fWHR is unrelated to social judgments. Existing research has found that fWHR is positively related to a number of antisocial perceptions, including aggressiveness (Lefevre & Lewis, 2014), deceptiveness (Efferson & Vogt, 2013), proneness to anger (Deska, Lloyd, & Hugenberg, 2017), threat potential (Geniole et al., 2017), and ascriptions of inhumanity (Deska, Lloyd, & Hugenberg, 2018). We welcome future research that further refines our understanding of how and why physical characteristics, such as fWHR, may differentially affect focal-actor behaviors versus social perceptions. Such an endeavor will increase our understanding of not only our evolved psyche, but also why immutable physical characteristics may shape social outcomes, even when they are not predictive of behavior.

Finally, our findings also contribute to corporate leadership research by suggesting that formidability signals (such as fWHR) are unlikely to be predictive of executive behavior. Our results suggest

that if formidability signals do indeed affect corporate outcomes, this will likely be due to the biasing effect of formidability signals on observer judgments, rather than through a direct link between an individual's fWHR and his or her behavior.

2.6 Limitations

While our findings appear robust, we also want to acknowledge two caveats. First, our results could be affected by the ceiling and reference-group effects because the business executives in our sample may differ systematically on both fWHR (Alrajih and Ward, 2014) and antisocial tendencies (Babiak, Neumann, and Hare, 2010) compared to the general population. Although the mean fWHR for males and females in our sample is similar to the general population (e.g., Alrajih and Ward, 2014; Kosinski, 2017), we cannot rule out the possibility that the executives in our sample are more antisocial (Babiak, Neumann, and Hare, 2010). This is a limitation with regard to generalizing our findings to the general population but utilizing an executive sample has allowed us to more definitively address whether the link between fWHR and behavior holds for corporate leaders. Second, since our data was collected in the

context of occupational training, it is possible that respondents could have been hesitant to portray their colleagues in a negative light. While we cannot entirely rule out this possibility, the leadership training program attempted to reduce this bias by making the ratings completely anonymous, and by making it clear to the raters that only scores aggregated across all raters will be disclosed to individual participants. We welcome future research that extends our work to consider these issues.

2.7 Tables

2.7.1 Table 1. Common factor analysis of selected Campbell leadership items with uniqueness score and variance explained

Variable	Warmth	Cynicism	Morality	Unique-ness
Sensitive (Highly aware of the feelings of others)	0.756			0.339
Considerate (Thoughtful of the needs and feelings of others)	0.754			0.292
Affectionate (Acts close, warm, and caring toward others)	0.727			0.424
Friendly (Warm and pleasant, nice to be around)	0.710			0.265
Likeable (Easy to feel friendly toward)	0.669			0.298
Insensitive (Unaware of the feelings of others)	-0.645			0.393
Suspicious (Inclined to distrust others)		0.630		0.441
Temperamental (Moody, irritable, and overly sensitive)		0.603		0.493
Cynical (Doubts the goodness of others)		0.597		0.494
Resentful (Feels injured, insulted, or exploited)		0.580		0.559
Sarcastic (Makes cutting remarks belittling others)		0.570		0.517
Credible (Worthy of trust, believable)			0.679	0.372
Candid (Open and honest when dealing with others)			0.560	0.539
Ethical (Lives within society's standards of right and wrong)			0.519	0.632
Deceptive (Conceals the truth for selfish reasons)			-0.560	0.493
Percentage of Variance Explained	*50.87%*	*31.53%*	*24.23%*	

Note. Only factor loadings above 0.40 are reported. Items were rotated using Varimax rotation.

2.7.2 Table 2. Correlations between self, peer, subordinate and superior reported scores on the three Campbell Leadership Index factors (N=1,179)

		Peer				Self				Sub			
				95% CI				95% CI				95% CI	
		r	*p*	*Lower*	*Upper*	*r*	*P*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	**Peer**	-	-	-	-								
	Self	0.284	0.000***	0.231	0.336	-	-	-	-				
	Sub	0.404	0.000***	0.355	0.451	0.264	0.000***	0.210	0.316	-	-	-	-
	Sup	0.370	0.000***	0.319	0.418	0.188	0.000***	0.133	0.243	0.279	0.000***	0.226	0.331
Morality	**Peer**	-	-	-	-								
	Self	0.131	0.000***	0.074	0.187	-	-	-	-				
	Sub	0.324	0.000***	0.272	0.374	0.197	0.000***	0.141	0.252	-	-	-	-
	Sup	0.303	0.000***	0.250	0.354	0.123	0.000***	0.066	0.179	0.253	0.000***	0.199	0.306
Warmth	**Peer**	-	-	-	-								
	Self	0.424	0.000***	0.376	0.470	-	-	-	-				
	Sub	0.494	0.000***	0.449	0.536	0.374	0.000***	0.324	0.422	-	-	-	-
	Sup	0.465	0.000***	0.419	0.508	0.279	0.000***	0.227	0.329	0.401	0.000***	0.352	0.448

Note. * for $p<0.05$, ** for $p<0.01$, *** for $p<0.001$

2.7.3 Table 3. Correlation between FWHR and CLI factors

fWHR Rater (Human)		Male (N = 873)				Female (N = 306)			
				95% CI				95% CI	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	**Peer**	-0.029	0.386	-0.037	0.096	0.025	0.659	-0.087	0.137
	Self	-0.071	0.037*	-0.004	0.136	-0.046	0.426	-0.157	0.067
	Sub	-0.008	0.807	-0.075	0.058	-0.073	0.202	-0.184	0.039
	Sup	-0.018	0.602	-0.049	0.084	-0.029	0.612	-0.141	0.083
Morality	**Peer**	-0.018	0.594	-0.084	0.048	0.032	0.575	-0.08	0.144
	Self	-0.002	0.947	-0.069	0.064	-0.011	0.851	-0.123	0.101
	Sub	0.03	0.378	-0.037	0.096	0.028	0.624	-0.14	0.084
	Sup	0.047	0.162	-0.019	0.113	0.05	0.386	-0.063	0.161
Warmth	**Peer**	-0.01	0.763	-0.077	0.056	0.025	0.662	-0.087	0.137
	Self	0.01	0.776	-0.057	0.076	0.037	0.524	-0.076	0.148
	Sub	0.01	0.76	-0.056	0.077	0.034	0.554	-0.078	0.146
	Sup	0.021	0.528	-0.045	0.088	0.014	0.809	-0.126	0.098
fWHR Rater (AI)		**Male (N = 873)**				**Female (N = 306)**			
				95% CI				95% CI	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	**Peer**	-0.023	0.505	-0.089	0.044	-0.01	0.867	-0.122	0.103
	Self	-0.081	0.016*	-0.015	0.147	-0.004	0.94	-0.116	0.108
	Sub	-0.035	0.305	-0.101	0.032	-0.083	0.148	-0.193	0.03
	Sup	-0.013	0.711	-0.079	0.054	-0.113	0.048*	-0.223	-0.001
Morality	**Peer**	0.037	0.271	-0.103		0.001	0.992	-0.113	

				0.029				0.112	
	Self			-				-	
		0.021	0.544	0.046	0.087	0.058	0.315	0.055	0.169
	Sub			-				-	
		0.012	0.723	0.054	0.078	0.03	0.604	0.083	0.141
	Sup			-				-	
		0.055	0.103	0.011	0.121	0.064	0.267	0.049	0.175
Warmth	**Peer**			-				-	
		0.031	0.362	0.036	0.097	0.052	0.367	0.061	0.163
	Self			-					
		0.003	0.919	0.063	0.07	0.063	0.274	-0.05	0.174
	Sub	-							
		0.004	0.909	-0.07	0.062	0.102	0.073	-0.01	0.212
	Sup			-				-	
		0.044	0.192	0.022	0.11	0.089	0.122	0.024	0.199

Note. * for $p<0.05$, ** for $p<0.01$, *** for $p<0.001$

2.7.4 Table 4. Partial correlations between fWHR and CLI factors with controls

fWHR Rater (Human)		**Male (N = 873)**				**Female (N = 306)**			
				95% CI				**95% CI**	
		r	*p*	***Lower***	***Upper***	***r***	***p***	***Lower***	***Upper***
Cynicism	**Peer**			-				-	
		0.046	0.176	0.021	0.112	0.030	0.603	0.083	0.142
	Self		0.048			-		-	
		0.067	*	0.001	0.133	0.036	0.530	0.148	0.076
	Sub			-		-		-	
		0.001	0.974	0.065	0.067	0.076	0.186	0.186	0.037
	Sup			-		-		-	
		0.029	0.398	0.038	0.095	0.021	0.711	0.133	0.091
Morality	**Peer**	-		-				-	
		0.034	0.321	0.100	0.033	0.020	0.731	0.093	0.132
	Self	-		-		-		-	
		0.010	0.774	0.076	0.057	0.019	0.738	0.131	0.093
	Sub			-		-		-	
		0.028	0.408	0.038	0.094	0.031	0.594	0.142	0.082
	Sup			-				-	
		0.033	0.330	0.033	0.099	0.045	0.435	0.068	0.156
Warmth	**Peer**	-		-				-	
		0.020	0.563	0.086	0.047	0.033	0.568	0.080	0.144

	Self	-0.009	0.788	-0.057	0.075	0.039	0.496	-0.073	0.150
	Sub	-0.010	0.769	-0.056	0.076	0.036	0.535	-0.077	0.147
	Sup	-0.018	0.596	-0.048	0.084	-0.012	0.832	-0.124	0.100
fWHR Rater (AI)		**Male (N = 873)**				**Female (N = 306)**			
				95% CI				**95% CI**	
		r	***p***	***Lower***	***Upper***	***r***	***p***	***Lower***	***Upper***
Cynicism	**Peer**	-0.001	0.984	-0.067	0.066	0.022	0.705	-0.091	0.134
	Self	-0.066	0.052	-0.001	0.132	0.005	0.925	-0.107	0.117
	Sub	-0.030	0.374	-0.096	0.036	-0.083	0.147	-0.193	0.029
	Sup	-0.004	0.897	-0.062	0.071	-0.092	0.109	-0.202	0.020
Morality	**Peer**	-0.027	0.418	-0.039	0.094	-0.011	0.842	-0.123	0.101
	Self	-0.014	0.682	-0.053	0.080	0.064	0.265	-0.049	0.175
	Sub	-0.023	0.501	-0.044	0.089	0.025	0.669	-0.088	0.136
	Sup	-0.038	0.258	-0.028	0.104	0.043	0.449	-0.069	0.155
Warmth	**Peer**	-0.017	0.618	-0.050	0.083	0.062	0.283	-0.051	0.172
	Self	-0.001	0.984	-0.066	0.067	0.057	0.323	-0.056	0.168
	Sub	-0.006	0.852	-0.073	0.060	0.096	0.095	-0.017	0.206
	Sup	-0.039	0.252	-0.028	0.105	0.081	0.156	-0.031	0.192

Note. * for $p<0.05$, ** for $p<0.01$, *** for $p<0.001$; fWHR and CLI factors are obtained by regressing facial expression, age and race and then getting the residuals.

2.7.5 Table 5. Correlation between fWHR and CLI factors by fWHR-rater, gender and CLI-rater adjusting for multiple comparison

fWHR Rater (Human)		Male (N = 873)				Female (N = 306)			
				95% CI				*95% CI*	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	Peer	0.029	0.386	-0.037	0.096	0.025	0.659	-0.087	0.137
	Self	0.071	0.037	0.004	0.136	-0.046	0.426	-0.157	0.067
	Sub	-0.008	0.807	-0.075	0.058	-0.073	0.202	-0.184	0.039
	Sup	0.018	0.602	-0.049	0.084	-0.029	0.612	-0.141	0.083
Morality	Peer	-0.018	0.594	-0.084	0.048	0.032	0.575	-0.080	0.144
	Self	-0.002	0.947	-0.069	0.064	-0.011	0.851	-0.123	0.101
	Sub	0.030	0.378	-0.037	0.096	-0.028	0.624	-0.140	0.084
	Sup	0.047	0.162	-0.019	0.113	0.050	0.386	-0.063	0.161
Warmth	Peer	-0.01	0.763	-0.077	0.056	0.025	0.662	-0.087	0.137
	Self	0.010	0.776	-0.057	0.076	0.037	0.524	-0.076	0.148
	Sub	0.010	0.760	-0.056	0.077	0.034	0.554	-0.078	0.146
	Sup	0.021	0.528	-0.045	0.088	-0.014	0.809	-0.126	0.098

fWHR Rater (AI)		Male (N = 873)				Female (N = 306)			
				95% CI				*95% CI*	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	Peer	-0.023	0.505	-0.089	0.044	-0.010	0.867	-0.122	0.103
	Self	0.081	0.016	0.015	0.147	-0.004	0.940	-0.116	0.108
	Sub	-0.035	0.305	-0.101	0.032	-0.083	0.148	-0.193	0.030
	Sup	-0.013	0.711	-0.079	0.054	-0.113	0.048	-0.223	-0.001
Morality	Peer	0.037	0.271	-	0.103	0.001	0.992	-	0.113

				0.029				0.112	
	Self	0.021	0.544	-0.046	0.087	0.058	0.315	-0.055	0.169
	Sub	0.012	0.723	-0.054	0.078	0.030	0.604	-0.083	0.141
	Sup	0.055	0.103	-0.011	0.121	0.064	0.267	-0.049	0.175
Warmth	Peer	0.031	0.362	-0.036	0.097	0.052	0.367	-0.061	0.163
	Self	0.003	0.919	-0.063	0.070	0.063	0.274	-0.050	0.174
	Sub	-0.004	0.909	-0.070	0.062	0.102	0.073	-0.010	0.212
	Sup	0.044	0.192	-0.022	0.110	0.089	0.122	-0.024	0.199

Note. Correlations significant at the $p < 0.002$ level (0.05/24) are given * since the *p*-values were adjusted for multiple comparisons. For the correlations table unadjusted for multiple comparisons, refer to Table 3 in manuscript.

2.7.6 Table 6. Partial correlation between fWHR and CLI factors by fWHR rater, gender and CLI-rater controlling for smiling, age and race adjusted for multiple comparison

fWHR Rater (Human)		Male (N = 873)				Female (N = 306)			
				95% CI				*95% CI*	
		r	*p*	*Lower r*	*Upper r*	*r*	*p*	*Lower r*	*Upper r*
Cynicism	Peer-rated	0.046	0.176	-0.021	0.112	0.030	0.603	-0.083	0.142
	Self-rated	0.067	0.048	0.001	0.133	-0.036	0.530	-0.148	0.076
	Sub-rated	0.001	0.974	-0.065	0.067	-0.076	0.186	-0.186	0.037
	Sup-rated	0.029	0.398	-0.038	0.095	-0.021	0.711	-0.133	0.091
Morality	Peer-rated	-0.034	0.321	-0.100	0.033	0.020	0.731	-0.093	0.132
	Self-rated	-0.010	0.774	-0.076	0.057	-0.019	0.738	-0.131	0.093
	Sub-rated	0.028	0.408	-0.038	0.094	-0.031	0.594	-0.142	0.082
	Sup-rated	0.033	0.330	-0.033	0.099	0.045	0.435	-0.068	0.156

Warmth	Peer-rated	-0.020	0.563	-0.086	0.047	0.033	0.568	-0.080	0.144
	Self-rated	0.009	0.788	-0.057	0.075	0.039	0.496	-0.073	0.150
	Sub-rated	0.010	0.769	-0.056	0.076	0.036	0.535	-0.077	0.147
	Sup-rated	0.018	0.596	-0.048	0.084	-0.012	0.832	-0.124	0.100

fWHR Rater (AI)		Male (N = 873)				Female (N = 306)			
				95% CI				*95% CI*	
		r	*p*	*Lower r*	*Upper r*	*r*	*p*	*Lower r*	*Upper r*
Cynicism	Peer-rated	-0.001	0.984	-0.067	0.066	0.022	0.705	-0.091	0.134
	Self-rated	0.066	0.052	-0.001	0.132	0.005	0.925	-0.107	0.117
	Sub-rated	-0.030	0.374	-0.096	0.036	-0.083	0.147	-0.193	0.029
	Sup-rated	0.004	0.897	-0.062	0.071	-0.092	0.109	-0.202	0.020
Morality	Peer-rated	0.027	0.418	-0.039	0.094	-0.011	0.842	-0.123	0.101
	Self-rated	0.014	0.682	-0.053	0.080	0.064	0.265	-0.049	0.175
	Sub-rated	0.023	0.501	-0.044	0.089	0.025	0.669	-0.088	0.136
	Sup-rated	0.038	0.258	-0.028	0.104	0.043	0.449	-0.069	0.155
Warmth	Peer-rated	0.017	0.618	-0.050	0.083	0.062	0.283	-0.051	0.172
	Self-rated	0.001	0.984	-0.066	0.067	0.057	0.323	-0.056	0.168
	Sub-rated	-0.006	0.852	-0.073	0.060	0.096	0.095	-0.017	0.206
	Sup-rated	0.039	0.252	-0.028	0.105	0.081	0.156	-0.031	0.192

Note. Partial correlations significant at the $p < 0.002$ level (0.05/24) are given * since the *p*-values were adjusted for multiple comparisons. For the table unadjusted for multiple comparisons, refer to Table 4 in manuscript.

