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**ARE BOARDS SENSITIVE TO CEO MASCULINITY? THE EFFECT OF CEO
FACIAL AND VOCAL MASCULINITY ON CEO DISMISSAL**

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ARE BOARDS SENSITIVE TO CEO MASCULINITY? THE EFFECT OF CEO FACIAL AND VOCAL MASCULINITY ON CEO DISMISSAL

ABSTRACT

Drawing on evolutionary psychology theorizing, this paper examines how CEO facial and vocal masculinity—as evolved biases shaping peoples’ perceptions of an individual’s leadership ability—influence boards’ dismissal decisions. Specifically, we theorize that boards are likely to perceive CEO facial and vocal masculinity as costly to the firm, as they signal aggression, dominance, and risk-taking—traits that are only valued in the narrow context of conflict. Based on this reasoning, we argue that CEO facial and vocal masculinity will be positively related to CEO dismissal. Further, we develop contingency arguments which suggest that CEO facial and vocal masculinity will interact with analysts’ evaluation of firm performance to jointly influence CEO dismissal. We test and find support for our predictions using a panel dataset of CEOs from S&P1500 firms.

Keywords: *boards of directors, CEO dismissal, CEO masculinity, evolutionary psychology, financial analysts.*

INTRODUCTION

The causes and consequences of CEO dismissal have long been a central concern for management and strategy researchers (Finkelstein et al., 2009). Dismissal—defined as the ad-hoc and forced departure of a CEO (Fredrickson et al., 1988)—is considered one of the most consequential governance decisions a board of directors will make for the firm (Connelly et al., 2020; Zhang, 2008), affecting operations, investment, and financing (see Berns et al. 2021 for a review). According to this line of work, poor firm performance relative to expectations, particularly those of financial analysts, is a major factor driving a board’s decision to dismiss the CEO (Farrell and Whidbee, 2003; Gentry et al., 2021; Puffer and Weintrop, 1991; Wiersema and Zhang, 2011). Indeed, CEOs are held responsible for the firm’s performance and boards use analysts’ performance expectations as a benchmark to assess CEOs and make subsequent dismissal decisions (Brauer and Wiersema, 2018).

Although scholars have devoted considerable attention to understanding the determinants of CEO dismissal, studies have tended to focus narrowly on the implications of firm performance and well-established agency arguments relating to board governance and composition (e.g., Boeker, 1992; Crossland and Chen, 2013; Flickinger et al., 2016; Hubbard et al., 2017). Far less is known about how the observable features of CEOs themselves—such as their face and voice—may influence boards’ dismissal decisions. To the extent that the corporate governance literature has considered CEOs’ facial and vocal features, facial and vocal *masculinity*—as indicated by a high facial width-to-height ratio (fWHR: the ratio of bizygomatic width to upper facial height) and low voice pitch—have been shown to bias boards’ early-stage hiring (Gomulya et al., 2017) and compensation decisions (Nair et al., 2022).

However, whether the masculinity bias evoked from CEOs' facial and vocal features extends to boards' later-stage dismissal decisions, which tend to occur after a CEO has built a track record with the organization and more reliable performance information exists, is theoretically inconclusive. On the one hand, studies suggest that boards will be less susceptible to the masculinity bias evoked from CEOs' facial and vocal features since there is more diagnostic performance information to assist their evaluations (Boivie et al., 2016; Graffin et al., 2013). As Graffin and colleagues (2013, p. 386) state, "heuristics will likely only be employed until reliable performance metrics such as firm performance become available later in the CEO's tenure." On the other hand, the evolutionary psychology literature suggests that boards will be equally susceptible to the masculinity bias, as the inferences people make about individuals from their facial and vocal features have been biologically adapted and are persistent over time (McAleer et al., 2014; Todorov et al., 2015). As such, it is not clear whether the masculinity bias exhibited by boards in early-stage hiring and compensation decisions will extend to later-stage dismissal decisions.

In this study, we depart from prior performance and agency-based explanations of CEO dismissal to propose that boards' dismissal decisions are likely to be influenced by CEOs' facial and vocal features. While previous studies suggest that boards utilize analysts' evaluation of firm performance to make inferences about a CEO, performance is causally ambiguous and resilient to precise identification (Lippman and Rumelt, 1982), which makes assessing CEOs' effect on the firm difficult (Fitza, 2017; Quigley and Graffin, 2017). Thus, we contend that CEOs' observable features will be a salient reference point for boards when making their dismissal decisions. According to evolutionary psychology research, fWHR and voice pitch are pervasive attributes that shape peoples' perceptions about an individual's masculinity (Geniole and McCormick, 2015; Puts et al., 2007, 2014) and, by extension, leadership ability in different contexts (Devine et al., 2021). Masculinity is argued to be an evolutionary signal

of aggression, dominance, and risk-taking—leadership traits favored during human ancestral times in the narrow context of conflict, but opposed in a broader array of contexts, including those requiring cooperation, diplomacy, honesty, peace, and trust (Van Vugt and Grabo, 2015). Although research has shown that fWHR and voice pitch are *not* predictive of an individual’s masculinity or leadership ability today (Klofstad and Anderson, 2018), they continue to bias peoples’ perceptions. The existence of facial and vocal masculinity bias is argued to be a case of an evolutionary mismatch, where physical features that were once predictive of actual leadership ability and behavior in human ancestral times no longer apply today, but nonetheless continue to bias peoples’ perceptions (Nair et al., 2022; Wang et al., 2019).