2.7.7 Table 7. Correlation between fWHR and CLI factors by fWHR-rater, gender, and CLI-rater for people with high (+1 SD) vs. low (-1 SD) fWHR not adjusting for multiple comparison.

fWHR Rater (Human)		Male (N = 277)				Female (N = 98)			
				95% CI				*95% CI*	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	Peer	0.052	0.390	-0.066	0.169	-0.072	0.481	-0.267	0.128
	Self	0.142	0.018*	0.025	0.256	-0.164	0.107	-0.351	0.036
	Sub	0.010	0.870	-0.108	0.128	-0.192	0.058	-0.376	0.006
	Sup	0.062	0.306	-0.057	0.178	-0.097	0.342	-0.290	0.103
Morality	Peer	0.005	0.935	-0.113	0.123	0.034	0.737	-0.165	0.231
	Self	-0.036	0.548	-0.153	0.082	-0.035	0.733	-0.232	0.165
	Sub	0.008	0.890	-0.110	0.126	0.002	0.987	-0.197	0.200
	Sup	0.043	0.473	-0.075	0.160	0.155	0.127	-0.045	0.343
Warmth	Peer	-0.045	0.453	-0.162	0.073	-0.046	0.650	-0.243	0.153
	Self	-0.001	0.990	-0.119	0.117	0.087	0.392	-0.113	0.281
	Sub	-0.009	0.881	-0.127	0.109	0.090	0.379	-0.111	0.283
	Sup	0.065	0.279	-0.053	0.182	-0.052	0.611	-0.248	0.148

fWHR Rater (AI)		Male (N = 277)				Female (N = 98)			
				95% CI				*95% CI*	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	Peer	0.017	0.780	-0.101	0.134	-0.008	0.934	-0.206	0.190
	Self	0.172	0.004**	0.055	0.284	-0.025	0.807	-0.222	0.174
	Sub	0.020	0.741	-0.098	0.137	-0.148	0.146	-0.336	0.052
	Sup	0.075	0.212	-0.043	0.191	-0.143	0.159	-0.332	0.057
Morality	Peer	0.037	0.535	-0.081	0.155	0.006	0.951	-0.192	0.204
	Self	-0.029	0.635	-0.146	0.090	-0.008	0.939	-0.206	0.191
	Sub	0.026	0.670	-0.092	0.143	0.001	0.989	-0.197	0.200
	Sup	0.059	0.330	-0.060	0.175	0.119	0.242	-0.081	0.310
Warmth	Peer	0.013	0.831	-0.105	0.131	-0.044	0.665	-0.241	0.155
	Self	0.003	0.962	-0.115	0.121	0.094	0.359	-0.107	0.287
	Sub	-0.003	0.954	-0.121	0.114	0.113	0.269	-0.088	0.304
	Sup	0.109	0.070	-0.009	0.224	-0.073	0.476	-0.267	0.127

Note. * for p<0.05, ** for p<0.01, *** for p<0.001

2.7.8 Table 8. Correlation between fWHR and CLI factors by fWHR-rater, gender, and CLI-rater for people with high (+1 SD) vs. low (-1 SD) fWHR adjusting for multiple comparison.

fWHR Rater (Human)		Male (N = 277)				Female (N = 98)			
				95% CI				*95% CI*	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	Peer	0.052	0.390	-0.066	0.169	-0.072	0.481	-0.267	0.128
	Self	0.142	0.018	0.025	0.256	-0.164	0.107	-0.351	0.036
	Sub	0.010	0.870	-0.108	0.128	-0.192	0.058	-0.376	0.006
	Sup	0.062	0.306	-0.057	0.178	-0.097	0.342	-0.290	0.103
Morality	Peer	0.005	0.935	-0.113	0.123	0.034	0.737	-0.165	0.231
	Self	-0.036	0.548	-0.153	0.082	-0.035	0.733	-0.232	0.165
	Sub	0.008	0.890	-0.110	0.126	0.002	0.987	-0.197	0.200
	Sup	0.043	0.473	-0.075	0.160	0.155	0.127	-0.045	0.343
Warmth	Peer	-0.045	0.453	-0.162	0.073	-0.046	0.650	-0.243	0.153
	Self	-0.001	0.990	-0.119	0.117	0.087	0.392	-0.113	0.281
	Sub	-0.009	0.881	-0.127	0.109	0.090	0.379	-0.111	0.283
	Sup	0.065	0.279	-0.053	0.182	-0.052	0.611	-0.248	0.148

fWHR Rater (AI)		Male (N = 277)				Female (N = 98)			
				95% CI				95% CI	
		r	*p*	*Lower*	*Upper*	*r*	*p*	*Lower*	*Upper*
Cynicism	Peer	0.017	0.780	-0.101	0.134	-0.008	0.934	-0.206	0.190
	Self	0.172	0.004	0.055	0.284	-0.025	0.807	-0.222	0.174
	Sub	0.020	0.741	-0.098	0.137	-0.148	0.146	-0.336	0.052
	Sup	0.075	0.212	-0.043	0.191	-0.143	0.159	-0.332	0.057
Morality	Peer	0.037	0.535	-0.081	0.155	0.006	0.951	-0.192	0.204
	Self	-0.029	0.635	-0.146	0.090	-0.008	0.939	-0.206	0.191
	Sub	0.026	0.670	-0.092	0.143	0.001	0.989	-0.197	0.200
	Sup	0.059	0.330	-0.060	0.175	0.119	0.242	-0.081	0.310
Warmth	Peer	0.013	0.831	-0.105	0.131	-0.044	0.665	-0.241	0.155
	Self	0.003	0.962	-0.115	0.121	0.094	0.359	-0.107	0.287
	Sub	-0.003	0.954	-0.121	0.114	0.113	0.269	-0.088	0.304
	Sup	0.109	0.070	-0.009	0.224	-0.073	0.476	-0.267	0.127

Note. Partial correlations significant at the $p < 0.002$ level (0.05/24) are given * since the *p*-values were adjusted for multiple comparisons.

Chapter 3. It’s Not What You Say, but How You Sound: The Effect of CEO Vocal Masculinity on CEO Compensation Decisions Made by the Board

ABSTRACT

Growing research in evolutionary psychology suggests that having a deep, masculine voice provides benefits to individuals in leadership positions. However, how these effects play out at the top of organizations is not clearly understood. In this study, we examine how CEO vocal masculinity—the perceived deepness of the CEO’s voice—shapes board decisions on CEO compensation. We argue that CEO vocal masculinity influences CEO compensation through two channels—shaping director’s perceptions of CEO quality, and their perceptions of the CEO’s willingness to retaliate against critical directors. We identify these mechanisms by examining two moderating conditions—industry competitiveness, and CEO power—where each of these biases is especially strong. We also argue female representation on the compensation committee weakens the effect of both mechanisms. Longitudinal analyses on a unique data

set consisting of CEO interviews and speeches from publicly listed UK firms from 2004 to 2013 provides support for our predictions.

3.1 Introduction

“It is not what you say that matters but the manner in which you say it; there lies the secret of the ages.” - William Carlos Williams

Boards of directors are instrumental in monitoring, motivating, and ultimately compensating CEOs for their contributions to the firm’s success. Although these tasks require the careful analysis of information about the CEO, boards are often susceptible to the influence of cognitive biases. Existing research has found that CEO compensation is driven not only by economic determinants, but also by biases such as in-group favoritism (Westphal & Zajac, 1995; Zhu & Westphal, 2014), group polarization (Zhu, 2014), and social comparison bias (O’Reilly, Main, & Crystal, 1988).

Some biases that influence boards may have deep evolutionary origins. Vocal masculinity—the perceived deepness or lowness of an individual’s voice, is a biological signal of formidability (i.e., fighting ability) that evolved due to the pervasiveness of violent

conflicts over the course of human evolutionary history (Puts, Doll, and Hill, 2014). Since formidability was important ancestrally, both in predicting an individual's quality as a leader, and an individual's willingness to retaliate in conflicts, there are evolved biases that associate vocal masculinity with both of these attributes (Cheng & Tracy, 2014; Puts et al., 2014). Growing research in evolutionary psychology under controlled experimental conditions provides support for this notion (Klofstad, Anderson, & Peters, 2012; Puts, Gaulin, & Verdolini, 2006; Tigue et al., 2012).

The benefits of having a deep voice for business executives have begun to receive the attention of practitioners and the business press (*Economist*, 2014; Goman, 2013; Shellenbarger, 2013). However, there is very little scholarly research that examines these benefits (for an exception, see Mayew, Parsons, and Venkatachlam, 2013). More importantly, the lack of attention to boundary conditions that moderate these effects has fueled a deterministic view of these biases. For example, a recent *Economist* (2014) article that discussed the benefits of possessing vocal masculinity and other formidability signals in the corporate elite, failed to propose conditions that can strengthen or mitigate the effect of these biases,

and concluded that “we just accept that stereotypes and prejudices cannot be wished away”.

This misunderstanding is a manifestation of the widely-held view, common even among scholars (Confer et al., 2010; Markóczy & Goldberg, 1998; Winegard, Winegard, & Deaner, 2014), that if something is evolutionary in nature, then it is impervious to change (Buss, 2014: p. 16-17). This line of reasoning is referred to as the deterministic fallacy. Contrary to this perspective, research in evolutionary psychology indicates that evolved biases are context-dependent, and that there are systematic differences between individuals in their propensity towards specific evolved biases (Buss, 2014: p. 16-17; Haselton, Nettle, & Murray, 2015; Neuberg, Kenrick, & Schaller, 2010).

In this article, we examine the effect of CEO vocal masculinity on the board’s decision on CEO compensation, and the boundary conditions that characterize this relationship. Vocal masculinity is likely to be particularly important to how boards perceive the CEO because of how often directors are exposed to it. Whether directors are calling the CEO on the phone, meeting the CEO face to face, or

attending company meetings via conference calls, CEO vocal masculinity is observable to directors.

We argue that CEO vocal masculinity influences CEO compensation through two separate mechanisms—shaping directors' perceptions of CEO quality, and their perceptions of the CEO's willingness to retaliate against directors critical of CEO compensation. We identify these mechanisms by examining two moderating conditions—industry competitiveness, and CEO power—where each of these biases is especially strong. We also argue that female representation on the compensation committee weakens the effect of CEO vocal masculinity on CEO compensation by mitigating the effect of both the CEO quality bias, and the CEO threat bias. Longitudinal analyses on a data set consisting of CEO interviews and speeches from UK firms listed on the FTSE 100 from 2004 to 2013 provide support for our hypotheses.

Our study adds to the corporate governance literature by introducing a novel evolutionary psychology approach to examine the effect of CEO vocal masculinity on CEO compensation. By examining the role of industry competitiveness, CEO power, and female representation on the compensation committee, in

moderating the positive effect of CEO vocal masculinity on CEO compensation, our research contributes to a non-deterministic account of how vocal masculinity influence outcomes in the governance context.

Our research is also notable for studying the association directors perceive between CEO vocal masculinity and the CEO's willingness to retaliate as a mechanism by which CEO vocal masculinity influences CEO compensation. Although scholars have argued that past threatening actions by the CEO, and the CEO's objective ability to retaliate, are important in shaping formal evaluations of the CEO by stakeholders such as financial analysts (Westphal & Clement, 2008) and journalists (Westphal & Deephouse, 2011), existing research has not examined how seemingly trivial factors—such as CEO vocal masculinity—could also play a similar role.

By examining the effect of female representation on the compensation committee in weakening the CEO vocal masculinity-CEO compensation relationship, we also contribute to an important debate in the gender diversity literature. Some scholars have argued that the increasing representation of female directors on boards will

have an effect on board decision-making (Chen, Crossland, & Huang, 2016; Huang & Kisgen, 2013; Levi, Li, & Zhang, 2014). Others have argued that since the type of males and females who rise to the top of the corporate leadership rank are different from their counterparts in the general population and more similar to each other, gender differences are unlikely to play an important role (Adams & Ragunathan, 2013; Bertrand & Hollock, 2001; *Economist*, 2015). Our arguments built on evolutionary reasoning support the perspective that gender differences are important in shaping board outcomes.

3.2 Theory and Hypotheses

Directors face two major challenges during the CEO compensation-setting process. First, the evaluation of CEO quality is often challenging. Although firm performance is the most widely used gage of CEO quality (Finkelstein, Hambrick, & Cannella, 2009; Meindl, Ehrlich, & Dukerich, 1985), it is difficult to determine whether firm performance is driven by the CEO's actions or by factors largely outside the CEO's control. These factors may include decisions made by the previous CEO (Graffin, Boivie, & Carpenter, 2013),

fluctuations in the industry environment (Holmstrom, 1982), and contributions of other top managers (Boeker, 1992).

Second, directors may be hesitant to criticize CEO compensation because of the potential for retaliation from the CEO. In spite of the board's legal authority over the CEO, CEOs often hold great power over boards, influencing director reappointment (Westphal & Zajac, 1995; Zhu & Westphal, 2014), director compensation (Bebchuk & Fried, 2004; Fiss, 2006), and the likelihood of directors attaining external board positions (Westphal & Stern, 2006; Westphal & Stern, 2007). Since CEO compensation is a source of material wealth and social status for the CEO (DiPrete, Eirich, and Pittinsky, 2010; Kim, Kogut, and Yang, 2015), CEOs may retaliate against directors who question CEO compensation (Bebchuk and Fried, 2004; Hill and Phan, 1991).

Due to the challenges associated with evaluating CEO quality and assessing potential threat from the CEO, directors are especially susceptible to the influence of biases during the CEO compensation-setting process (Boivie, 2016). We will now examine how CEO vocal masculinity influences CEO compensation by shaping both directors'

perceptions of CEO quality, and their perceptions of the CEO's willingness to retaliate against critical directors.

3.2.1 Vocal masculinity

Evolutionary scientists have argued that due to the pervasive nature of violence over valued resources across evolutionary history (Manson and Wrangham, 1991; Puts, Bailey, and Philip, 2015), humans evolved the ability to assess the formidability of others on the basis of physiological signals (Petersen, 2015; Sell et al., 2009a; Sell et al., 2010). This ability provided humans with a survival and reproductive advantage by inducing individuals to engage in conflicts when the probability of success was relatively high, and to yield when the probability of failure was relatively high (Hammerstein and Parker, 1982; Petersen et al., 2013; Sell, Tooby and Cosmides, 2009b). Among the most important formidability signals is vocal masculinity (Puts et al., 2014; Sell et al., 2010).

Vocal masculinity provides information about formidability that is not easily deduced from visual cues in the body and the face (Sell et al., 2010). Furthermore, listeners across cultures can quickly and accurately assess the formidability of male speakers by listening to

only their voices, even when the speakers are speaking in a language that is unfamiliar to them (Sell et al., 2010).

3.2.2 Vocal masculinity, leadership quality, and willingness to retaliate

Formidability was important ancestrally in predicting both leadership quality and willingness to retaliate in conflicts. Thus, there are evolved biases that prompt listeners to link vocal masculinity with these traits. These biases are highly automated (Bargh & Chartrand, 1999) and operate largely beyond the realm of conscious experience (Cosmides & Tooby, 1994; Kahneman, 2003; Klofstad, Nowicki, & Anderson, 2016).

Due to the pervasiveness of violence in ancestral environments, it was beneficial to follow a formidable leader. Following a formidable leader provided a survival and reproductive advantage to individuals by discouraging challengers from approaching and increasing the probability of prevailing in conflicts. As a result, humans evolved a preference for leaders who display physiological characteristics that signal formidability, such as vocal masculinity (Murray, 2014; Van Vugt & Ronay, 2014). Consistent with this notion, experimental research in political psychology has found that individuals prefer leaders with deeper voices (Klofstad et

al., 2012; Tigue et al., 2012). The idea that formidability signals bias perceptions of leadership quality is also supported by studies examining the effect of other formidability signals such as facial masculinity (Spisak et al., 2012), musculature (Blaker & Van Vugt, 2014), and height (Blaker et al., 2013) on voter preferences.