Drawing on evolutionary psychology theorizing, we first argue that CEO facial and vocal masculinity will be positively related to dismissal (i.e., they will increase the likelihood of dismissal) given the narrow context of conflict in which masculine traits were evolutionarily valuable. Indeed, research suggests that masculinity has been selected against over the course of human evolution due to the perceived costs associated with aggression and dominance (Wrangham, 2018, 2019). Second, since the value of masculine traits is contingent on their perceived ‘*fit*’ with the environmental context (Van Vugt and Grabo, 2015), we also propose interactive effects of CEOs’ fWHR and voice pitch with analysts’ evaluation of firm performance as a critical situational circumstance. Because boards seek CEOs that will undertake aggressive changes when firm performance is poor (Cannella and Shen, 2001; Shen and Cannella, 2002), we argue that a deterioration in analysts’ evaluation of performance will weaken the positive effects of CEO facial and vocal masculinity on dismissal. Conversely, as boards seek CEOs with social capital when performance is good (Wiersema et al., 2018), we expect that an improvement in analysts’ evaluation of firm performance will strengthen the positive effects of CEO facial and vocal masculinity on dismissal. We test and find support for our hypotheses using a panel dataset of male CEOs of S&P1500 firms between 2000 and 2018.

Our results provide strong support for our theory by showing that a deterioration in analysts' evaluation of firm performance not only reduce the positive effects of CEO facial and vocal masculinity on dismissal, but reverse the valence of the effects from positive to negative as poor performance intensifies.

Our study contributes to the corporate governance literature in two ways. First, we advance a novel evolutionary psychology account of CEO dismissal that considers how CEO facial and vocal masculinity influence boards' dismissal decisions. Extending recent work that examines how CEO facial and vocal masculinity impact boards' early-stage hiring and compensation decisions (Gomulya et al., 2017; Nair et al., 2022), we demonstrate how the masculinity bias evoked from these features is persistent and carries over to boards' later-stage dismissal decisions. Second, in considering how analysts' evaluation of firm performance moderates the effects of CEO facial and vocal masculinity on dismissal, our study offers new insights into *when* and *why* poor performance may not always lead to an increased likelihood of dismissal as the extant literature suggests (see Finkelstein et al., 2009 for a review). Specifically, we highlight a double-edged sword of CEO facial and vocal masculinity, which gradually decreases their dismissal risk as performance expectations deteriorate—ultimately reversing the positive relationship as the deterioration becomes more extreme—and increases their dismissal risk as performance expectations improve.

THEORY AND HYPOTHESES

CEO Dismissal

CEO turnover has become increasingly common among the world's largest corporations, reaching a record high of 17 percent in 2018 (PwC, 2018). While CEOs can leave the firm for several reasons, including retirement and voluntary resignation, the most theoretically intriguing form of CEO turnover is that of dismissal, where the CEO is forcibly removed from the company by the board of directors (Finkelstein et al., 2009). This is because dismissing the CEO is one of the most important governance mechanisms that a board uses to protect the firm and its shareholders when their assessment of the CEO's leadership is negative (Fama and Jensen, 1983; Fiordelisi and Ricci, 2014). Indeed, boards are responsible for monitoring and controlling firms' executives (Jensen and Meckling, 1976) and serve as "shareholders' first line of defense against incompetent management" (Weisbach, 1988, p. 431).

According to the corporate governance literature, firm performance is the principal metric that boards use to assess CEOs and make their dismissal decisions (Finkelstein et al., 2009; Hilger et al., 2013). Several studies have empirically demonstrated the central role of firm performance in driving the dismissal of CEOs—both in terms of accounting-based measures of performance, as captured by metrics such as industry-adjusted return-on-assets (e.g., Hubbard et al., 2017), and in terms of analysts' performance expectations, as captured by their recommendations and downgrades (e.g., Wiersema and Zhang, 2011). However, the performance expectations of analysts are considered particularly salient for boards when evaluating CEOs (e.g., Mergenthaler et al., 2012; Puffer and Weintrop, 1991). Analysts are recognized as legitimate third-party experts who assess a firm and its executives based on several factors, including—but not isolated to—accounting-based measures of performance (Westphal and Clement, 2008; Wiesenfeld et al., 2008). In addition to accounting-based

measures of performance, analysts consider a firm's environment and prospects when making their evaluations. As such, they are considered critical stakeholders for boards when assessing a CEO (Brauer and Wiersema, 2018). For instance, Farrell and Whidbee (2003) find that boards are more likely to dismiss a CEO if the firm has failed to meet analysts' earnings per share forecast, especially when there is less dispersion among individual forecasts and a higher number of analysts following the firm. Similarly, Wiersema and Zhang (2011) find that negative analyst recommendations increase the likelihood of CEO dismissal. More recently, Gentry, Harrison, Quigley, and Boivie (2021), using their open access database of CEO turnover and dismissal, show that various measures of performance—including analyst recommendations and downgrades—are predictive of dismissal.

Despite the consistency of evidence regarding the importance of analysts' performance expectations as a determinant of CEO dismissal, measures of performance explain only a small proportion of the variance in dismissal and turnover rates (Finkelstein et al., 2009). Indeed, boards face difficulties in evaluating CEOs based on measures of performance alone, as it "does not necessarily reflect the CEO's leadership" (Wang et al., 2023, p. 1331). This is because firm performance is complex and causally ambiguous due to the many factors outside of a CEO's control that play a role in determining how well the firm performs, including resource endowments, industry trends, macroeconomic conditions (Graffin et al., 2013; Quigley and Graffin, 2017), and luck (Fitzg, 2017). Further, CEOs' job demands are complex and change as a function of the internal organizational and external industry environment (Hambrick et al., 2005). As such, even in light of what is considered an 'objective' firm performance evaluation from expert analysts, assessing a CEO's efficacy in a changing demand environment is a difficult task for a board and fraught with uncertainty (Wade et al., 2006).

Thus, although prior work suggests that boards will only be susceptible to exhibiting biases in the early stages of a CEO's tenure due to the lack of robust firm performance information to

guide their evaluations (Graffin et al., 2013), we propose that boards will also be susceptible to biases in the later stages of tenure. Given the ambiguous nature of performance and difficulty in assessing CEOs, we contend that the masculinity bias evoked from CEOs' facial and vocal features that have been shown to influence boards' early-stage hiring and compensation decisions (Gomulya et al., 2017; Nair et al., 2022) will also extend to later-stage dismissal decisions. The evolutionary psychology literature has long suggested that people draw inferences about the traits, attributes, and competencies of individuals based on their facial and vocal features (Puts et al., 2006; Todorov et al., 2015). It is to this literature we now turn.

CEO Facial and Vocal Masculinity and CEO Dismissal

According to evolutionary psychology theory, our judgements about individuals as potential leaders are shaped by cues that convey information about their ability to solve specific coordination challenges experienced across human evolutionary history (Van Vugt et al., 2008), such as hunting, gathering, fighting off predators, managing conflicts, negotiating, brokering relations, and peacekeeping (Van Vugt, 2006; Van Vugt and Ahuja, 2010; Van Vugt and Grabo, 2015). Darwin (1968 [1859]), in his theory of evolution, recognized that organisms produce more offspring than can survive, which leads to a struggle for existence whereby only the fittest endure. Thus, heuristics adapted for recognizing various characteristics and traits in individuals for solving specific coordination challenges were critical for survival.

An important adaptation in this regard was the ability to infer traits of masculinity as a leadership attribute (Van Vugt and Grabo, 2015), since evidence suggests that life in human ancestral times was highly competitive and conflict laden (Van Vugt et al., 2008). Reviews of hunter-gatherer societies indicate that many had a "Big Man" as an informal leader who was the best hunter and warrior (e.g., Boehm, 1999; Lewis, 1974). Further, during the agricultural revolution and rise of permanent settlements, which inevitably led to greater intergroup conflict

over resources, a vacuum was created for the rise of “tough aggressive men who built coalitions of followers united in the common purpose of extracting resources by force” (Van Vugt et al., 2008, p. 188). Thus, to ensure survival in domains characterized by conflict and antagonistic competition, it is argued that individuals adapted heuristics for identifying masculine male leaders who possessed traits of aggressiveness, dominance, and risk-taking.

Historically, such traits were identified by the “big and imposing, wide and long” facial features (Wrangham, 2019, p. 139) and deep voices of early male humans (Puts et al., 2006). There is an abundance of research that has shown that fWHR and voice pitch are important physical features correlated with people’s perceptions of masculinity (Geniole et al., 2014, 2015; Puts et al., 2014). Spisak et al. (2012), for instance, find that individuals with a high-fWHR are more likely to be perceived as masculine. Similarly, in the case of voice pitch, studies have shown that there is a bias towards selecting individuals with a low (i.e., deep) voice for positions of leadership (e.g., Klofstad, 2016; Klofstad et al., 2012). Klofstad and Anderson (2018), for example, find that politicians with a low-pitched voice are more likely to win elections. Thus, while individuals’ facial and vocal features are not predictive of their actual leadership ability today, they continue to bias peoples’ perceptions and serve as sensemaking inputs for perceivers (Nair et al., 2022; Wang et al., 2019). This is also illustrated in research that shows how the inferences drawn from individuals’ facial and vocal masculinity are instantaneous and persistent over time (e.g., McAleer et al., 2014; Todorov et al., 2015; Todorov and Uleman, 2002, 2003, 2004). As Todorov and Willis (2006) demonstrate, perceivers make judgements about individuals in less than 100 milliseconds of facial exposure.

Despite there being some historical benefit to inferring masculinity during human ancestral times in the narrow context of conflict, masculine traits of aggression, dominance, and risk-taking are considered undesirable in a much broader array of contexts, including those requiring civility, cooperation, negotiation, peace, and trust among others (Spisak et al., 2012;

Van Vugt and Grabo, 2015). As such, masculinity has been actively selected against over the course of human evolution (Wrangham, 2019). As Darwin (2005 [1871], p. 875) states, “violent and quarrelsome men often came to a bloody end.” This idea has been advanced by several scholars who propose that, due to the undesirable behavior exhibited by masculine men who used aggression in selfish and exploitative ways, often to the detriment of others, such individuals were executed by their social group (Wrangham, 2018, 2019). This led to the emergence of a less aggressive psychology as human social groups became larger, more complex, and relied on other traits to function and survive (Wrangham, 2019).

Although this selection against masculine traits may seem at odds with the well-known “think manager-think male” stereotype of leadership (Eagly and Karau, 2002; Schein, 2001), which remains a substantial hurdle for the advancement of females in executive roles, this stereotype is not isolated to a preference for ‘masculine’ male leaders that are presumed aggressive, dominant, and risk-prone. As Wiesel and colleagues (2024) recently demonstrated across several experimental studies, people not only spontaneously imagine dominant (i.e., masculine) leaders as being male, but also prestigious leaders as male—those they believe are socially capable or possess specialized knowledge or skill. Further, they found that people exhibited a general preference for prestigious over dominant leaders, as they are viewed as more cooperative, kinder, less aggressive, and less exploitative. As such, the selection against masculine male leaders does not imply a preference for female leaders or feminine features that contradict the “think manager-think male” stereotype.

In sum, outside of the narrow context of conflict where masculine traits were evolutionarily valuable, masculinity is generally perceived as costly and is socially undesirable among followers. Studies have shown that individuals with a masculine face and voice are considered less trustworthy and more immoral than individuals with less masculine features (Spisak et al., 2012; Van Vugt and Grabo, 2015). In the case of CEOs, therefore, we contend that boards may

subconsciously penalize those with highly masculine facial and vocal features, as they are considered too reckless, aggressive, and selfish for most organizational situations. When a CEO's features are perceived as being incongruent with organizational demands and potentially costly, boards are more likely to dismiss the CEO. Thus, given the narrow context of conflict in which masculine attributes were considered valuable and the general selection against masculinity over the course of human evolutionary history, we expect—*ceteris paribus*—that CEO facial and vocal masculinity will be positively associated with dismissal. Formally stated:

Hypothesis 1a: CEO facial masculinity is positively associated with CEO dismissal.