Physical violence was the last resort for unresolved conflicts over evolutionary history (Barkow, 2014). Since individuals higher on formidability were more likely to prevail in conflicts, they also evolved a greater willingness to retaliate when their access to important resources were challenged (Petersen et al., 2013; Sell et al., 2009b). Consistent with this notion, existing research has found that more formidable individuals are more likely to espouse aggressive policies against enemies (Sell et al., 2009b; Sell et al., 2012), to become angry when negotiating with others (Sell et al., 2009b), and to be self-interested with regard to material wealth (Petersen et al., 2013). Given the recurrent nature of these patterns, listeners are influenced by vocal masculinity when assessing an individual's willingness to retaliate in conflicts (Laustsen, Peterson, & Klofstad, 2015).

3.2.3 CEO vocal masculinity and CEO compensation

We contend that CEO vocal masculinity will positively influence CEO compensation through two mechanisms: shaping directors' evaluations of CEO quality, and their assessment of the CEO's willingness to retaliate in response to criticism of CEO compensation. First, since evaluating CEO quality is difficult, directors are especially susceptible to evolved biases that associate deeper voices with CEO quality. Given their positive views of the quality of CEOs high on vocal masculinity, directors will support higher compensation for these CEOs.

Second, since CEO compensation is important to the CEO, providing the CEO with not only material wealth but also social status (DiPrete et al., 2010; Kim et al., 2015), biases that associate vocal masculinity with willingness to retaliate in conflicts will influence directors' decisions on whether to criticize CEO compensation. CEOs often have influence over director reappointment and the likelihood that directors gain directorships at other firms (Bebchuk & Fried, 2004; Westphal & Stern, 2006; Westphal & Stern, 2007). Thus, directors are likely to be dissuaded from criticizing the compensation of CEOs with deeper voices, whom

directors perceive to be more willing to retaliate in response to criticism of their compensation. Since open discussions of CEO compensation are one of the most important channels to lower CEO compensation (Zhu, 2014), CEOs with deeper voices are likely to receive greater pay. Thus,

Hypothesis 1*: CEO vocal masculinity is positively associated with CEO compensation.*

3.2.4 The moderating effect of industry competitiveness

In the prior section, we argued that one of the two mechanisms by which CEO vocal masculinity influences CEO compensation is by shaping perceptions of CEO quality. Here we examine how the positive effect of CEO vocal masculinity on CEO compensation through the quality perception mechanism is amplified by industry competitiveness.

Inter-group competition in ancestral environments was characterized by recurrent episodes of violence (Bowles, 2009; Puts et al., 2015). Since unlike in modern contexts, leaders fought directly in inter-group conflicts, often on the front lines (Van Vugt, 2006; Van Vugt and Ronay, 2014), the evolved tendency to associate deeper voices with leadership quality is likely to be stronger in contexts

characterized by greater competition. Existing research has found that individuals' preference for formidable leaders who possess physiological traits like vocal masculinity (Tigue et al., 2012), facial masculinity (Spisak et al., 2012), and musculature (Blaker & Van Vugt, 2014) is stronger for war-time leaders than peace-time leaders. Because evolved biases are tailored to the ancestral environment in which they evolved (Haselton *et al.*, 2015), and inter-group competition and physical violence went hand in hand in the evolutionary past (Puts et al., 2015), the preference for formidable leaders will strengthen even in the presence of competitive environments devoid of physical violence. Accordingly, we contend that as the competitiveness of the industry in which the firm operates increases, the association directors perceive between CEO vocal masculinity and CEO quality also strengthens. Thus,

Hypothesis 2*: Industry competitiveness strengthens the positive relationship between CEO vocal masculinity and CEO compensation.*

3.2.5 The moderating effect of CEO power

Earlier, we argued that the second mechanism by which CEO vocal masculinity influences CEO compensation is by shaping directors'

perceptions of the CEO's willingness to retaliate. Here, we examine how this mechanism is amplified by CEO power.

CEOs differ in their ability to retaliate as a function of CEO power (Bebchuk & Fried, 2004; Hambrick & Finkelstein, 1995). CEOs vary in in the number of years they have served in the firm, which increases their legitimacy (Simsek, 2007); in the proportion of directors appointed during their tenure, which increases the support they enjoy in the board (Wade, O'Reilly, & Chandratat, 1990); and in the number of external board positions they hold, which increases their influence in the corporate elite (Useem, 1984). Powerful CEOs can rely on the support of other directors to oust critical directors from the board (Bebchuk & Fried, 2004; Hill and Phan, 1991), and use their influence in the corporate elite to prevent these directors from being appointed to other boards (Westphal and Stern, 2006; Westphal and Stern, 2007).

Existing research has found that individuals systematically misperceive formidability signals depending on a target's social power. Specifically, individuals overestimate the size of more powerful others (Dannenmaier & Thumin, 1964; Wilson, 1968; Yap, Mason, & Ames, 2013). Formidability signals convey the target's

willingness to retaliate in non-violent conflicts (Cheng & Tracy, 2014; Petersen, 2015; Puts et al., 2015) and social power conveys the target's ability to inflict costs by retaliating. Thus, perceptual distortions in the salience of formidability signals as a function of the target's social power could serve to heighten the salience of the target's willingness to retaliate when the target's ability to inflict costs by retaliating increases (Haselton et al., 2015).

Similarly, we suggest that when CEO power is high, directors will be more attuned to CEO vocal masculinity as an indicator of the CEO's willingness to retaliate. Thus, CEO vocal masculinity will become more influential in deterring directors from criticizing CEO compensation as CEO power increases.

Hypothesis 3*: CEO power strengthens the positive relationship between CEO vocal masculinity and CEO compensation.*

3.2.6 The moderating effect of female representation on the compensation committee

In addition to contextual factors such as industry competitiveness and CEO power, the effect of CEO vocal masculinity on CEO compensation may also be influenced by attributes of the directors themselves. Specifically, we argue here that greater female representation on the compensation committee mitigates the effect

of CEO vocal masculinity on CEO compensation by reducing the effect of *both* the quality and the threat biases.

We focus on the compensation committee rather than the board at large for two reasons. First, the firm's compensation committee is tasked with aiding the board in setting CEO compensation (Landsberg, 2007; Main & Johnston, 1993). Second, female directors may be appointed to the board for symbolic reasons to appease stakeholder demands, and be barred from playing a more substantive role in board decision-making (Bilimoria, 2007; Fondas & Sassalos, 2000). For example, Bilimoria and Piderit (1994) found evidence that sex-based discrimination makes it more difficult for female directors to gain membership in important committees, such as the compensation committee. Thus, female directors who are appointed to the compensation committee are likely to play a more substantive role in compensation decisions than female directors who do not serve on the committee.

Physical violence was more influential in shaping the physical and psychological traits of men than women over evolutionary history (Bowles, 2009; McDonald, Navarrete, & Van Vugt, 2012; Neuberg & Schaller, 2016; Puts et al., 2015; Sell, Hone, & Pound,

2012). This contention is corroborated by both the discovery of sex differences in physiological and psychological traits that aid men in physical conflicts (McDonald et al., 2012; Puts et al., 2014; Sell et al., 2012) and from archeological and anthropological evidence that indicate that men make up the majority of perpetrators and victims of violence in cultures across time and space (Archer, 2004; Archer, 2009; Daly & Wilson, 1988; Daly & Wilson, 1990; Walker & Bailey, 2013; Whyte, 1978).

Accordingly, we expect female directors to be less influenced by biases related to formidability signals, such as vocal masculinity, than male directors are. First, the preference for vocal masculinity in leaders likely evolved as a result of the violent inter-group conflicts that characterized much of human evolutionary history. Since females were less likely to have been involved in violent inter-group conflicts than males (McDonald et al., 2012; Puts et al., 2015; Sell et al., 2012), they have a weaker preference for vocally masculine leaders. Consistent with this notion, an experimental study found that females are less likely to associate vocal masculinity with leadership quality than males (Klofstad et al., 2012). Second, since physical violence likely posed a greater threat to males than females

over evolutionary history, males are more attuned to vocal masculinity as an indicator of willingness to retaliate in conflicts than females. A number of studies have shown more generally that men are more influenced by biases related to threats from others than women (for a review, see McDonald et al., 2012). This pattern holds not only in situations where individuals may feel vulnerable to physical threats (Schaller, Park, & Mueller, 2003), but also in situations where there is no possibility of a physical confrontation (Navarrete et al., 2010; Van Vugt, De Cremer, & Janssen, 2007).

Based on these arguments, we suggest that female directors on the compensation committee are less influenced by CEO vocal masculinity when evaluating CEO quality, and when deciding whether to criticize CEO compensation. Thus, we expect that as the female representation on the compensation committee increases, the effect of CEO vocal masculinity on CEO compensation dampens.

Hypothesis 4*: The proportion of female directors on the compensation committee weakens the positive relationship between CEO vocal masculinity and CEO compensation.*

3.3 Methods

3.3.1 Data and sample

Our sample consists of UK firms appearing in the FTSE 100 index from 2004 to 2013. Due to the surging popularity of the internet over the past decade, this time frame is ideal for extracting CEO speech from online resources within the public domain. We focus only on male CEOs in this study because indicators of vocal masculinity are highly sexually differentiated (Puts et al., 2014; Wolff & Puts, 2010) and listeners are better at assessing the formidability of males than the formidability of females from voice recordings (Sell et al., 2010). Furthermore, as there were only five female CEOs in our initial sample, performing separate regression analyses on female CEOs was unfeasible. However, when we added the female CEOs to our analysis, the results remained largely unchanged.

Clips of CEO speech were manually gathered from company websites and the business press covering CEO interviews and speeches. The final sample consists of 169 male CEOs across 113 firms from 2004 to 2013, representing 69% of total firm-years in our original sample. We performed the Kolmogorov–Smirnov (K-S) test to compare included firm-years in our final sample with firm years

not included due to missing CEO speech data. The K-S test verifies if the distribution of variables of interest is statistically different between the chosen sample and overall population (Petrenko et al., 2015; Siegel & Castellan, 1988; Westphal & Bednar, 2005). We confirmed that firm performance, firm size, CEO tenure, and CEO age were not significantly different when compared to the original population.

To confirm the accuracy of our vocal masculinity measure, we collected additional voice data for CEOs in our sample (N=74) for whom audio clips of sufficient quality were available (the standards we used to determine whether an audio clip is acceptable are described below). Using the same methods for obtaining vocal masculinity described below, no significant differences in vocal masculinity (t-test of $p = 0.64$; $r = 0.69$) between different videos for the same CEO were observed, demonstrating the consistency of the method across different CEO speech clips.

CEO compensation and CEO board appointment data was gathered from the BoardEx executive database. Firm financial data was collected from Datastream. The other variables were hand-collected from annual reports.

3.3.2 Dependent variable

CEO total compensation. CEO total compensation is defined as the sum of CEO salary, bonus, long-term incentive plans, options, restricted stock grants, and miscellaneous forms of cash compensation for the respective year. This variable was log transformed since it was highly skewed. All explanatory, moderating, and control variables are lagged by one year, at time *t - 1*, relative to CEO pay, at time *t*.

3.3.3 Explanatory variable

CEO vocal masculinity. We chose to measure CEO vocal masculinity using formant dispersion, a commonly employed measure of vocal masculinity in the evolutionary psychology literature (Puts et al., 2006; Puts et al., 2014; Wolff & Puts, 2010). Formant dispersion refers to the average spacing, or "dispersion," between a speaker's formants and shapes perceptions of voice "deepness" or "lowness" (Puts et al., 2006). Formants measure the resonance quality of the speaker (Hodges-Simeon, Gaulin, & Puts, 2010; Puts et al., 2006) by capturing the frequencies at which a speaker's voice does not significantly vibrate, also referred to as low impedance. Since formant dispersion is inversely related to vocal masculinity (Puts et al., 2014), we reversed the sign of our formant

dispersion values to obtain our vocal masculinity measure. We standardized the measure to facilitate interpretation.

We use the log function of the audio program Praat 64-bit to measure the formant dispersion of 20-second segments of audio clips of CEO speech (Mayew et al., 2013; Puts, Apicella, & Cárdenas, 2011). In the Praat software, formants across a voice clip are returned as a set of four numbers denoting the resonance of a voice, labeled here as *F1*, *F2*, *F3*, and *F4* (González, 2004). The formula for formant dispersion, D_f, is $D_f = \sum_{i=1}^{n=4} \frac{(F_{i+1} - F_i)}{n-1}$, where *n* refers to the number of formant frequencies measured.

One of our main considerations when selecting our measure of vocal masculinity was to avoid reverse causality. If CEOs are aware that executives with deeper voices are paid more, they may try to deepen their voice in anticipation of higher compensation. Existing research suggests that this could be the case with fundamental frequency, a vocal masculinity indicator that individuals can deepen to some extent to garner greater influence in competitive situations (Puts et al., 2006) and group discussions (Cheng et al., 2016).

Formant dispersion, on the other hand, is very difficult for individuals to modulate. It is determined by the length of an individual's vocal tract (Fitch, 1997), with longer vocal tracts producing deeper voices with lower formant dispersion. Existing research has shown that formant dispersion is largely uninfluenced by age once an individual reaches adulthood (Evans, Neave, & Wakelin, 2006), by feelings of powerfulness or powerlessness (Ko, Sadler, & Galinsky, 2014; Puts et al., 2006), by emotion states (Williams & Stevens, 1972), and by voice coaching (Ko et al., 2014). For example, when the former British Prime Minister, Margaret Thatcher, underwent voice coaching in the 1970s to sound more authoritative, the formant dispersion of her voice remained the same while other characteristics of her voice, including her fundamental frequency, changed (Ko et al., 2014).

To minimize the effect of background noise on our formant dispersion measures, we set the pitch floor and pitch ceiling on the Praat software as 75 Hertz, and 300 Hertz, respectively. This prevents the processing of sounds that are outside the normal speaking range of adult male speakers (Puts et al., 2007). We also did not use any clips where the background noise falls within the

range of our pitch floor and pitch ceiling, as determined by examining readings from the unvoiced portions of the clips. To further ensure the accuracy of our voice data, two independent coders selected different 20-second intervals within a CEO audio clip and measured their formant dispersions. The Pearson correlation coefficient between the two raters' measures for formant dispersion is .9435 ($p < .001$), indicating high consistency. We took the average of these two measures to compute the formant dispersion for each CEO.

3.3.4 Moderating variables

Industry competitiveness. We operationalize industry competitiveness via the Lerner index of competition (Aghion et al., 2005; Bloom et al., 2012; Bloom, Kretschmer, and Van Reenen, 2011; Giroud and Mueller, 2010; Van Reenen, 2011). This was calculated as 1 minus the average profits divided by the average sales for each 3-digit SIC industry group (Bloom et al., 2012). In line with previous research (Bloom et al., 2012), we then took the 5-year rolling average of the Lerner index (e.g., for 2010, this would be the mean value from 2005 to 2009) and standardized the variable for the

regression models. Higher values mean that an industry is more competitive.

CEO power. Because the CEO's power over the board depends on a number of factors (Daily & Johnson, 1997; Finkelstein, 1992), composite measures have been increasingly utilized to measure CEO power (e.g. Coles, Daniel, and Naveen, 2008; Haynes & Hillman, 2010; Krause, Filatotchev, & Bruton, 2015; Sauerwald, Lin, & Peng, 2016; Zhang & Rajagopalan, 2003). Our study incorporates three commonly used indicators that influence directors' perceptions of the CEO's ability to retaliate against critical directors: (1) CEO tenure (Hill and Phan, 1991), (2) directors selected by the current CEO (Wade et al., 1990), and (3) CEO external board appointments (Fahlenbrach, Low, and Stulz, 2010). First, CEO tenure is measured as the number of years since the CEO started the position. Second, directors selected by the current CEO is calculated as the percentage of directors who joined after the current CEO's induction. Third, CEO external board appointments is measured as the CEO's number of current directorships at other corporate boards. The three components were standardized and then summed together. Since there was no theoretical reason to

single out a specific component as more important than another (Schmidt & Kaplan, 1971), the three components were weighed equally in the summation (Sauerwald et al., 2016).

Female compensation committee representation. We measured female compensation committee representation as the proportion of female directors on the firm's compensation committee (Zhang & Qu, 2015). The data used to compute this measure was manually gathered from annual reports.

3.3.5 Control variables

Firm performance. Firm performance was measured using return on assets, defined as a firm's net income divided by its total assets. Higher firm performance should increase CEO compensation to reward the CEO for an effective strategy and induce the CEO to stay with the firm.

Firm size. Firm size was measured as the log of total employees. Larger firms are more complex and the CEO's marginal contributions to firm value are more important, leading to higher CEO pay.

Board size. Larger boards often suffer from free riding and collective action problems (Dalton et al., 1999). Board size is

measured as the total number of directors who served on the board in any given year.

CEO age. Older CEOs may have higher personal wealth accumulated outside of the firm, which may affect CEO pay practices (Kalyta, 2009).