Hypothesis 1b: CEO vocal masculinity is positively associated with CEO dismissal.

Firm Performance, CEO Facial and Vocal Masculinity, and CEO Dismissal

Given our baseline hypotheses rest on the assumption that boards are sensitive to the perceived *fit* between a CEO's facial and vocal features with the firm's situational context when making dismissal decisions (Chen and Hambrick, 2012), we also develop contingency arguments. Specifically, we propose interactive effects with analysts' recommendations and downgrades as important measures of firm performance.

The evolutionary psychology literature suggests that humans evolved to be highly sensitive to changes within their environment, and such changes shifted peoples' perceptions of what constitutes a 'good' leader (Spisak et al., 2012; Van Vugt, 2006; Van Vugt and Spisak, 2008). In contexts of conflict, the evolved heuristic is to follow a masculine leader who is perceived as being capable of resolving antagonistic engagements and competition with other groups; whereas in other contexts—such as those requiring cooperation between ingroup members or

competence—the evolved heuristic is to select *against* masculine leaders that are considered too aggressive and domineering (Grabo and Van Vugt, 2018; Spisak et al., 2012). Since analysts' evaluation of firm performance is a salient contextual factor influencing boards' perceptions of a CEO, we expect that boards' assessments and dismissal decisions will be shaped by the perceived fit between the CEO's facial and vocal attributes and the firm's performance situation.

As analysts' evaluation of performance deteriorates, we contend that the board will perceive an increasing need for an aggressive CEO who will engage in antagonistic competition and potential conflict with peer organizations to improve the performance prospects of the firm. Under such conditions, boards will start to interpret masculine traits in a more positive light—such as the aggressive pursuit of success and the motivation to dominate others (e.g., Klofstad and Anderson, 2018; Spisak et al., 2012)—due to their alignment with the firm's eroding performance situation. As several studies on CEO turnover and succession indicate, boards look towards CEOs that they believe will undertake aggressive changes and overhaul existing strategies to rectify poor performance (e.g., Cannella and Shen, 2001; Karaevli, 2007; Shen and Cannella, 2002). Since facial and vocal masculinity are pervasive features that evoke perceptions of aggression, dominance, and risk-taking among perceivers, we expect that boards will start to place more value on these features as analysts' evaluation of firm performance worsens. Indeed, prior work suggests that masculine leaders are viewed as being capable of taking command to resolve conflict and competitive threats (Wiesel et al., 2024). Thus, we argue that a deterioration in analysts' evaluation of firm performance will weaken the positive effects of CEO facial and vocal masculinity on dismissal, as boards will perceive masculine traits as being increasingly aligned with organizational needs.

Conversely, as analysts' evaluation of firm performance improves, we contend that boards will perceive a decreasing need for masculine traits of aggression, dominance, and risk-taking.

Although masculine individuals are valued in the narrow context of conflict, they are also perceived as being antisocial and detrimental to ingroup solidarity (Van Vugt and Grabo, 2015; Wiezel et al., 2024). As performance increases, the perceived antisocial nature of masculine CEOs will be viewed more critically given the firm is likely to pursue growth strategies that require strong internal and external social ties to others, which facilitate access new products, markets, and technologies (Cao et al., 2015). Indeed, prior work suggests that CEO social capital positively impacts a firm's ability to access and secure resources and identify opportunities (e.g., Geletkanycz and Hambrick, 1997; McDonald et al., 2008). Moreover, Wiersema and colleagues (2018) found that boards are more likely to appoint CEOs with greater social capital when firm performance is high. Thus, we argue that improvements in analysts' evaluation of firm performance will strengthen the positive effects of CEO facial and vocal masculinity on dismissal, as boards will perceive masculine traits as being increasingly misaligned with organizational needs. Accordingly, we hypothesize that:

Hypothesis 2a: Analysts' evaluation of firm performance moderates the positive relationship between CEO facial masculinity and dismissal, such that the relationship will be weakened (strengthened) as analysts' evaluation worsens (improves).

Hypothesis 2b: Analysts' evaluation of firm performance moderates the positive relationship between CEO vocal masculinity and dismissal, such that the relationship will be weakened (strengthened) as analysts' evaluation worsens (improves).

METHODS

Data and Sample

We tested our hypotheses using a sample of CEOs of S&P1500 firms spanning the period 2000 to 2018. We constructed our sample by intersecting data from several sources. First, since we

seek to examine how CEOs' facial and vocal masculinity influence boards' dismissal decisions, we started with an open access database on CEO turnover and dismissal in S&P1500 firms developed by Gentry et al. (2021), which covers CEO turnover events starting from 2000.^[1] We chose this database as our starting point as it alleviates some of the difficulties highlighted in prior research about distinguishing dismissal from other types of turnover (Shen and Cannella, 2002). Specifically, the authors use a robust protocol and coding scheme to gather evidence for various types of CEO turnover.

Second, we merged this data with CEO-level data from ExecuComp, firm-level data from Compustat, board characteristics data from Institutional Shareholder Services (ISS), and analyst recommendation data from Institutional Brokers Estimates Systems (I/B/E/S). Third, we manually gathered CEOs' photos from various sources, such as company websites, news articles, and annual reports to derive our measure of CEO facial masculinity. In circumstances where a CEO was no longer in office, we searched Google Images for available pictures using the CEO's family name and company affiliation. If the search returned more than one image, we selected the best image in terms of resolution, natural expression, and angle (i.e., forward facing). Finally, we manually obtained CEOs' voice data from recorded quarterly earnings conference calls archived in the Refinitiv Eikon database to derive our measure of CEO vocal masculinity.

We restricted our sample to male CEOs only because of the sexually dimorphic nature of facial structure (Carré and McCormick, 2008; Jia et al., 2014) and voice pitch (Puts et al., 2006, 2012; Mayew et al., 2013). Further, female CEOs are severely underrepresented and comprise only 2.7 percent of our sample. Our final (full) sample consisted of 5,716 CEO-firm-quarter observations for 235 unique firms and 351 CEOs. Consistent with our assumption that dismissal tends to be a later-stage decision for boards, the average tenure of a dismissed CEO was 16.5 years ($SD = 6.7$ years). The sample selection procedure is documented in

supplementary appendix A1. Given we test our hypotheses using a logistic regression on a propensity-score-matched sample of CEOs to alleviate endogeneity concerns (Li, 2012), there are fewer observations in the reported regression results than the stated final sample size owing to the matching procedure. To ease interpretation, we standardized all continuous variables prior to estimating our regression models.

Dependent Variable

We followed Gentry et al. (2021) and defined our dependent variable of *CEO dismissal* as all forced turnover events. These include dismissals for job-related (e.g., firm performance) and behavior-related reasons (e.g., company policy violations and behavioral concerns), which were identified by negative media coverage citing such issues. We coded CEO dismissal as 1 if a CEO was forcibly removed for either job- or behavior-related reasons, and 0 otherwise. Our full sample contained 923 dismissal events, of which 817 were for job-related reasons and 106 for behavior-related reasons according to Gentry et al.'s (2021) database. We included both job- and behavior-related dismissals in our measure, as boards may justify the removal of a masculine executive using either job- or behavior-related reasons.

Explanatory Variables

CEO facial masculinity. We measured CEO facial masculinity as the ratio of facial width (i.e., the horizontal distance between the left and right facial zygion) to facial height (i.e., the vertical distance between the upper lip and the highest point of the eyelid) (Carré and McCormick, 2008; Jia et al., 2014). We hired two doctoral research assistants to search for and measure images of CEOs. The research assistants were trained by the authors on how to identify the best available image according to resolution, natural expression, and forward-facing orientation, as well as measure fWHR using ImageJ software. CEO facial masculinity was then calculated as the average of the two independent measurements taken by each research

assistant. In situations where the difference between measures was more than 5 percent, which occurred for approximately 11 percent of measurements, a third research assistant was employed and the new measure was averaged with the closest of the two original measures.

CEO vocal masculinity. We captured CEO vocal masculinity by capturing each CEO's vocal fundamental frequency (F_0), defined as the average number of oscillations in speech per second as measured in Hertz (H_z). Mayew et al. (2013) suggest that measuring F_0 provides a quantifiable indication of an individual's voice pitch. We used PRAAT software (version 6.1.56) with the autocorrelation method and default system settings to estimate F_0 for each CEO. To ensure robust measurements, we streamed approximately 5-minutes ($Mean = 323.7$ seconds) of a CEO's speech in the quarterly conference call. We used a 5-minute duration window as opposed to a shorter (20-second) window (e.g., Mayew et al., 2013), as CEOs may purposely modulate their voice pitch in specific sections of a conference call that shorter durations of audio offer less data points for averaging out. The pitch floor (ceiling) values were set to 75 (300) Hz, as these boundaries are considered most appropriate for analyzing the speech of male speakers (Mayew et al., 2013; Puts et al., 2006, 2012). To ensure consistency, we multiplied F_0 by minus one so that larger values captured higher degrees of vocal masculinity.

Analysts' evaluation of firm performance. We used analyst recommendation and analyst downgrades as two measures of performance expectations (Gentry et al., 2021; Wiersema and Zhang, 2011). *Analyst recommendation* was measured as the mean analyst recommendation for a given firm based on the ratings provided by analysts during each quarter. The I/B/E/S database uses a five-point scale for recommendations, where (1) represents "strong buy", (2) "buy", (3) "hold", (4) "underperform", and (5) "sell". A higher score on this scale therefore indicates lower firm performance. Given that the number of analysts covering a firm may vary over time, we calculated the weighted average of monthly mean analyst recommendation in a given quarter and applied a lag of six months to avoid issues of simultaneity (Wiersema and

Zhang, 2011). *Analyst downgrades* was measured as the total number of downgrades in recommendation issued by financial analysts covering the firm in the 180 days prior to the close of the last fiscal year a focal CEO was listed as the firm's leader. Again, higher values of downgrades indicate more negative revisions in analyst recommendations.

To avoid issues of endogeneity between analysts' evaluation of firm performance and other factors that may influence CEO dismissal, such as absolute measures of firm financial performance, we followed Wiersema and Zhang (2011) and created proxies for analyst recommendation and downgrades that are uncorrelated with financial metrics of performance. Specifically, we used the residuals from two regression models predicting analyst recommendation and downgrades as a function of industry-adjusted accounting performance, industry-adjusted stock market return, log of total assets, and year dummies.

Control Variables

We included several control variables that may influence CEO dismissal. A log transformation was applied for certain variables to account for right skewness in their distributions. At the CEO-level, we controlled for voluntary turnover, age, compensation, stock ownership, tenure, and duality. *Voluntary turnover* was included using a dummy variable that captures all unforced, voluntary CEO turnovers. We used Gentry et al.'s (2021) database to capture these events, which include turnovers where a CEO took a comparable position elsewhere or departed for undisclosed personal or business reasons unrelated to the firm's activities. This classification excluded turnovers due to illness, death, interim CEOs, or dismissal. *CEO age*, measured as the natural logarithm of CEO age, was included as age may be associated with risk-taking. *CEO compensation*, measured as the natural logarithm of total compensation, was included as compensation can also influence risk-taking (Wowak and Hambrick, 2010). *CEO stock ownership*, measured as the number of shares owned by the CEO scaled by total

outstanding shares, *CEO tenure*, measured as the natural logarithm of the current CEO's years in office, and *CEO duality*, measured as an indicator equal to 1 if the CEO serves as board chair, and 0 otherwise, were included as prior studies suggest that these variables capture a CEO's power in the boardroom (Hubbard et al., 2017; Wiersema and Zhang, 2011).