CEO elite status. CEO elite status is proxied by an indicator variable for whether or not the CEO attended Cambridge or Oxford for undergraduate education. CEOs who attended prestigious universities generally have higher prestige (Hayward, Rindova, & Pollock, 2004) and more social capital (Engelberg, Gao, & Parsons, 2012), which increases CEO pay (Belliveau, O'Reilly, & Wade, 1996; Fiss, 2006).

Blockholder ownership*.* Blockholders are able to overcome collective action problems and therefore are better able to monitor CEO pay (Hambrick & Finkelstein, 1995; Holderness, 2003). We define blockholders as shareholders holding at least 5 percent of shares outstanding (Thomsen, Pedersen, & Kvist, 2006). We summarize blockholder ownership as the cumulative proportion of shares held by blockholders.

Board independence. Board independence is an important control mechanism and may reduce CEO pay (Dalton et al., 1998). This variable was measured as the proportion of independent directors on the board.

Pay mix. CEO pay mix is the ratio of fixed compensation (salary and bonus) to total compensation for that respective year (Sauerwald et al., 2016). A lower pay mix often results in calls for increased total CEO compensation owing to increased compensation risk (Core, Holthausen, & Larcker, 1999). Year and industry controls are included in all models.

3.3.6 Analytical strategy

Selection-induced endogeneity may be a concern in our analysis if CEOs with deep voices are not randomly distributed across firms (Antonakis et al., 2010). This source of endogeneity arises if unobservable factors impacting whether the firm is headed by a CEO with a deep voice are also related to our dependent variable of CEO compensation. For instance, boards wishing their firms to pursue bold competitive actions (such as entering more competitive industries) could be more likely to appoint CEOs with deeper voices. These firms are also likely to pay their CEOs more.

To alleviate this issue, we followed Chatterjee and Hambrick (2007) and Malhotra et al.'s (2017) two-stage approach. In the first stage, we examined a number of factors that may influence the selection of CEOs with deeper voices. These include board size, board independence, firm ownership, firm performance, and industry competitiveness. We do not examine CEO-specific attributes in predicting CEO vocal masculinity because formant dispersion—our measure of vocal masculinity—is largely outside of the control of the CEO. Due to the identification problems that arise when all of the variables in the first stage selection equation are also in the second stage (Sartori, 2003), we included the proportion of female directors on the board's nomination committee as the exclusion restriction unique to the first-stage. We expect that female representation on the nomination committee will influence the vocal masculinity of the CEO heading the firm because of the importance of the nomination committee in CEO succession decisions, but we do not expect this variable to influence CEO compensation. The significant parameters from the first-stage (i.e., industry competitiveness and female representation on the nomination committee) were then used to estimate a predicted value of CEO vocal masculinity, which accounts

for the fact that some firms are more likely to be headed by CEOs with deeper voices (Chatterjee & Hambrick, 2007; Malhotra et al., 2017). This endogeneity control is then included in the second-stage model to control for possible selection-induced endogeneity**.**

In the second-stage CEO compensation model, our data precludes us from proceeding with a clustered ordinary least squares regression analysis. Ordinary least squares (OLS) is problematic for panel data analysis due to the unobserved heterogeneity in terms of within-firm and between-firm effects (Afuah, 2001). This can lead to three potential forms of bias: cross-sectional autocorrelation, heteroskedascticity, and serial autocorrelation (Sine, Haveman, & Tolbert, 2005). Firm-fixed effects panel models are often preferred, but fixed effects panel models are ineffective in estimating slowly-changing or time-invariant effects, which in our case includes *CEO vocal masculinity*. To accommodate these challenges, we adopt a generalized least square cross-sectional time series regression, thereby correcting for potential heteroskedasticity and modeling first-order autocorrelation in the error terms (Bednar, Love, & Kraatz, 2015; Zhang & Rajagopalan, 2010; Zhu & Chen, 2015). Cross-sectional time series analysis is

fitting for investigating longitudinal data with a continuous dependent variable (Bednar et al., 2015). This analytical method generates a matrix-weighted average of between-firm and within-firm effects (Afuah, 2001; Stata, 1999). It also allows for autocorrelation in the error terms, which efficiently estimates variables that vary over time (Bednar et al., 2015).

3.4 Results

Table 1 displays descriptive statistics and the correlation matrix for the variables used in this study. Model 1 in Table 1 displays the first-stage regression model used to account for the vocal masculinity of the CEO heading a given firm. Firms operating in more competitive industries ($p < 0.001$) and firms with a lower proportion of female directors serving on the nomination committee ($p < 0.05$) tend to be headed by CEOs with deeper voices.

Table 2 also presents the models used for the second-stage including the endogeneity control derived from the first-stage model. Model 2 shows our baseline model with only the control and moderating variables; the direction and statistical significance of these variables are largely as expected. Model 3 introduces our

main construct of *CEO vocal masculinity* (i.e., the standardized value of the negative of formant dispersion). Models 4, 5 and 6 include the interaction terms to evaluate our moderating hypotheses pertaining respectively to *industry competitiveness*, *CEO power*, and *female compensation committee representation*. Model 7 displays the full model with all interaction terms and moderators present.

Hypothesis 1 argues that CEOs with greater *CEO vocal masculinity* will receive higher compensation because directors associate CEO vocal masculinity with both CEO quality and with the CEO's willingness to retaliate against directors who criticize CEO compensation. We find support for Hypothesis 1, not only in Model 3 ($p < 0.001$), but also in every model thereafter (Model 4, $p < 0.001$; Model 5, $p < 0.001$; Model 6, $p < 0.001$; Model 7, $p < 0.001$). Based on Model 3, we also find that a one standard deviation increase in CEO vocal masculinity is associated with a 5.9 percent increase in total pay, indicating that the effect of CEO vocal masculinity on CEO compensation is economically significant.

Hypothesis 2 proposes that the relationship between CEO vocal masculinity and CEO compensation will be strengthened in firms that operate in more competitive industries. Since inter-group

competition over evolutionary history was characterized by recurrent violence, the association between CEO vocal masculinity and perceptions of CEO quality is stronger in more competitive industries. The interaction term in Model 4 ($p < 0.001$) shows support for this hypothesis.

Hypothesis 3 refers to the interaction between *CEO power* and *CEO vocal masculinity*, arguing that CEO power positively moderates the relationship between CEO vocal masculinity and CEO compensation because CEO vocal masculinity will be more influential in deterring directors from criticizing the compensation of powerful CEOs. The interaction term in Model 5 ($p < 0.05$) shows support for this hypothesis.

Hypothesis 4 argues that greater female representation on the compensation committee negatively moderates the relationship between CEO vocal masculinity and CEO compensation because CEO vocal masculinity influences the judgment of female directors less than the judgment of male directors. The interaction term in model 6 ($p < 0.01$) shows support for this hypothesis.

Model 7 contains the full model with all variables and moderating variables included. The results in Model 7 are largely

similar to those observed in Models 2 to 6 (Hypothesis 1, $p < 0.001$; Hypothesis 2, $p < 0.001$; Hypothesis 3, $p < 0.01$; Hypothesis 4, $p < 0.05$).

3.4.1 Robustness checks and additional analyses

We performed three additional tests to further evaluate our original hypotheses. First, we included an alternative adjustment for selection-induced endogeneity by using a Heckman selection model (Heckman, 1979; Shaver, 1998). Although the Heckman selection model is commonly used to correct for sample selection bias, it can also be used to address selection induced endogeneity (Chang, Kogut, & Yang, 2016; Shaver, 1998). In the first stage, we estimated a probit model to predict the probability of a firm having a CEO with a vocal masculinity above the median value within our sample. The parameters from the first-stage were then used to generate the inverse Mills ratio (IMR), which accounts for the likelihood of firms with particular traits hiring CEOs with deeper voices. The IMR is then included in the second-stage model as a control for possible selection. We included the proportion of female directors on the firm's nomination committee as the exclusion restriction in the first-stage (Sartori, 2003). In the second-stage Heckman, the results are

largely similar to findings from the two-stage model used in our main regressions (Hypothesis 1, $p < 0.001$; Hypothesis 2, $p < 0.001$; Hypothesis 3, $p < 0.05$; Hypothesis 4, $p < 0.05$).

Second, we used CEO tenure as an indicator of CEO power in our main analysis, which is consistent with existing research (Golden & Zajac, 2001; Hill & Phan, 1991; Ocasio, 1994). We argued that as CEO power increases, directors will be more attuned to CEO vocal masculinity as a cue to the CEO's willingness to retaliate, strengthening the effect of CEO vocal masculinity on CEO compensation. However, some research suggests that CEO tenure may also weaken the effect of CEO quality biases. According to this logic, since the board has more information about the CEO later in the CEO's tenure (Graffin et al., 2013), the effect of CEO vocal masculinity on perceptions of CEO quality should diminish as CEO tenure increases. Thus, CEO tenure could weaken the effect of CEO vocal masculinity on CEO compensation. We examine both possibilities empirically by testing the moderating effect of CEO tenure on the CEO vocal masculinity-CEO compensation relationship. Our finding that the CEO tenure interaction term has a positive sign (coefficient of 0.05 with $p < 0.001$) suggests that the

strengthening of the CEO threat bias as CEO tenure increases has a greater effect on the relationship between CEO vocal masculinity and CEO compensation than the weakening of the CEO quality bias.

Third, while we noted the shortcomings of OLS analysis above, we re-ran our main regressions with OLS estimation clustered at the firm level. The results did not change substantively (Hypothesis 1, $p < 0.05$; Hypothesis 2, $p < 0.05$; Hypothesis 3, $p < 0.10$; Hypothesis 4, $p < 0.10$).

3.5 Discussion

We set out to theoretically and empirically examine how CEO vocal masculinity influences the board's decisions on CEO compensation. We argued that CEO vocal masculinity shapes CEO compensation by influencing directors' perceptions of CEO quality, and their perceptions of the CEO's willingness to retaliate against directors who criticize CEO compensation. We identify these separate mechanisms by testing two moderating conditions—industry competitiveness, and CEO power—where each of these biases is particularly strong. We also argued that female representation on the

compensation committee mitigates the effect of both biases. Our empirical results provide support for our hypothesized predictions.

3.5.1 Theoretical contributions

Our study makes three major theoretical contributions. First, we contribute to the corporate governance literature by introducing a novel evolutionary psychology approach to examine both the direct effect of CEO vocal masculinity on CEO compensation, and the boundary conditions that shape this relationship. Prevailing accounts of vocal masculinity in corporate leadership have directed their attention on the benefits that accrue to those who possess them, and largely avoided discussing when these biases are more or less likely to play a salient role. This is consistent with existing research, which has primarily focused on showing that these biases exist. In contrast, we use insights from evolutionary psychology to demonstrate that theories regarding the origin and evolved function of vocal masculinity biases can be used to make testable predictions regarding the conditions that shape the CEO vocal masculinity-CEO compensation relationship (Buss, 2014; Kenrick et al., 2010). Collectively, the boundary conditions we examine—industry competitiveness, CEO power, and female representation on the

compensation committee—contribute to a non-deterministic understanding of the role of vocal masculinity in corporate governance.

Second, we contribute to the literature on CEO evaluations by examining how CEO vocal masculinity could discourage directors from criticizing CEO compensation. Governance scholars have begun to recognize that formal evaluations of the CEO, such as financial analyst recommendations (Westphal & Clement, 2008) and media coverage by journalists (Westphal & Deephouse, 2011), are influenced by stakeholders' fear of retaliation from the CEO. Prior research in the managerial power stream has highlighted the importance of past threatening actions by the CEO (Westphal & Clement, 2008; Westphal & Deephouse, 2011) and the CEO's objective ability to retaliate (Bebchuk & Fried, 2004), in shaping perceptions of CEO threat. We add to this literature by arguing that one of the two mechanisms by which CEO vocal masculinity can influence CEO compensation is by increasing directors' perceptions of the CEO's *willingness* to retaliate. We also argued that the effect of this threat bias is strengthened when the CEO's objective *ability* to retaliate, as measured by CEO power, increases. Our supportive

empirical findings indicate that threat perceptions during formal evaluations of the CEO may arise not only from objective considerations as demonstrated by past research, but also from seemingly trivial physiological features, such as the deepness of the CEO's voice.

Third, our study contributes to research on gender diversity. There is an ongoing debate in the gender diversity literature whether female representation has an effect on board decision-making. Some scholars have argued, building on existing research on gender differences, that female directors will behave differently from male directors in a number of ways (Chen et al., 2016; Huang & Kisgen, 2013; Levi et al., 2014). Others have argued that these differences are less likely to play a role in the upper echelons because directors are a highly selected group, i.e., the type of men and women who make it to the top of the organization are similar to each other, but different from their counterparts in the general population (Adams & Ragunathan, 2013; Bertrand & Hallock, 2001; *Economist*, 2015). The empirical evidence on the effect of female representation remains mixed (e.g., Adams & Ragunathan, 2013; Chen et al., 2016; Levi et al., 2014; Sila, Gonzalez, & Hagendorff, 2016). We argue

based on evolutionary reasoning that female directors differ from male directors in that female directors tend to be less influenced by vocal masculinity. Our theoretical predictions and supportive empirical findings corroborate the view that gender differences are important in understanding board outcomes.

3.5.2 Practical contribution

Our research can be used by practitioners to reduce the effect of CEO vocal masculinity on board decision-making. First, research in evolutionary psychology indicates that by making individuals aware of the conditions under which specific evolved biases are likely to play a salient role, they can gain some control (albeit limited) over how much they are influenced by these biases (Buss, 2014). Thus, for example, making directors aware that they will be more influenced by CEO vocal masculinity when assessing CEO quality in more competitive industries may mitigate the effect of this bias on board decision-making. Second, boards can use knowledge regarding individual differences in susceptibility to specific biases to change board composition. To this end, boards can increase the representation of female directors on important committees because

female directors are less influenced by CEO vocal masculinity than male directors.

3.5.3 Limitations and future research

As with all forms of empirical research, our study has some limitations that point to opportunities for refinement and future research. First, we focus only on male CEOs. Thus, our results might not be generalizable to female CEOs who make up an increasing percentage of CEOs of large firms around the world. A study of the vocal masculinity of female CEOs would be especially interesting as females may face a tradeoff between vocal masculinity, which conveys both leadership quality (Klofstad et al., 2012) and dominance (Borkowska & Pawlowski, 2011; Jones et al., 2010), and vocal femininity, which conveys attractiveness (Collins & Missing, 2003; Feinberg et al., 2005). This trade-off does not seem to be faced by males (Klofstad et al., 2016; Puts et al., 2014).

Second, while we examined CEOs of UK firms in our study, it is possible that the tendency to associate vocal masculinity with CEO quality may vary across cultures. Existing research suggests that the preference for formidability signals is weaker in more cooperative settings (e.g., Spisak et al., 2012). Thus, it could be the

case that in less individualistic cultures such as Japan where decision-making authority tends to rest with a group of executives rather than solely the CEO (Crossland & Hambrick, 2007, 2011), the preference for CEOs with deeper voices is likely weaker.

Third, we focus only on biases associated with formidability signals in the voice—vocal masculinity—and not on biases associated with other formidability signals. While we explained that CEO vocal masculinity is likely to be particularly important in CEO/board relations, studies under controlled experimental conditions suggest it is possible that formidability signals in the body and face could also influence perceptions of CEO quality, and perceptions of the CEO's willingness to retaliate (Blaker & Van Vugt, 2014; Cheng & Tracy, 2014; Petersen, 2015). Future research could examine the relative influence of different formidability signals on influencing directors.

3.6 Conclusion

Although existing research suggests that there are benefits to possessing a deep voice in leadership contexts, there is very little research examining this phenomenon at the top of the organization.

What we argue and find is that while CEO vocal masculinity positively influences the board's decision on CEO compensation, this effect is contingent on industry competitiveness, CEO power, and female representation in the compensation committee. In this way, our research promotes a non-deterministic understanding of how vocal masculinity influences corporate governance outcomes. We also shed greater light on the process by which perceptions of CEO threat are formed in formal CEO evaluations, as well as the importance of gender differences in understanding board outcomes. It is our hope that our research will be useful for researchers, boards, and other stakeholders in understanding the effects of vocal masculinity biases, and to devise ways to reduce their effects.