At the firm-level, we controlled for firm size, age, performance (as proxied by operating cash flow, sales growth, and return-on-equity), board size, board independence, and analyst coverage. *Firm size*, measured as the natural logarithm of total assets, and *firm age*, measured as the natural logarithm of the number of years since the firm's first appearance in the CRSP database, were included as greater expectations may be put on CEOs of larger and more established firms (Shen and Cannella, 2002). *Operating cash flow*, measured as the ratio of operating cash flow to total assets, *sales growth*, measured as the percentage change in the natural logarithm of sales between period t and $t - 1$, and *return-on-equity*, measured as the ratio of net income to shareholders' total equity, were included as alternative indicators of firm performance. *Board size*, measured as the number of directors on the board, *board independence*, measured as the proportion of outside directors serving on the board, and *analyst coverage*, measured as the average number of analysts following the firm in a given quarter, were included as these governance characteristics influence monitoring and can impact dismissal (Boeker, 1992; Park et al., 2020).

Estimation

We tested our hypotheses using a propensity-score-matched pair design. Propensity score matching (PSM) provides a way to create a balanced control and treatment group akin to a randomized experiment to address endogeneity concerns (Li, 2012; Rosenbaum and Rubin, 1983; Shipman et al., 2017). We defined our treatment group as CEOs that possess a masculine facial and or vocal feature [1] versus a control group of CEOs who do not possess such

masculine features [0]. By performing matching, we aimed to create comparable pairs of CEOs with similar characteristics, except for the masculinity variables of interest. This allows us to isolate the impact of CEO facial and vocal masculinity on CEO dismissal, reducing the potential influence of unobserved factors.

Following Shipman et al. (2017), our matching procedure started with a logit model where we estimated the probability of treatment. We then used the coefficients to calculate a propensity score for each firm, indicating the likelihood of treatment conditional on a set of covariates (the same control variables reported above) as well as year and industry fixed-effects. We employed one-to-one nearest-neighbor matching without replacement and imposed a caliper distance of 0.001 to match observations. The results of this procedure are reported in supplementary appendix A2. The mean values among regression variables between the balanced treatment and control groups were generally statistically indistinguishable at conventional levels, suggesting that our PSM method was effective. This process led to a final sample of 2,900 CEO-firm-quarter observations: slightly less observations are reported for regressions that include analyst recommendation (2,880) and analyst downgrades (2,868) due to missing data points in these variables.

We used PSM as our primary method of analysis for several reasons. First, prior research has highlighted the limitations of alternative approaches, such as the Heckman (1979) two-stage model, which is sensitive to model specification and sample selection criteria (Lennox et al., 2012). Further, the Heckman model relies on instrumental variables that are correlated with the explanatory but uncorrelated with the dependent variable, which makes identification difficult. Thus, without compelling theoretical and empirical rationale, researchers are advised against using the Heckman procedure over other methods (e.g., Larcker and Rusticus, 2010). Second, using a fixed-effects approach to control for unobserved heterogeneity is not appropriate in our study. This method requires variance in both the dependent and explanatory variables to ensure

that they are distinguishable from fixed-effects. As highlighted by Wiersema and Zhang (2011), if a fixed-effects model was applied, these firms would be dropped from the analysis leading to biased estimation. In addition, our CEO facial and vocal masculinity variables are time-invariant. Thus, controlling for CEO fixed-effects would absorb the impact of CEO facial and vocal features. Third, we conducted a Hausman test to evaluate whether the choice of a random-effects model was appropriate (Wooldridge, 2010). One of the critical assumptions underlying a random-effects model is that the unobserved firm heterogeneity is not correlated with explanatory variables. The Hausman test was rejected ($p < 0.001$), suggesting that a random-effects model was not appropriate. For these reasons, we determined that a PSM procedure was the most suitable for our study.

After generating a matched sample of CEOs and firms, we estimated the following logistic regression:

$$\Pr(Y_{ijt} = 1) = \beta_0 + \beta_1 X_{it} + \beta_2 W_{ijt} + \beta_3 Z_{ijt} + \beta_4 (X_{it} \times W_{ijt}) + \beta_5 (X_{it} \times Z_{ijt}) + \beta_6 (W_{it} \times Z_{ijt}) + \beta_7 V_{ijt}$$

where Y_{it} is the dismissal of CEO j for firm i in quarter t , X_{it} is CEO facial masculinity, W_{it} is CEO vocal masculinity, Z_{it} is analyst recommendation or analyst downgrades, and V_{it} is the set of CEO- and firm-level controls as well as industry and time fixed-effects.

RESULTS

Table I reports the descriptive statistics and correlations among the study variables. The correlations do not implicate multicollinearity as an issue. The average variance inflation factor (VIF) was 1.41 and individual VIFs ranged between 1.08 to 2.75, which are all well below the commonly accepted threshold level of 10 (Cohen et al., 2002).

INSERT TABLE I AND TABLE II ABOUT HERE

Table II reports the results of the logistic regression. Model 1 is the baseline model that includes only controls. Models 2 to 6 examine the main effects of CEO facial and vocal masculinity and their interactions with analyst recommendation. Model 2 includes the main effects of CEO facial masculinity, CEO vocal masculinity, and analyst recommendation to the baseline. Model 3 includes an interaction term between CEO facial and vocal masculinity to test for potential multiplicative effects. Model 4 includes an interaction term between CEO facial masculinity and analyst recommendation. Model 5 includes an interaction term between CEO vocal masculinity and analyst recommendation. Model 6 is the full model. In Models 7 to 11, we replicate Models 2 to 6, albeit using analyst downgrades instead of analyst recommendation as the moderating variable.

In Hypotheses 1a and 1b, we theorized that CEO facial masculinity (H1a) and CEO vocal masculinity (H1b) would be positively associated with CEO dismissal. In support of our predictions, we find that both CEO facial (Model 2: $B = 0.210, p < 0.05$; Model 7: $B = 0.233, p < 0.01$) and vocal masculinity (Model 2: $B = 0.224, p < 0.05$; Model 7: $B = 0.230, p < 0.05$) are positively and significantly associated with dismissal. To interpret effect size, we calculate the average marginal effects (i.e., dy/dx) of a one standard deviation increase in CEO facial and vocal masculinity on dismissal. Marginal effects are useful as they translate log-odds coefficients into estimates on the probability scale (Greene, 2012). We find that for each one standard deviation increase in facial masculinity, the likelihood of dismissal increases by an average of 1.7 percentage points (Model 2: $dy/dx = 0.017, p < 0.05$) and 1.8 percentage points (Model 7: $dy/dx = 0.018, p < 0.01$). Given the predicted probability of dismissal at mean levels

of facial masculinity in both Models 2 and 7 is approximately 15 percent, this translates into a 11.3 percent (Model 2) and 12 percent (Model 7) relative increase, respectively.ⁱⁱⁱ

Similarly, for each unit increase in vocal masculinity, the likelihood of dismissal increases by 1.8 percentage points in both Models 2 and 7 ($dy/dx = 0.018, p < 0.05$). Given the predicted probability of dismissal at mean levels of vocal masculinity is also approximately 15 percent, this translates into a 12 percent relative increase. The non-significant interaction term between CEO facial and vocal masculinity in Models 3 and 8 suggest that the main effects are independent and additive rather than multiplicative, meaning their combined influence does not exceed the sum of their individual contributions. These findings are consistent across all specifications presented in Table II.

In Hypotheses 2a and 2b, we theorized that analysts' evaluation of firm performance would moderate the positive effects of CEO facial and vocal masculinity on dismissal. Providing support for Hypothesis 2a, the interaction terms between CEO facial masculinity and analyst recommendation (Model 4: $B = -0.236, p < 0.01$; Model 6: $B = -0.384, p < 0.001$), and CEO facial masculinity and analyst downgrades (Model 9: $B = -0.355, p < 0.001$; Model 11: $B = -0.359, p < 0.001$) are significant and negative. To probe these interactions further, we conducted a marginal effects analysis following Busenbark et al. (2022). Specifically, we estimated the average marginal effect of a one standard deviation increase in CEO facial masculinity on dismissal at different levels of analyst recommendation and downgrades ranging between -2 and +2 standard deviations (moving in 0.5 standard deviation increments based on the full model results: Models 6 and 11). The results are provided in Table III.

INSERT TABLE III ABOUT HERE

As shown in Table III, increases (decreases) in analyst recommendation and downgrades weaken (strengthen) the positive effect of CEO facial masculinity on dismissal. Interestingly, as analyst recommendation and downgrades increase beyond mean levels, the positive effects of CEO facial masculinity become non-significant and eventually turn negative as the deterioration in performance expectations becomes more extreme ($\geq +1.5$ SD). When analyst recommendation and downgrades are two standard deviations above the mean, each one standard deviation increase in CEO facial masculinity decreases the probability of dismissal by 3.8 percentage points ($dy/dx = -0.038, p < 0.01$) and 2.9 percentage points ($dy/dx = -0.029, p < 0.05$), respectively. Given the predicted probability of dismissal at mean levels of facial masculinity in Models 6 and 11 is 14.7 percent and 15.3 percent, this translates into a 25.9 percent and 19 percent relative decrease.

Conversely, when analyst recommendation and downgrades are two standard deviations below the mean, each unit increase in CEO facial masculinity increases the probability of dismissal by 7.2 percentage points ($dy/dx = 0.072, p < 0.001$) and 9 percentage points ($dy/dx = 0.090, p < 0.001$). This translates into a 49 percent and 58.9 percent relative increase. Further, corroborating our hypothesized main effect, we find that when analyst recommendation and downgrades are at mean levels, each unit increase in CEO facial masculinity increases the probability of dismissal by 2.3 percentage points ($dy/dx = 0.023, p < 0.01$) and 2.4 percentage points ($dy/dx = 0.023, p < 0.01$).

In support of Hypothesis 2b, the interaction terms between CEO vocal masculinity and analyst recommendation (Model 5: $B = -0.251, p < 0.01$; Model 6: $B = -0.391, p < 0.001$) are significant and negative. However, the interaction terms between CEO vocal masculinity and analyst downgrades are non-significant. Thus, Hypothesis 2b is only partial supported. To

investigate the significant interactions between CEO vocal masculinity and analyst recommendation further, we again estimate average marginal effects. As shown in Table III, increases (decreases) in analyst recommendation weaken (strengthen) the positive effect of CEO vocal masculinity on dismissal. Again, we find that as analyst recommendation increases beyond mean levels, the positive effect of CEO facial masculinity becomes non-significant, eventually becoming negative as the deterioration in analyst recommendation becomes more extreme ($\geq +1.5$ SD). When analyst recommendation is two standard deviations above the mean, each one unit increase in CEO vocal masculinity decreases the probability of dismissal by 4 percentage points ($dy/dx = -0.040, p < 0.05$). Given the predicted probability of dismissal at mean levels of vocal masculinity in Model 6 is 14.4 percent, this translates into a 27.8 percent relative decrease.