3.7 Tables

3.7.1 Table 1. Descriptive statistics and correlations

No.	Variable name	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	CEO total compensation[a)]	8.05	0.85	1.00													
2	CEO vocal masculinity	0.00	1.00	0.07	1.00												
3	Industry competitiveness	0.00	1.00	0.07	0.09	1.00											
4	CEO power	0.05	2.49	0.01	0.10	0.02	1.00										
5	Female compensation committee representation[b)]	0.16	0.14	0.03	-0.10	0.01	-0.03	1.00									
6	Pay mix[b)]	0.48	0.24	-0.39	0.02	-0.03	0.13	-0.01	1.00								
7	Firm size[a)]	2.69	1.87	0.30	0.01	0.12	-0.23	-0.11	-0.18	1.00							
8	Firm performance	0.05	0.08	0.08	0.01	0.21	-0.01	-0.08	-0.04	0.02	1.00						
9	Female nomination committee representation[b)]	0.11	0.14	0.13	-0.07	-0.12	0.08	0.32	-0.07	0.03	-0.03	1.00					
10	CEO elite status	0.21	0.41	-0.04	-0.02	-0.22	-0.04	-0.03	0.03	-0.06	-0.11	0.04	1.00				
11	CEO age	52.92	5.48	0.07	-0.06	0.05	0.29	0.04	0.01	0.11	-0.07	0.09	-0.13	1.00			
12	Board size	11.27	2.68	0.31	0.02	-0.04	0.00	0.04	-0.18	0.35	-0.12	0.05	0.01	0.13	1.00		
13	Board independence[b)]	0.63	0.13	0.17	-0.02	-0.04	-0.14	0.00	-0.05	0.18	-0.06	0.06	0.02	-0.10	0.00	1.00	
14	Blockholder ownership[b)]	0.18	0.17	-0.14	0.01	0.03	0.14	-0.05	0.10	-0.22	0.04	-0.09	-0.05	0.00	-0.11	-0.11	1.00

Notes: The sample size is 793 firm-years. Correlations larger than |0.06| are significant at the $p < 0.05$ level.
a) Log transformed
b) Proportional terms

3.7.2 Table 2. Regressions: The effect of CEO vocal masculinity on CEO total compensation

Variables	Model	Model	Model	Model	Model	Model	Model
Female	-0.50*						
	(0.26)						
Industry	0.12***	0.20***	0.18***	0.17***	0.19***	0.19***	0.18***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Pay mix		-	-	-	-	-	-
		(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Firm size	-0.01	0.09***	0.08***	0.08***	0.08***	0.08***	0.08***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm	-0.42	1.28***	1.33***	1.32***	1.29***	1.30***	1.25***
	(0.47)	(0.29)	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)
Female		-0.04	0.04	0.04	0.01	-0.01	-0.01
		(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
CEO power		0.04***	0.03**	0.03***	0.02+	0.03***	0.02*
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
CEO elite status		0.01	0.01	0.00	0.03	0.02	0.01
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
CEO age		0.00	0.00	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Board size	0.01	0.07***	0.07***	0.07***	0.07***	0.07***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Board	-0.10	0.64***	0.61***	0.58***	0.61***	0.62***	0.59***
	(0.28)	(0.15)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Blockholder	-0.02	-0.23*	-0.18+	-0.19+	-0.19+	-0.24*	-0.24*
	(0.22)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
Second-stage		-	-	-	-	-	-
		(0.23)	(0.23)	(0.23)	(0.23)	(0.22)	(0.22)
Hypothesis							
CEO vocal			0.06***	0.05***	0.05***	0.10***	0.09***
			(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
CEO vocal masculinity X				0.07***			0.06***
				(0.01)			(0.02)
CEO vocal masculinity X					0.01*		0.01**
					(0.00)		(0.01)
CEO vocal masculinity X Female comp. committee rep.						-0.28**	-0.25*
						(0.10)	(0.10)
Constant	0.17	7.24***	7.11***	7.26***	7.08***	7.17***	7.23***
	(0.28)	(0.23)	(0.23)	(0.24)	(0.23)	(0.22)	(0.23)
Observations	793	793	793	793	793	793	793
χ^2	21.4	884	1432	972	1051	1517	1731

Notes: Robust standard errors are in parentheses. Year and industry controls are included.
+ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; two-tailed tests for both hypothesized variables and controls.

Chapter 4. Man Up: The Influence of Board Political Ideology on the Selection of Masculine CEOs

ABSTRACT

Despite an abundance of studies examining the causes and consequences of CEO succession, the strategic leadership literature has yielded surprisingly little insight into one of the most central puzzles surrounding the CEO selection process: Why do CEOs look the way they do? We explore this question by focusing on how directors' political ideologies, and specifically their positions on the liberalism-conservatism spectrum, manifest in boards' selections of more (versus less) masculine male CEO candidates. Integrating research in evolutionary psychology, political ideology, and behavioral corporate governance, we theorize that conservative and liberal boards will differ in their relative sensitivities to threat, which will in turn influence their propensities to choose more masculine CEOs to lead their firms. We further examine whether this relationship becomes amplified in more threatening contexts, specifically in poorly performing firms and in slowly growing industries. Using an innovative methodology to assess masculinity

as reflected in CEOs' faces and voices, we test our ideas on a sample of 528 CEO succession events at S&P 1500 firms from 2007 to 2013. Results provide considerable support for our theory. We discuss the contributions of our study for research on CEO succession, diversity in the corporate elite, and implicit leadership theory.

4.1 Introduction

Why do chief executive officers (CEOs) look the way they do? While this puzzle remains surprisingly underexplored (Hambrick, 2007; Wowak, Gomez-Mejia, and Steinbach, 2017), it touches on a broader question that has long been of interest to management scholars (Bass and Stogdill, 1990; Eagly and Karau, 1991): Why are some individuals more likely than others to be chosen as leaders? According to implicit leadership theory, such choices are in part the result of audiences' pre-existing notions of what constitutes a prototypical leader (Gupta and Misangyi, 2018; Lord and Maher, 1991). These leadership schemas are associated with a variety of idealized traits and abilities (Epitropaki et al., 2013), but considerable work suggests that one's masculinity is a potent predictor of

leadership emergence, particularly for males (Klofstad, Anderson, and Peters, 2012; Spisak et al., 2012; Tigue et al., 2012; Van Vugt and Ronay, 2013). Observer perceptions of masculinity, or the extent to which an individual exhibits prototypically male attributes, emanate from physical features such as one's face and voice (Feinberg et al., 2008; Puts et al., 2012; Wolff and Puts, 2010). This evolutionary bias, which can trace its roots to early ancestral societies in which leadership was closely tied with the ability to prevail in physical combat (Van Vugt and Ronay, 2013; Petersen, 2015), predisposes observers to select more masculine-seeming individuals for leadership roles (Klofstad et al., 2012; Little et al., 2007; Spisak et al., 2012; Tigue et al., 2012).

Could this predilection also influence boards' CEO selection decisions? A wealth of research has shown that directors are subject to decision-making biases (for a review, see Westphal and Zajac, 2013), which raises the possibility that at least some boards may unconsciously favor CEO candidates with more masculine traits. The high-stakes nature of CEO selection decisions lends further credence to this idea, as the masculinity bias tends to be most pronounced in situations characterized by high levels of threat (Little

et al., 2007; Spisak et al., 2012; Tigue et al., 2012). The potential organizational consequences of such a bias are also noteworthy, as recent evidence indicates that more masculine CEOs tend to engage in more financial misreporting (Jia, Lent, and Zeng, 2014), receive higher compensation (Nair and Haque, 2016; Mayew, Parsons, and Venkatachalam, 2013), and garner higher market valuations for their firms (Joshi et al., 2017). Yet despite these implications, little is known about whether masculinity is a contributing factor when boards select their CEOs.

Given the central role of threat perceptions in driving observers' preferences for more masculine leaders (Little et al., 2007; Spisak et al., 2012; Tigue et al., 2012), it follows that directors' subjective evaluations of threat could help determine the extent to which they gravitate toward more masculine CEO candidates who fit the classic mold of a strong leader. Research in political psychology suggests that these threat perceptions will vary as a function of political ideology (Vigil, 2010; Fessler, Pisor, and Holbrook, 2017), which reflect individuals' deeply held values and preferences (Jost, Federico, and Napier, 2009). Building on the logic of upper echelons theory (Hambrick and Mason, 1984), which holds that corporate

leaders' decisions reflect their individual values and preferences, researchers have shown that political ideologies affect executives' strategic decisions (Chin, Hambrick, and Treviño, 2013; Gupta, Briscoe, and Hambrick, 2017) and, closer to our domain, directors' governance decisions (Gupta and Wowak, 2017). The hiring of a CEO is one of the most critical governance decisions that a board must make, and ample research suggests that directors' ideologies will influence the characteristics they look for in a CEO.

This basic logic undergirds our study. Integrating concepts from the literatures on evolutionary psychology, political ideology, and behavioral corporate governance, we examine how directors' ideologies, and specifically the board-level average of how conservative or liberal its directors are, manifest in decisions to hire more (versus less) masculine male[1] CEOs. Existing evidence suggests that conservatives (as compared to liberals) are more sensitive to threat in the external environment (Jost et al., 2007). If conservative boards are more sensitive to threat, they should be

[1] As a point of clarification, masculinity can be assessed for both males and females, with the latter generally scoring lower on the dimension. But because there are relatively few female CEOs in our population of interest (large public companies), we focus on male CEOs only in our arguments and empirical tests. As we discuss in a later section, however, our results are robust to the inclusion of female CEOs.

more prone to the masculinity bias in their evaluations of potential CEO candidates. Our central argument is thus that CEOs hired by conservative boards will exhibit more masculine traits than will CEOs hired by liberal boards.

We also theorize that this relationship will vary depending upon the contextual conditions facing the firm at the time of succession. While a conservative board's heightened sensitivity to threat should generally predispose it toward more masculine CEO candidates, this effect will arguably be more pronounced when the firm is facing an objectively difficult situation. Threats should loom even larger for conservative boards in such contexts, the result of which will be a stronger activation of the masculinity preference. We therefore propose that the effect of board conservatism on CEO masculinity will be amplified in highly threatening contexts, specifically in recently underperforming firms and in slow-growth industries.

Testing our ideas on a sample of 528 CEO succession events at S&P 1500 firms from 2007 to 2013, we use an innovative methodology to assess masculinity as reflected in CEOs' faces and voices. This technique, which we will discuss in detail below and

which has been validated and used in evolutionary psychology research (e.g., Lefevre et al., 2012; Puts et al., 2014), involves measuring (1) facial masculinity by using the lower face to face-height ratio as computed from the measurements of facial images, and (2) vocal masculinity via the formant dispersion (which relates to the "deepness" or "lowness" of one's voice) as computed from clips of spoken audio.

Our study offers several key contributions. First, we shed new light on a compelling but curiously understudied question: Why do CEOs look the way they do? In demonstrating that directors' political ideologies affect the types of leaders they gravitate toward, our study offers novel insight into boards' CEO selection decisions. Second, we contribute to the burgeoning literature on diversity in the corporate elite, which with rare exceptions has almost exclusively focused on gender, race, and social class background as the basis for preferential treatment (e.g., Kulich et al., 2011; Maclean, Harvey, and Kling, 2014; Westphal and Stern, 2007; Stern and Westphal, 2010). We extend this conversation by illustrating that masculinity (or a lack thereof) can play a role in brightening (or dimming) one's career prospects – even among those at the perceived apex of the

corporate elite (white, upper-class males). And third, we contribute to implicit leadership theory by showing that even the activation of leadership prototypes with deep evolutionary origins can vary according to individuals' idiosyncratic beliefs and preferences.

4.2 Theory and Hypotheses

4.2.1 CEO selection as a critical board task

The CEO sits at the helm of the modern organization, shaping its strategic posture, its culture, and ultimately its fate and fortune (for a review, see Finkelstein, Hambrick, and Cannella, 2009). Directors often describe the choosing of a CEO as one of the most important decisions that a board must make (Caldwell et al., 1999), a sentiment that is borne out by the many studies illustrating that CEO succession decisions have an important effect on firm performance (Beatty and Zajac, 1987; Bertrand and Schoar, 2003; Hambrick and Quigley, 2014; Mackey, 2008; Quigley and Hambrick, 2015). Indeed, the "CEO effect" on firm performance has become amplified over the last few decades (Quigley and Hambrick, 2015), some correlates of which include growing attention to CEOs in the business press (Quigley and Hambrick, 2015), increases in CEO pay relative to the pay of other top managers (Frydman and Jenter, 2010), and greater

sensitivity of CEO dismissals to firm performance (Kaplan and Minton, 2012; Murphy and Zabojnik, 2004).

Much of the existing research has tended to focus on the person-situation fit aspect of boards' CEO selection decisions. According to this view, for a firm to maximize its odds of future success, its executives should possess experience and abilities that align with the needs of the firm (Chen and Hambrick, 2012; Gupta and Govindarajan, 1984; Hambrick and Crozier, 1985). Thus, as the needs of the firm change, so too do the characteristics that boards seek in a CEO. For instance, CEO attributes such as education, functional expertise, and age tend to co-vary with factors including the firm's life cycle phase (Drazin and Kazanjian, 1993), the industry in which it operates (Datta and Rajagopalan, 1998), and its legal environment (Fligstein, 1987). Relatedly, and consistent with the idea that the choice of a CEO is in part a reflection of the board's relative desire for change (Vancil 1987; Lorsch and MacIver 1989), numerous studies have found that incoming CEOs tend to come from outside (inside) the company when pre-succession performance is poor (good) (Allen, Panian, and Lotz, 1979; Boeker and Goodstein, 1993; Cannella and Lubatkin, 1993).

While directors may strive to be rational when hiring new CEOs, these decisions are far from straightforward. As many scholars have noted (e.g., Khurana, 2002; Groysberg, McLean, and Nohria, 2006), the selection process is fraught with uncertainty. First, the *ex ante* evaluation of CEO ability is difficult. Most CEO candidates have never held the CEO position before, having instead served as heads of divisions or in other executive positions (chief financial officer, chief operating offer, etc.) (Finkelstein, Hambrick, and Cannella, 2009). These executive roles, while important to the functioning of an organization, do not entail nearly as much decision-making responsibility or managerial discretion as does the CEO position (Hambrick and Finkelstein, 1987). Further, available performance metrics (e.g., profits, market share, etc.) reflect not only the contributions of the focal executive, but also external factors outside of the executive's control such as fluctuations in industry conditions (Holmstrom, 1982) and contributions of other managers (Boeker, 1992; Graffin et al., 2008). For instance, while top managers of high-performing firms who have worked under well-known CEOs are more likely to become CEOs themselves (Graffin

et al., 2008), they also tend to perform worse than their former bosses (Groysberg, McLean, and Nohria, 2006).

Second, boards face information processing limitations that complicate the task of CEO selection (Boivie et al., 2016; Graffin, Boivie, and Carpenter, 2013). CEO succession decisions are highly complex, requiring directors to comprehend the needs of the focal firm, its environment, and the abilities of potential successors. Moreover, directors serve the firm on a part-time basis, and typically must devote a substantial amount of time and effort to their own full-time jobs in addition to other board appointments (Ferris, Jagannathan, and Pritchard, 2003; Fich and Shivdasani, 2006; Field, Lowry, and Mkrtchyan, 2013). These factors can contribute to cognitive overload and less-than-rational decision making (Boivie et al., 2016; Oldroyd and Morris, 2002).

Third, and just like the rest of us, directors are subject to cognitive biases (summarized in Westphal and Zajac, 2013). Behavioral governance scholars have examined how biases influence a number of board decisions, including strategic persistence (Westphal and Bednar, 2005), acquisition premiums (Zhu, 2013), director selection (Westphal and Zajac, 1995; Zhu,

Shen, and Hillman, 2014; Zhu and Westphal, 2014), CEO compensation (Graffin, Boivie, and Carpenter, 2013; Westphal and Zajac, 1995; Zhu and Westphal, 2014; Zhu, 2014), and CEO dismissal (Graffin, Boivie, and Carpenter, 2013). However, there is relatively little research on how biases influence directors' CEO selection decisions.

In one of the few studies to examine this issue, Westphal and Zajac (1996) found that boards tend to prefer CEO successors who resemble their own demographic profiles, which offers evidence of similarity-attraction bias in CEO selection decisions. In another example, Khurana (2002) illustrated that boards often make suboptimal CEO choices due to an "irrational" preference for charismatic leaders who appear colorful and exciting but whose skills and abilities may not align well with what the firm needs. Khurana's work in particular suggests that boards may have idealized notions of what constitutes a good leader, and that these biases – ill-founded though they may be – shape their CEO selection decisions.

Along these lines, implicit leadership theory suggests that the preference for leaders who possess certain attributes arises

because individuals possess cognitive schemas regarding what a competent leader looks like (for a review, see Junker and Dick, 2014). The traditional understanding has been that these leadership prototypes, which are contextually dependent, are deeply rooted in culturally-imprinted perceptions regarding attributes that imply promise of effective leadership (Junker and Dick, 2014). Individuals who possess these attributes are viewed as better leaders, and are therefore more likely to be selected into leadership positions. At the same time, existing research has found that individuals differ in their perceptions of leadership quality – even when facing objectively similar contextual conditions (Atkins and Woods, 2002; Scullen, Mount, and Goff, 2008) – which is indicative of differences in the implicit leadership prototypes held by individuals (Junker and Dick, 2014). The literature on implicit leadership thus suggests that: (1) leader selection is affected by evaluators' implicit leadership biases; (2) the activation of these biases is contingent on contextual conditions; and (3) evaluators can significantly differ in their beliefs about what an ideal leader looks like.

While implicit leadership prototypes have traditionally been viewed as socially learned (Javidan et al., 2006), evolutionary

psychology research has illustrated that some of these prototypes have deep evolutionary origins (Junker and Dick, 2014; Petersen, 2015; Spisak et al., 2012; Van Vugt and Ronay, 2013). Drawing on this latter work, we next discuss how evolutionary leadership prototypes related to masculine physiological features create advantages for individuals who possess these attributes such that they are perceived as more competent leaders (particularly when contextual conditions connote threat). We then explore how board political conservatism – as an important audience characteristic that we theorize will be associated with a stronger masculinity bias – shapes the CEO selection process.

4.2.2 Masculinity and leader selection

According to evolutionary scientists, the masculine leadership prototype evolved in the context of pervasive violent conflicts over human evolutionary history (Petersen, 2015; Puts et al., 2014). Prevailing in these conflicts allowed the victor to gain greater access to material resources and mates, whereas defeat often meant a loss in social status, potentially debilitating injuries, and even death (Manson and Wrangham, 1991; Puts et al., 2015). Given that individuals vary in their formidability – or their capacity to prevail in

violent conflicts – humans appear to have developed the ability to accurately assess the formidability of others from outwardly perceivable physiological signals. Indeed, research across cultures has found that individuals are able to gauge another individual's formidability using information gleaned from the other's face, voice, and body (Durkee, Goetz, and Lukaszewski, 2017; Little et al., 2015; Sell et al., 2009; Sell et al., 2010). This instinct has been argued to provide an evolutionary advantage by inducing individuals to engage in violent conflicts when the likelihood of success is relatively high, and to yield to opponents when the likelihood of failure is relatively high (Hammerstein and Parker, 1982; Petersen et al., 2013).

Because violent encounters posed a greater challenge to survival and reproduction for human males than females (Bowles, 2009; McDonald et al., 2012; Neuberg and Schaller, 2016; Puts et al., 2015; Sell et al., 2012), formidability signals are highly sexually dimorphic (i.e., males and females meaningfully differ along the relevant dimensions). Across cultures, men – while varying on these characteristics themselves – have more muscular bodies (Lassek and Gaulin, 2009; Wells, 2012), deeper voices characterized by lower timbre (Puts, Gaulin, and Verdolini, 2006; Puts et al., 2014),

and the lower half of their faces are longer relative to the length of their full face (Penton-Voak et al., 2001; Lefevre et al., 2010). Accordingly, males deemed by others to be higher on these dimensions tend to be perceived as more masculine (Feinberg et al., 2008; Puts et al., 2012; Wolff and Puts, 2010).

Following a masculine leader was beneficial in ancestral environments characterized by threats from inter-group competition. For the relatively small coalitional groups that were common in the evolutionary past, masculine leaders could provide protection from physical violence, credibly enforce group norms, and serve as an intimidating presence in negotiations with other coalitions (Chagnon, 1983; Lukaszewski et al., 2016; Von Reuden, 2014). Over time, this gave rise to evolved biases that associate masculine physiological features with leadership effectiveness (Petersen, 2015; Puts et al., 2014). And because this relationship tended to be stronger when threats were high (Little et al., 2007; Spisak et al., 2012; Tigue et al., 2012), the activation of these biases is at least partially contingent on evaluators' perceptions of threat.

Consistent with these arguments, considerable research using voice recordings and facial images manipulated with respect to

masculinity have found that individuals prefer more masculine leaders (Klofstad et al., 2012; Little et al., 2007; Spisak et al., 2012; Tigue et al., 2012), especially when contextual conditions connote threat (Little et al., 2007; Spisak et al., 2012; Tigue et al., 2012). Additionally, research examining vocal masculinity and leadership selection in the modern political sphere (e.g., the election of national legislators [Klofstad, 2016] and presidents [Banai, Banai, and Bovan, 2017]) also suggests a general preference for more masculine leaders.

Given the central role of *perceptions* of threat in predisposing individuals toward masculine leaders, it seems plausible that the preference for masculine leaders will vary depending on how sensitive individuals are to potential threat cues. As we describe below, considerable research suggests that these threat perceptions will vary as a function of individuals' political ideologies.

4.2.3 Implications of board political ideology

Political ideology, broadly defined as one's views regarding "how society should be governed" (Jost et al., 2009: 309), is a fundamental dispositional attribute that "helps to explain why people do what they do" (Jost, 2006: 653). Scholars have proffered a

number of different dimensions and labels to describe political ideology (Slomp, 2000), but the liberal-conservative (or left-right) spectrum has been deemed the "most useful and parsimonious way to classify political attitudes" (Jost, 2006: 654). Whereas conservatives[2] are more likely to support capital punishment, hold a more positive view of the military and law enforcement, and believe in the merits of tradition, liberals place a premium on civil rights, multiculturalism, and egalitarianism (Jost, 2006). Differences between conservative and liberal ideologies are reflected in individuals' attitudes (Jost, 2006), personalities (Carney et al., 2008), and moral judgments (Graham, Haidt, and Nosek, 2009; Haidt and Graham, 2007).

Although political ideologies have long been understood to guide individuals' behaviors as they relate to the political sphere (e.g., public policy preferences, voting, etc.), recent research suggests that ideologies likewise affect how corporate elites approach their job responsibilities (Chin et al., 2013; Francia, 2005;

[2] We use "conservatives" and "liberals" as shorthand terms for individuals with conservative-leaning and liberal-leaning ideologies, respectively. We similarly refer to conservative-leaning boards as "conservative boards" and liberal-leaning boards as "liberal boards." As we will discuss later, though, directors and boards can espouse ideologies at any point on the conservatism-liberalism continuum.

Tetlock, 2000). In shaping these work-related decisions, political ideologies act as interpretive lenses which lead corporate executives to not only prefer courses of action that are consistent with their ideological worldviews, but also to fundamentally shape their reasoning in a way that they see instrumental merits in choices that align with their ideologies (Kunda, 1991; Gupta et al., 2017). For example, Chin and colleagues (2013) demonstrated that liberal CEOs exhibited greater engagement in corporate social responsibility (CSR) than did conservative CEOs. Chin and Semadeni (2017) found that firms headed by conservative CEOs (as compared to liberal CEOs) tended to have higher pay dispersion among non-CEO top management team (TMT) members, and Christensen and colleagues (2015) illustrated that conservative CEOs were less likely to engage in tax avoidance than were liberal CEOs. In perhaps the most relevant precedent for our own study, Gupta and Wowak (2017) found that conservative boards tended to pay CEOs more while also tying CEO pay more closely to firm performance.

This stream of research collectively illustrates that ideologies shape executives' and directors' decisions about firms' strategic

actions and governance initiatives. Still unexplored, however, is the role of board ideology in determining who is selected as the CEO in the first place. This absence of attention is part of a broader blind spot in the upper echelons literature regarding factors that influence the sorting of executives into their positions (Wowak et al., 2017), an oversight that we aim to address in our arguments below.

4.2.4 Board conservatism and incoming CEO masculinity

Scholars and practitioners alike have long recognized that managing the various threats facing the firm is vital to continued success. For instance, classic research in strategy suggests that the firm's fate is inextricably tied to prevailing structural conditions such as the bargaining power of buyers and suppliers, the intensity of interfirm competition, and so on (Porter, 1980; Porter, 2008). Threats to firm success can also hinge upon more socially constituted factors such as status, reputation, and legitimacy (Bitektine, 2011; George et al., 2016; Harrison et al., 2018), as well as the obvious pitfalls that often accompany risky strategic initiatives such as overseas acquisitions (Cuervo-Cazurra, Maloney, and Manrakhan, 2007).

Finding ways to mitigate the threats facing the firm is a primary concern for directors, not only because of their formal

responsibility to create value for the firm's shareholders, but also because their livelihoods depend on it. While executives manage threats on a daily basis via the strategic choices that they make, boards of directors have fewer and more indirect avenues through which to manage these threats (Baysinger and Hoskisson, 1990). Thus, the ability to choose who becomes CEO, which (as mentioned earlier) can have a profound impact on firm success and failure, is perhaps the most powerful lever at the board's disposal.

Research in political psychology has long held that individuals vary in how attentive they are to threats as a function of their political conservatism (Duckitt, 2001; Jost et al., 2003; 2007), and that this tendency translates to greater willingness to take actions to address these threats (Holbrook et al., 2016). For example, conservatives have a greater tendency to ascribe to "competitive jungle" and "dangerous-world" beliefs about their social environment (Federico, Hunt, and Ergun, 2009). This is consistent with Fessler, Pisor, and Holbrook's (2017) finding that conservatives are more likely to believe information of uncertain veracity about threats than liberals. And research on facial evaluations has shown that conservatives have a greater tendency to interpret ambiguous facial expressions

as displaying threatening emotions (Vigil, 2010). Growing research suggests that conservatives' heightened sensitivity to threat has detectable physical manifestations. When faced with threatening stimuli, conservatives have greater skin reactions, display more startle blinks, and direct more visual attention than liberals (Carraro, Castelli, and Macchielle, 2011; Dodd et al., 2012; Mclean et al., 2014; Oxley et al., 2008). Kanai et al. (2011) found that conservatives tend to possess larger brain regions associated with the processing of threat cues, suggesting that there are neural bases for conservatives' greater sensitivity to threat. To be clear, these studies do not indicate that either conservatives or liberals are more *accurate* in their assessment of actual threat – instead, they suggest that conservatives tend to be more motivated to attend to threat cues than liberals.

Building on these ideas, we contend that conservative boards will be relatively more attentive to potential threats to the firm's future success and survival, a result of which will be a stronger activation of evolutionary leadership biases in favor of more masculine individuals. Therefore, we expect that as board conservatism

increases, so too will the masculinity of the incoming CEO. Accordingly:

Hypothesis 1: The more conservative the board, the more masculine the incoming CEO.

4.2.5 The moderating influence of contextual threats

So far, we have argued that conservative-leaning boards will evidence a greater preference for masculine CEOs because these boards are more sensitive to potential threats facing the firm. At the same time, differences between conservative and liberal boards with respect to perceptions of threat are likely to depend on the extent to which contextual conditions actually connote peril. In this section, we focus on two distinct sources of contextual threat that are likely to shape the baseline relationship hypothesized above: the degree to which the firm has recently performed well (versus poorly); and the degree to which the firm's industry has been experiencing rapid (versus slow) growth. Examining these two factors allows us to shine a more focused spotlight on threat perceptions, our primary theorized mechanism linking board ideology and CEO masculinity.

A firm's financial performance offers an objective barometer of the firm's overall health, which is naturally top-of-mind for directors

(Boivie, Graffin, and Pollock, 2012; Vafeas, 1999). When firm performance is high, there is relatively less information that can be interpreted as potentially threatening. Conservative and liberal directors alike will perceive lower levels of threat in such situations, which should in turn diminish the effect of board conservatism on incoming CEO masculinity. In other words, good firm performance will cause all directors to feel better about their firms' future prospects, which will diminish the tendency - more pronounced in conservatives than in liberals - toward more masculine leaders.

When firm performance is poor, the firm is unable to deliver value to its shareholders, the likelihood of layoffs rises, and there are increased calls for changes in the firm's leadership (Finkelstein, Hambrick, and Cannella, 2009). The business press is replete with examples of boards that were replaced during times of poor firm performance. Because of increased threats to the firm and to directors' livelihood, that accompany poor firm performance, conservative directors, who are more sensitive to threats, will exhibit an even greater preference for masculine CEOs. Thus:

Hypothesis 2: The better the firm's recent performance, the less positive the relationship between board conservatism and incoming CEO masculinity.

In addition to firm performance, we posit that industrywide resource constraints (or the lack thereof) will play an important role in moderating the influence of board political ideology on incoming CEO masculinity. An abundance of research suggests that a firm's vitality is in part a function of the overall industry environment (McGahan and Porter, 1997; Short et al., 2003), with firms in slow-growth industries facing steeper challenges than their counterparts in more rapidly growing industries. As such, industry conditions naturally influence corporate leaders' cognitions and behaviors (Abrahamson and Hambrick, 1997; Hambrick and Abrahamson, 1995).

Industry munificence, defined as "the extent to which the environment can support sustained growth," (Starbuck, 1976) refers to the general trajectory of an industry (Dess and Beard, 1984). When industry munificence is high, directors will generally perceive more growth opportunities and, as consequence, relatively lower

levels of threat. The converse should be true in a slow-growth industry, as the lack of growth opportunities will tend to raise the level of threat perceived by directors. We thus propose that board ideology will have a stronger effect on incoming CEO masculinity in the latter (slow-growth industries) than in the former (high-growth industries), as the objectively higher level of threat in slow-growth industries will be particularly salient to conservative boards that are already closely attuned to threat. As such:

> *Hypothesis 3: The more munificent the industry, the less positive the relationship between board conservatism and incoming CEO masculinity.*

4.3 Methods

4.3.1 Sample and data sources

We tested our hypotheses on a sample consisting of CEO succession events in S&P 1500 firms from 2007 to 2013. As we discuss below, we computed facial masculinity from pictures of executives gathered from company websites and the business press, and computed vocal masculinity from audio clips gathered from CEO presentations, interviews with the business press, and

earnings calls with financial analysts. We measured political ideology by collecting individual donation data for members of the board of directors from the FEC (Federal Election Commission) (e.g., Chin et al., 2013; Gupta, Briscoe, and Hambrick, 2017; Gupta and Wowak, 2017). For the other variables, financial data was collected from Compustat, stock market data was collected from the Center for Research in Security Princes (CRSP), and information on the CEO and the board were collected from Institutional Shareholder Services (ISS).

Because masculine physiological features are more important in shaping the evaluations of males than females (Sell et al., 2009; Sell et al., 2010), in conjunction with the fact that there were relatively few female incoming CEOs in our sample, we focused solely on male CEOs. However, the results were substantively similar when including female CEOs in our analysis. After accounting for missing masculinity data for incoming CEOs and outgoing CEOs, our final sample comprised 528 succession events.

4.3.2 Dependent variables

CEO masculinity*.** We assessed CEO masculinity using two distinct measures. The first of these, the ***facial masculinity of the

incoming CEO, was captured by computing the lower face to face height ratio of their faces. Multiple studies have found that the lower face to face height ratio exhibits sexual dimorphism: it is significantly higher for males than females, and this gendered association with masculinity strongly predicts within-group differences among males (e.g., Lefevre et al., 2012; Penton Voak et al., 2001).

We were selective in choosing pictures, making sure that they were forward facing with minimal head tilt. The collected pictures were cropped around the CEOs' faces and converted to 8-bit grayscale images with a standardized height of 400 pixels (e.g., Carré et al., 2009). We measured the two facial metrics required to compute the lower face to face height ratio – lower face height and total face height – using the NIH ImageJ software. Lower face height was measured as the vertical distance from the height of the eyes to the bottom of the chin, and total face height was measured as the vertical distance from the top of the forehead to the bottom of the chin (Lefevre et al., 2012; Penton Voak et al., 2001).

Our second measure, ***vocal masculinity*** of the incoming CEO, was measured using the formant dispersion of the CEO's voice. Formant dispersion, a widely accepted measure of vocal

masculinity in the evolutionary sciences, is defined as the average "dispersion" or spacing between the formants of a speaker's voice and influences the perceived "deepness" or "lowness" of the voice (Puts et al., 2014; Puts, Gaulin, and Verdolini, 2006; Wolff and Puts, 2010). Formants are a measure of the resonance quality of speech and capture low impedance, or in other words, the frequencies where the voice of the speaker vibrates the least (Hodges-Simeon, Gaulin, and Puts, 2010; Puts et al., 2006). Formant dispersion is a stable characteristic of the speaker and is extremely difficult to modulate (Fitch, 1997). Once an individual reaches adulthood, it is largely unaffected by age, social rank, or voice coaching (Evans, Neave, and Wakelin, 2006; Ko, Sadler, and Galinsky, 2014). For example, when the former British Prime Minister, Margaret Thatcher, underwent voice coaching, her formant dispersion remained the same even as other parameters of her voice changed (Ko, Sadler, and Galinsky, 2014). Given that formant dispersion is inversely related to vocal masculinity (Puts et al., 2014), the sign of the formant dispersion values was reversed to compute our vocal masculinity measure.

The log function of the Praat 64-bit audio software was used to measure CEO vocal masculinity. Consistent with the literature, we used 20-second audio clips of CEO speech (Nair and Haque, 2016; Mayew et al., 2013). To assess the robustness of the vocal masculinity measure to different clip lengths, we compared these 20-second audio clips with 45-second audio clips for a random subsample of 100 incoming CEOs. The correlation between the formant dispersion measures of these clips was very high (r=0.989, p<0.001), suggesting that using 20-second clips was appropriate. The formula used to compute formant dispersion is:

$$D_f = \sum_{i=1}^{n=4} \frac{(F_{i+1} - F_i)}{n-1}$$

Here, n refers to the total number of measured formant frequencies and F refers to the specific formants: F1, F2, F3, and F4. We standardized the values of the facial masculinity and vocal masculinity variables to allow for a more straightforward interpretation of regression results.

4.3.3 Independent variables

***Board political ideology*.** Following prior research, board ideology was measured by compiling data on political donations by

individual directors to the two major US parties (e.g., Chin et al., 2013; Gupta and Wowak, 2017; Gupta, Briscoe, and Hambrick, 2017). Political donations of over $200 to individual political candidates, political action committees, federal office campaign committees, and national parties are publicly available from the FEC's website (Chin, Hambrick, and Trevino, 2013). The political science literature has shown that support for the Republican Party, which espouses conservative beliefs, and the Democratic Party, which espouses liberal beliefs, reflect stable political ideological differences (Poole and Rosenthal, 1984; Goren, Federico, and Kittilson, 2009). Thus, the choice to donate to one party over another is indicative of individual differences in political ideology.

Data on the political donations of individual directors was collected using the probabilistic linkage procedure outlined by Gupta and Wowak (2017). We measured the ideology of individual directors using the index introduced by Chin, Hambrick, and Trevino (2013). This index consisted of four components: 1) the number of donations to the Republican Party divided by donations to both the Republican and Democratic Parties; 2) the dollar amounts of donations to the Republican Party divided by dollar amounts of

donations to both the Republican and Democratic Parties; 3) the number of distinct years in which the individual contributed to the Republican party divided by the number of distinct years in which the executive contributed to both the Republican and Democratic Parties, and 4) the number of distinct Republican recipients of donations divided by the total number of distinct Republican and Democratic recipients (Chin, Hambrick, and Trevino, 2013). Consistent with the assumption that political beliefs are very stable over time (Sears and Funk, 1999; Burris, 2001; Jost, 2006), we utilized all political donations made by individual directors in computing the index (Gupta and Wowak, 2017). Finally, board political conservatism was computed by averaging the conservatism scores for individual directors on the board of the focal firm in the year prior to the appointment of the new CEO. However, using the board conservatism for the succession year produced highly consistent results.

4.3.4 Moderating variables

***Financial performance*.** We measured financial performance using total shareholder returns (TSR), a widely recognized performance metric that is closely monitored by directors and

shareholders (Connelly et al., in press). TSR was computed as the monthly compounded returns to shareholders (assuming the continuous reinvestment of dividends) for the prior fiscal year.

***Industry munificence*.** Industry munificence was measured following the method outlined in Dess and Beard (1984), which involved regressing total industry sales on the trailing five years and subsequently dividing the regression slope coefficient by average sales over the same time period.

4.3.5 Control variables

There is limited research on CEO masculinity in the corporate governance literature, which somewhat complicates the selection of control variables. We nevertheless included a comprehensive array of controls to help rule out alternative influences on our dependent variables. At the firm level, we controlled for *firm size* (net sales, log transformed to correct for skew) and *firm accounting performance* (return on assets, calculated as net income divided by total assets). We also controlled for *industry dynamism*, calculated using the Dess and Beard (1984) method. At the board level, we included measures of *board size* and *number of independent directors.* To help account for the potential influence of other incoming CEO characteristics, we

controlled for *CEO age*, *CEO racial minority status* (a dummy variable coded as 1 if the incoming CEO is not Caucasian), and *CEO conservatism* (same method as that used for computing the ideology of individual directors). We likewise controlled for characteristics of the outgoing CEO, including *predecessor facial and vocal masculinity* (measured as described above) and *predecessor conservatism*. All control variables were measured the year prior to the appointment of the new CEO.

4.3.6 Estimation method and endogeneity

Because each CEO appears only once in our analysis, we used ordinary least squares (OLS) regressions to test our hypotheses. Three different sets of regressions were run: Models 1 through 5 predict the facial masculinity of the incoming CEO; Models 6 through 10 predict the vocal masculinity of the incoming CEO; and Models 11 through 15 predict the overall masculinity of the incoming CEO (computed as the average of the [standardized] values for the facial masculinity and vocal masculinity variables). As a point of clarification, we controlled for the facial masculinity of the incoming CEO in the regressions predicting the vocal masculinity of the

incoming CEO, and for vocal masculinity of the incoming CEO in the regressions predicting the facial masculinity of the incoming CEO.

To improve approximation of causality, we performed additional analyses to assess the sensitivity of our results to concerns about endogeneity. In our context, endogeneity concerns can take two major forms: reverse causality and omitted variable bias. Reverse causality would imply that our independent variable – board political ideology – is caused by our dependent variable(s) – CEO facial masculinity and CEO vocal masculinity. We aimed to mitigate this concern by following the time-honored principle of temporal precedence: we ensured that our key independent variables were measured in the year prior to our dependent variable, e.g. board political ideology in year prior to succession predicts incoming CEO masculinity in the succession year.

Omitted variable bias would occur if some unobserved variable influences both our board political ideology and CEO masculinity variables, thereby causing spurious association between them. While only a randomized experiment can fully rule out omitted variable bias, we ran supplemental models using two-stage least squares (2SLS) regression, which represents the best practice for

mitigating such concerns in strategic management research (Semadeni, Withers, and Certo, 2013). This approach involved adding all of our first predictors in the main models to the first-stage equation, as well as selecting two exogenous instrument variables. Based on the idea that board political ideology is influenced in part by supply side factors, we entered: (1) the average conservatism level of directors in the focal firm's 4-digit GICS industry, and (2) the conservatism level of the headquarter state, measured using the voting data from the most recent presidential election. The two variables were significantly predictive of board ideology ($p<.01$, $F=23.27$), but have no direct effect on the masculinity of the incoming CEO. These analyses yielded results that are highly similar to those reported in Tables 2 and 3, such that the instrumented version of the board conservatism measure was a significant predictor across all models. Additionally, the Durbin-Wu-Hausman test did not call for rejection of the null hypothesis that board conservatism was exogenous ($p=.34$), suggesting that omitted variable bias was not a major concern in our sample.

4.4 Results

Variable intercorrelations, means, and standard deviations are reported in Table 1. Tables 2 through 4 present the 15 models we ran to test our hypotheses. Consistent with prior work which finds that facial and vocal masculinity provide independent information about formidability and masculinity (Sell et al., 2010), our facial and vocal masculinity indicators are uncorrelated with each other.

Model 1, 6, and 11 are the baseline models and include only the control and moderating variables. The control variables are generally insignificant predictors of masculinity with the exception of outgoing CEO facial masculinity in predicting incoming CEO facial masculinity, and outgoing CEO vocal masculinity in predicting incoming CEO vocal masculinity. Model 2, 7, and 12 add our explanatory variable, board political conservatism. Model 3, 8, and 13 introduce the interaction term associated with TSR, and Model 4, 9 and 14 introduce the interaction term associated with industry munificence. Finally, Model 5, 10, and 15 include the full model with both interaction terms.

---- Insert Tables 1 through 4 here ----

Hypothesis 1 proposes that conservative boards have a greater preference for masculine CEOs because conservative boards are more sensitive to cues of threat. We find strong support for Hypothesis 1 across all models in which the board conservatism variable was included (2-5, 7-10, and 12-15).

Hypothesis 2 and Hypothesis 3 refer to the moderating effect of firm performance and industry munificence, respectively, on the board political conservatism-incoming CEO masculinity relationship. We argued that when the threat and uncertainty facing the firm is high because of poor firm performance (H2) or low industry munificence (H3), the preference of conservative directors for masculine CEOs will be even stronger. We find support for H2. The prediction for H2 is significant and has the expected sign across all models (3, 5, 8, 10, 13, and 15). The prediction for H3 is significant and has the right sign in the regressions predicting the facial masculinity of the incoming CEO (model 4 and 5) but not in the regressions predicting the vocal masculinity and overall masculinity of the incoming CEO. The interaction plots (Figures 1 through 4) display the significant interactions graphically.

[Insert Figures 1 through 4 here]

In addition to passing the test of statistical significance, our predictors were also meaningful in terms of effect sizes. In models predicting facial masculinity, difference between liberal-leaning (-1 S. D.) and conservative-leaning boards corresponded to approximately four tenth of a standard deviation change in both facial and vocal masculinity, as well as in our composite masculinity index. For facial masculinity, this difference increased to six tenth of a standard deviation when the firm exhibited poor stock performance (-1 S.D.), or when the industry had low munificence (-1 S.D.). Similarly, for vocal masculinity, liberal and conservative boards corresponded to six tenth of a standard deviation when the firm had poor stock performance. In sum, our independent variables were substantively important predictors of the masculinity of the incoming CEO.

4.5 Discussion

4.5.1 Contributions

Our study set out to examine how board political ideology influences the selection of more (versus less) masculine CEOs. Recent research has found that CEO masculinity shapes a variety of organizational outcomes, including CEO compensation (Mayew et al., 2013; Nair and Haque, 2016), financial misreporting (Jia et al.,

2014), and firm performance (Joshi et al., 2017). Using insights from research on evolutionary psychology, political ideology, and behavioral corporate governance, we theorized that because the preference for masculine leaders is driven by perceptions of threat, and because conservative directors are likely to have higher sensitivities to threat, conservative boards would show a stronger preference for masculine CEOs. We further argued that this relationship would be more pronounced in situations where the focal firm faced difficult conditions, specifically poor recent performance and slow industry growth. As discussed above, our results are broadly consistent with these predictions.

We make three major contributions in our study. First, we contribute to the CEO succession literature by addressing the question: Why do CEOs look the way they do? While the puzzle regarding why some individuals are more likely to attain leadership positions than others has long been of interest to management scholars (Bass and Stogdill, 1990; Eagly and Karau, 1991), we still know surprisingly little about how CEOs are sorted into specific firms (Hambrick, 2007; Wowak et al., 2017). The traditional view has been that CEOs are matched to firms based on the fit between executive

skills and the needs of the firm (Chen and Hambrick, 2012; Gupta and Govindarajan, 1984; Hambrick and Crozier, 1985). Thus, when the needs of the firm change, the characteristics of the appointed CEO also change. However, several studies have shown that directors are influenced by cognitive biases during the CEO selection process (Khurana, 2002; Zajac and Westphal, 1996), suggesting that CEO hiring decisions could also be driven by non-economic factors. By showing that the political ideologies of directors affect the extent to which boards gravitate towards masculine CEOs, our research shows that CEO selection decisions are motivated not only by the needs of the firms, but also by the idiosyncratic preferences of directors.

Second, we contribute to the growing literature on diversity in the corporate elite, which (with some exceptions) has been mostly limited to discussions of gender, race, and social class. This research, mostly conducted in Western societies, has shown that executives who are upper-class, Caucasian, and male enjoy a number of privileges, including higher compensation levels (Fiss, 2006; Kulich et al., 2011), greater upward job mobility (Maclean, Harvey, and Kling, 2014; Westphal and Stern, 2007; Stern and

Westphal, 2010), and lower accountability for poor firm performance (Park and Westphal, 2013). We add to this burgeoning domain by providing evidence that differences in masculinity can serve as a source of discrimination – even among those commonly assumed to sit at the apex of the corporate elite. Current theorizing and empirical evidence suggest that the existence of the masculinity bias is cross-cultural in nature (Petersen, 2015) but is magnified by evaluators' perceptions of threats in the environment (Little et al., 2007; Spisak et al., 2012; Tigue et al., 2012). By examining how the political conservatism of the board, a variable tracking directors' threat sensitivity, influences the preference for masculine CEOs, we highlight the salient role of political ideology in shaping diversity-related outcomes (Briscoe and Joshi, 2017; Carnahan and Greenwood, 2018).

Third, we contribute to implicit leadership theory by providing evidence of individual variations in preferences for evolutionary leadership prototypes. While implicit leadership theory has traditionally assumed that leadership prototypes are created through socialization and personal experience (Javidan et al., 2006), more recent research has recognized that some of these prototypes have

deep evolutionary origins (Junker and Dick, 2014; Petersen, 2015; Spisak et al., 2012; Van Vugt and Ronay, 2013). Existing research in this area has tended to focus on situational conditions that activate evolutionary leadership prototypes. For example, the masculinity bias is more apparent in the presence of threatening conditions such as high intergroup competition (e.g., Little et al., 2007; Spisak et al., 2012; Tigue et al., 2012). However, individuals vary in how sensitive they are to threats in the environment (e.g., Federico et al., 2009; Fessler et al., 2017). Our results are consistent with the notion that conservative directors' heightened sensitivity to threat predisposes them toward leaders with more masculine features. While evolutionary scientists going all the way back to Charles Darwin (1859) have highlighted the importance of studying individual differences in evolutionarily adaptive traits, their implications for leadership outcomes – including CEO selection – has remained largely unexplored.

4.5.2 Limitations and future research

Our research has several limitations that present opportunities for future research. First, our study focused on examining the role of CEO masculinity in shaping the board's CEO

selection decisions. However, we can readily envision that CEO masculinity will influence CEO evaluations by other stakeholder groups as well, including shareholders, journalists, and financial analysts. Our study suggests that these effects might hinge on the political ideology of evaluators. Given that these audiences play a key role in CEO career outcomes, future studies exploring this idea could shed even more light on the role of CEO masculinity in brightening (or dimming) the career prospects of top executives.

Second, we focused only on male incoming CEOs in our study because masculine physiological features are more important in influencing the perceptions of male targets (Sell et al., 2009; Sell et al., 2010) and, more practically, because there were too few female incoming CEOs in our study population to accurately model. Existing research has highlighted that unlike masculine males, who are rated by observers as both more leaderlike and more attractive, masculine females are rated as more leaderlike, but less attractive (Puts et al., 2014; Klofstad et al., 2016). In light of the unique tradeoff that females seem to face between masculinity and attractiveness, studying the role of female CEO attractiveness and

masculinity concurrently in CEO selection decisions could be an interesting avenue for future inquiry.

Third, our study was conducted in the U.S. context and may not be generalizable to other national contexts. For instance, directors in countries with weaker political and economic institutions could be more likely to believe that they live in a “competitive jungle” or “dog-eat-dog” world, and hence be more vigilant to threats. Accordingly, they might evidence a stronger overall preference for masculine leaders than directors living in the US. As images and audio clips become more widely available for CEOs across different countries, scholars could examine the extent to which national context matters for our theorized relationships.

4.6 Conclusion

The hiring of a CEO is unquestionably one of the board’s most important responsibilities, yet surprisingly little is known about why CEOs look the way they do. Integrating insights from several academic fields, our theory and findings illustrate that directors’ personal beliefs, and specifically their political ideologies, influence the characteristics that they look for in a CEO. By offering evidence

that directors' ideologies help shape their idealized notions of leadership, we offer a new vantage on CEO succession that can likewise inform research on diversity in the corporate elite and implicit leadership theory.

4.7 Tables and Figures

4.7.1 Table 1. Correlations and descriptive statistics

		Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	Masculinity index	.02	.70																	
(2)	Predecessor masculinity index	.00	.63	.13																
(3)	CEO facial masculinity	.01	1.00	.70	.02															
(4)	Predecessor facial masculinity	.00	.84	.07	.72	.12														
(5)	CEO vocal masculinity	.01	1.00	.68	.08	-.04	-.02													
(6)	Predecessor vocal masculinity	.00	.87	.03	.75	-.09	.09	.14												
(7)	Net sales (logged)	7.91	1.60	.00	-.08	.08	.01	-.06	-.12											
(8)	Return on assets	2.87	1.97	.05	.01	.05	.02	.01	-.01	.19										
(9)	Total shareholder returns (std)	-.02	.99	.06	.02	.05	.01	.02	.01	.03	.21									
(10)	Industry munificence (std)	.02	10.00	-.14	-.07	.02	.01	-.19	-.11	.09	.05	-.14								
(11)	Industry dynamism	.02	.02	.06	.05	-.01	.00	.08	.08	-.02	-.05	-.04	-.09							
(12)	CEO age	56.88	7.60	.08	.08	.05	.01	.07	.10	.05	.00	.04	-.05	.03						
(13)	CEO racial minority status	.04	.20	.03	.06	.09	.05	-.04	.05	.04	.04	.02	.06	-.05	.02					
(14)	Board size	9.28	2.42	.01	-.04	.08	.03	-.07	-.08	.49	.08	.05	-.03	.02	.05	.07				
(15)	Number of independent directors	7.89	2.40	.01	-.02	.00	.01	.01	-.04	.47	.05	.04	-.05	.05	.03	.07	.95			
(16)	CEO conservatism	.53	.20	-.01	.00	.00	-.02	-.02	.02	.08	.03	.04	-.04	-.03	.08	.01	.04	.04		
(17)	Predecessor conservatism	.53	.20	-.02	.03	-.03	.01	.00	.04	.05	.00	.04	-.07	.00	.07	.01	.06	.07	.29	
(18)	Board conservatism (std)	.00	1.01	.12	.07	.12	.06	.10	.04	-.02	.04	.00	-.04	-.04	.05	.02	-.01	.00	.21	.14

4.7.2 Table 2. OLS models predicting facial masculinity of incoming CEOs

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
CEO vocal masculinity	-0.008	-0.044	-0.051	-0.043	-0.050
	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)
Predecessor facial masculinity	0.125*	0.108*	0.113*	0.107*	0.112*
	(0.054)	(0.053)	(0.053)	(0.053)	(0.053)
Net sales (logged)	0.016	0.018	0.021	0.016	0.019
	(0.036)	(0.035)	(0.035)	(0.035)	(0.035)
Return on assets	0.003	0.002	0.002	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Total shareholder returns (std)	0.018	0.029	0.017	0.026	0.013
	(0.050)	(0.049)	(0.050)	(0.049)	(0.049)
Industry munificence (std)	-0.065	-0.057	-0.061	-0.063	-0.067
	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)
Industry dynamism	2.250	2.916	2.904	3.125	3.117
	(3.309)	(3.261)	(3.253)	(3.249)	(3.240)
CEO age	0.004	0.004	0.005	0.004	0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
CEO racial minority status	0.358	0.333	0.339	0.357	0.364
	(0.231)	(0.228)	(0.227)	(0.227)	(0.226)
Board size	0.139*	0.145*	0.142*	0.143*	0.139*
	(0.066)	(0.065)	(0.065)	(0.065)	(0.065)
Number of independent directors	-0.144*	-0.151*	-0.149*	-0.144*	-0.141*
	(0.067)	(0.066)	(0.066)	(0.066)	(0.065)
CEO conservatism	0.446	0.164	0.157	0.169	0.162
	(0.391)	(0.391)	(0.390)	(0.390)	(0.388)
Predecessor conservatism	-0.358	-0.304	-0.302	-0.333	-0.333
	(0.391)	(0.385)	(0.384)	(0.383)	(0.382)
Board conservatism (std)		0.206**	0.204**	0.202**	0.200**
		(0.049)	(0.049)	(0.049)	(0.049)
Board conservatism X TSR			-0.103+		-0.107*
			(0.055)		(0.054)
Board conservatism X Industry munificence				-0.113*	-0.116*
				(0.049)	(0.049)
Constant	-0.523	-0.419	-0.494	-0.448	-0.527
	(0.441)	(0.435)	(0.436)	(0.433)	(0.434)
R2	0.04	0.07	0.07	0.08	0.08
N	528	528	528	528	528

+ $p<0.1$; * $p<0.05$; ** $p<0.01$

4.7.3 Table 3. OLS models predicting vocal masculinity of incoming CEOs

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
CEO facial masculinity	-0.001	-0.040	-0.047	-0.039	-0.046
	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)
Predecessor vocal masculinity	0.153**	0.137*	0.132*	0.138*	0.133*
	(0.058)	(0.057)	(0.057)	(0.057)	(0.057)
Net sales (logged)	-0.055	-0.051	-0.047	-0.050	-0.047
	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
Return on assets	0.006	0.005	0.005	0.005	0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Total shareholder returns (std)	0.053	0.063	0.050	0.064	0.051
	(0.052)	(0.051)	(0.052)	(0.051)	(0.052)
Industry munificence (std)	-0.107*	-0.097+	-0.102*	-0.096+	-0.101*
	(0.052)	(0.051)	(0.051)	(0.051)	(0.051)
Industry dynamism	5.575	6.234+	6.217+	6.204+	6.195+
	(3.452)	(3.389)	(3.381)	(3.395)	(3.386)
CEO age	0.006	0.006	0.007	0.006	0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
CEO racial minority status	-0.213	-0.219	-0.207	-0.222	-0.209
	(0.242)	(0.237)	(0.237)	(0.238)	(0.237)
Board size	-0.079	-0.065	-0.067	-0.065	-0.067
	(0.070)	(0.068)	(0.068)	(0.068)	(0.068)
Number of independent directors	0.094	0.078	0.078	0.077	0.078
	(0.070)	(0.069)	(0.069)	(0.069)	(0.069)
CEO conservatism	0.179	-0.127	-0.135	-0.127	-0.135
	(0.408)	(0.406)	(0.405)	(0.406)	(0.405)
Predecessor conservatism	-0.000	0.045	0.046	0.049	0.049
	(0.407)	(0.400)	(0.399)	(0.400)	(0.399)
Board conservatism (std)		0.234**	0.233**	0.234**	0.233**
		(0.051)	(0.051)	(0.051)	(0.051)
Board conservatism X TSR			-0.108+		-0.107+
			(0.057)		(0.057)
Board conservatism X Industry munificence				0.013	0.009
				(0.052)	(0.052)
Constant	-0.250	-0.141	-0.224	-0.137	-0.220
	(0.461)	(0.453)	(0.454)	(0.453)	(0.454)
R2	0.06	0.09	0.10	0.09	0.10
N	528	528	528	528	528

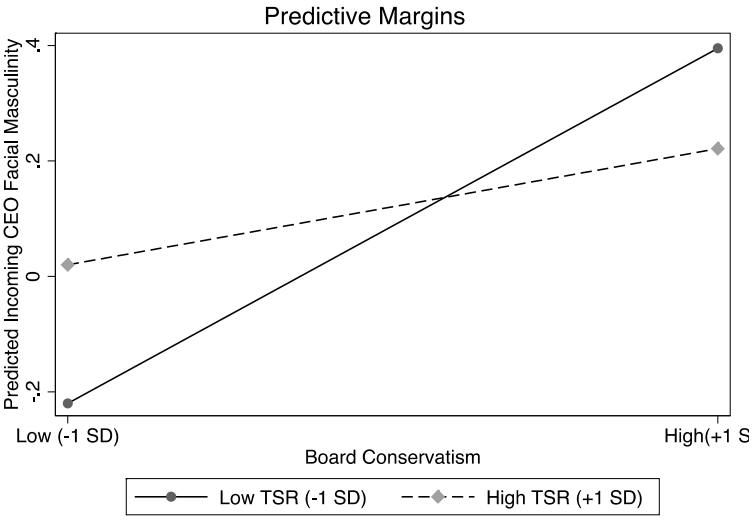
+ $p<0.1$; * $p<0.05$; ** $p<0.01$

4.7.4 Table 4. OLS models predicting masculinity index of incoming CEOs

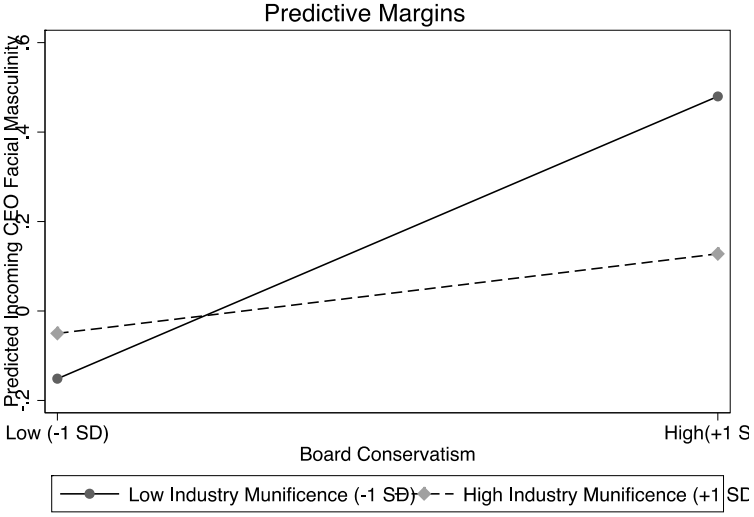
Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Predecessor masculinity index	0.036	0.013	0.015	0.012	0.013
	(0.053)	(0.051)	(0.051)	(0.051)	(0.051)
Net sales (logged)	-0.024	-0.020	-0.016	-0.021	-0.017
	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)
Return on assets	0.005	0.004	0.004	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Total shareholder returns (std)	0.035	0.044	0.032	0.043	0.030
	(0.036)	(0.035)	(0.035)	(0.035)	(0.035)
Industry munificence (std)	-0.090*	-0.078*	-0.082*	-0.081*	-0.084*
	(0.036)	(0.034)	(0.034)	(0.034)	(0.034)
Industry dynamism	4.136+	4.651*	4.594*	4.750*	4.697*
	(2.381)	(2.296)	(2.284)	(2.295)	(2.282)
CEO age	0.006	0.006	0.007	0.006	0.007
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
CEO racial minority status	0.094	0.076	0.083	0.087	0.095
	(0.167)	(0.161)	(0.160)	(0.161)	(0.160)
Board size	0.025	0.033	0.031	0.032	0.030
	(0.048)	(0.046)	(0.046)	(0.046)	(0.046)
Number of independent directors	-0.020	-0.030	-0.029	-0.027	-0.026
	(0.048)	(0.046)	(0.046)	(0.046)	(0.046)
CEO conservatism	0.295	-0.005	-0.013	-0.004	-0.011
	(0.282)	(0.276)	(0.274)	(0.276)	(0.274)
Predecessor conservatism	-0.159	-0.102	-0.101	-0.115	-0.114
	(0.282)	(0.272)	(0.270)	(0.271)	(0.270)
Board conservatism (std)		0.216**	0.213**	0.214**	0.212**
		(0.034)	(0.034)	(0.034)	(0.034)
Board conservatism X TSR			-0.100**		-0.102**
			(0.038)		(0.038)
Board conservatism X Industry munificence				-0.050	-0.052
				(0.035)	(0.035)
Constant	-0.409	-0.290	-0.363	-0.304	-0.378
	(0.318)	(0.307)	(0.307)	(0.307)	(0.306)
R2	0.04	0.11	0.12	0.11	0.12
N	528	528	528	528	528

+ $p<0.1$; * $p<0.05$; ** $p<0.01$

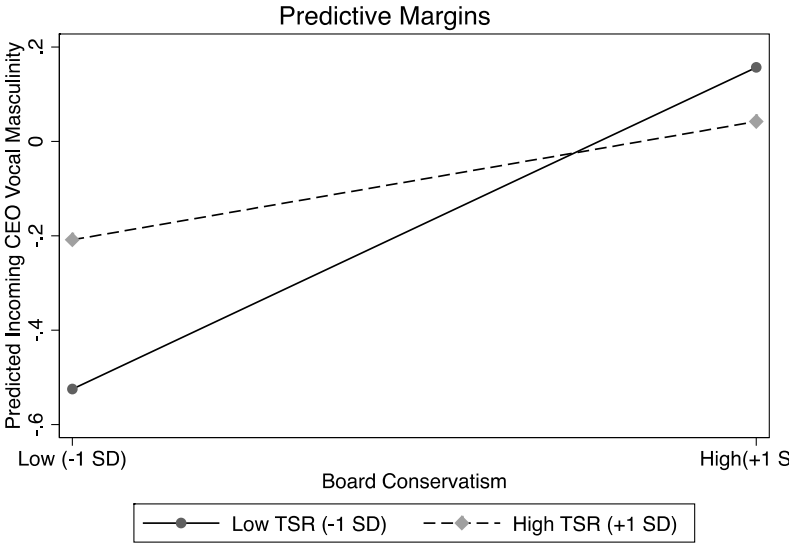
4.7.5 Figure 1. The effect of board conservatism on the facial masculinity of the incoming CEO – under high versus low stock performance



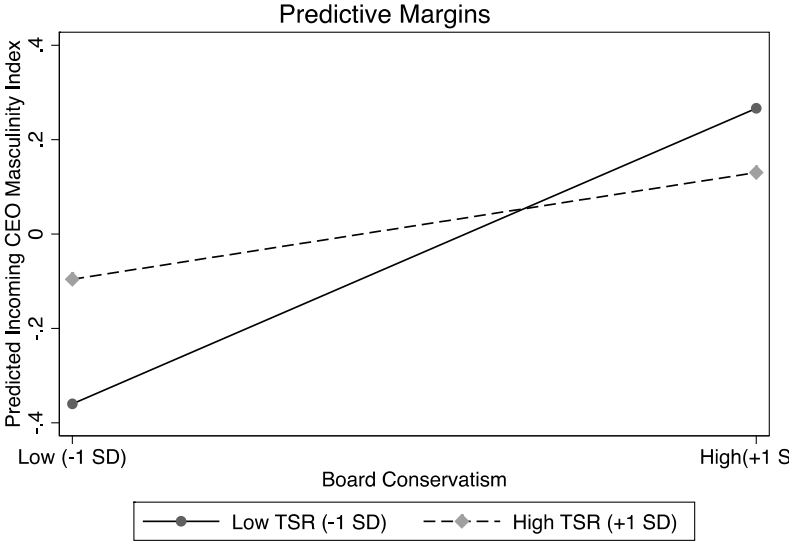
4.7.6 Figure 2. The effect of board conservatism on the facial masculinity of the incoming CEO – under high versus low industry munificence



4.7.7 Figure 3. The effect of board conservatism on the vocal masculinity of the incoming CEO – under high versus low stock performance



4.7.8 Figure 4. The effect of board conservatism on the overall masculinity (composite of vocal and facial masculinity) of the incoming CEO – under high versus low stock performance



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English Summary

The large body body of literature on corporate leadership is diverse in many dimensions, but the studies in this area typically share an underlying (if implicit) belief that social forces are the primary driver of perceptions and behavior. While acknowledging the relevance of these social factors, I suggest that there is the potential to substantially advance our understanding of executive behavior by considering a very different perspective; namely, one that is rooted in biological rather than social explanations. Building on recent research in evolutionary psychology, the three papers in this dissertation examine how biological signals of fighting ability that appear in the face and voice affect executive behavior, selection, and compensation. This work contributes to the corporate leadership literature by introducing a unique perspective that complements existing approaches to studying the drivers of corporate leader perceptions and behavior.

Samenvatting (summary in Dutch)

De literatuur inzake het bestuur van organisaties is divers op uiteenlopende manieren, maar de studies delen vaak een onderliggende overtuiging dat sociale krachten primaire drijfveren zijn van percepties en gedragingen. Ondanks dat ik de relevantie van deze sociale krachten erken, suggereer ik dat er een potentieel is om ons begrip van bestuurlijk gedrag te vergroten door een ander perspectief te overwegen; namelijk, één die is geworteld in biologische verklaringen in plaats van sociale. Voortbouwend op recente onderzoek in evolutionaire psychologie, onderzoek ik middels de drie artikelen in deze dissertatie hoe bestuurlijk gedrag, selectie en compensatie beïnvloed worden door biologische signalen met betrekking tot de capaciteit om fysieke conflicten te winnen die zich manifesteren op het gezicht en in de stem. Dit werk draagt bij aan de literatuur inzake het bestuur van organisaties door een uniek perspectief te introduceren dat bestaande benaderingen complementeert inzake de drijfveren van percepties en gedragingen van bestuurders.

About the Author

Krishnan Nair is a Postdoctoral Fellow at the Kellogg School of Management at Northwestern University. His research applies insights from the evolutionary sciences to study topics related to corporate governance and politics. His PhD dissertation explores the effect of business executives' physiological features on their behavior, compensation, and selection. His other research examines the role of ethnic interests in shaping political behavior and the relationship between family characteristics and family conflicts in family businesses. The first paper from Krishnan's dissertation has been published in *Psychological Science*, one of the leading journals in the field of psychology. He has presented his papers at a number of conferences, including multiple annual meetings of the Academy of Management and the Strategic Management Society. He will defend his PhD dissertation (in Strategy and Entrepreneurship) at Erasmus University on October 11, 2019.

Portfolio

Publications

Nair, K., & Haque, W. “It’s Not What I Say but How I Sound: The Effect of CEO Vocal Masculinity on CEO Compensation.” *2016 AOM “Best Papers” Proceedings, BPS Division.*

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Research Visits

Visiting Predoctoral Fellow, Kellogg School of Management, Northwestern University (2017-2019).

Conferences Presentations

Nair, K., Lee, E., & Zajac, E. (March 2019) “Whose Call is It? Examining the CEO/Analyst Relationship.” Strategic Management Society Special Conference, Las Vegas, Nevada.

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Nair, K (January 2016). "Status and Partner Choice: A Darwinian Perspective." AMR-OMT workshop with the AMR editors, Rotterdam, Netherlands.

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