Conversely, when analyst recommendation is two standard deviations below the mean, each unit increase in CEO vocal masculinity increases the probability of dismissal by 7.2 percentage points ($dy/dx = 0.072, p < 0.001$). This translates into a 50 percent relative increase. As mentioned above, we find no significant differences in the effect of CEO vocal masculinity on CEO dismissal given analyst downgrades. Again, corroborating our hypothesized main effect, we find that when analyst recommendation is at mean levels, each unit increase in CEO vocal masculinity increases the probability of dismissal by 2.3 percentage points ($dy/dx = 0.023, p < 0.01$). To aid interpretation of the interactions, we graph the average marginal effects of CEO facial masculinity and CEO vocal masculinity given analyst recommendation and analyst downgrades in Figures 1 and 2. Estimates above (below) the horizontal zero-line indicate a positive (negative) effect on CEO dismissal.

INSERT FIGURES 1 AND 2 ABOUT HERE

We also conducted a series of robustness tests, which are presented in supplementary appendix A3. First, we conducted a Heckman two-stage instrumental variables model and estimated average marginal effects. Second, like prior work (Wiersema and Zhang, 2011), we examined alternative lags when constructing our moderator variables of analyst recommendation and downgrades, including a 12-month lag period and no lag period. Third, we re-estimated a full model using industry-adjusted return-on-assets as an absolute measure of firm performance for our moderating variable. The results of these additional analyses are consistent with our main findings.

DISCUSSION

In this study, we proposed that CEO facial and vocal masculinity as evolved biases influencing peoples' perceptions of an individual's leadership ability in various contexts will be an important reference point for boards when making their dismissal decisions. Consistent with our theorizing, we found that both CEO facial and vocal masculinity are positively associated with CEO dismissal (i.e., they increase the likelihood of dismissal). The positive main effects of CEO masculinity on dismissal hold when considering analysts' evaluation of performance. Further, when considering how the effect of CEO masculinity on dismissal changes as a function of analysts' evaluation of firm performance, we found that a deterioration (improvement) in performance expectations weaken (strengthen) the positive effect. Interestingly, we found that as deterioration in performance expectations become more extreme, the effect of CEO masculinity switches from positive to negative. When analysts' evaluation of performance is at mean levels or higher, CEO facial and vocal masculinity are positively associated with dismissal. These results have important theoretical and practical implications.

Theoretical and Practical Implications

Theoretically, our study contributes to the corporate governance literature in two ways. First, while prior studies have identified how CEO facial and vocal masculinity can influence boards' early-stage hiring and compensation decisions (Gomulya et al., 2017; Nair et al., 2022), the literature is inconclusive on whether CEO facial and vocal masculinity will influence boards' later-stage dismissal decisions. The corporate governance literature suggests that boards will only be susceptible to biases in the early stages of a CEO's tenure due to the lack of reliable performance information to guide their evaluations (Boivie et al., 2016; Graffin et al., 2013). In contrast, the evolutionary psychology literature suggests that the inferences people draw from individuals' facial and vocal features are adapted and persistent over time (McAleer et al., 2014; Todorov et al., 2015; Willis and Todorov, 2006). Our study resolves these conflicting predictions by building theory and providing empirical evidence which suggests that the masculinity bias evoked by CEOs' facial and vocal features persists and extends to boards' later-stage dismissal decisions.

In demonstrating how boards' dismissal decisions are influenced by CEOs' facial and vocal features, our study advances a novel evolutionary psychology account of dismissal. In doing so, we answer calls in the literature for microlevel explanations of dismissal that account for CEOs' individual features (Berns et al., 2021). Although prior studies on CEO dismissal have tended to consider firm performance as the principal metric by which boards assess CEOs (Farrell and Whidbee, 2003; Gentry et al., 2021; Wiersema and Zhang, 2011), our study shows that CEOs' facial and vocal features also impact boards' dismissal decisions. This is consequential, as it contradicts the notion that boards base their dismissal decisions on objective performance information and feedback accumulated over a CEO's tenure (Graffin et al., 2013).

Indeed, our observation that the masculinity bias evoked by CEOs' facial and vocal features is persistent suggests that boards find it difficult to update their assumptions about a CEO based on their *actual*—rather than *assumed*—actions and behaviors. This means that boards' first impressions about a CEO based on their observable characteristics, like their face and voice, can have potentially long-term career consequences and may induce or protect a CEO from dismissal under certain circumstances. While prior work has demonstrated that such stereotyping exists based on gender, with female CEOs exhibiting greater dismissal risk than their male counterparts (Gupta et al., 2020), or age, with older CEOs exhibiting greater dismissal risk than younger CEOs (Shen and Cannella, 2002), our study extends the range of individual characteristics (not related to job performance) that enter durably into boards' dismissal decisions. Future research may seek to examine how other individual characteristics and stereotypes, such as those based on race, influence boards' decisions.

It is worth noting here that while our results show that CEOs with masculine facial and vocal features experience heightened dismissal risk, this does not mean that female executives are preferred or experience less dismissal risk. Our results merely show that masculine male CEOs that are presumed to be aggressive, dominant, and risk-prone, are more likely to be dismissed than less masculine male CEOs. In this sense, our findings do not contradict the “think manager-think male” stereotype, which remains a pervasive hurdle for the advancement of females in executive roles (Eagly and Karau, 2002;). Rather, they suggest that the stereotype may extend beyond a preference for dominant male leaders over communal female leaders.

Second, and relatedly, our study provides new insights into *when* and *why* poor firm performance may not always lead to an increased likelihood of dismissal, as prior work suggests (Finkelstein et al., 2009). Specifically, our research extends this work by highlighting how analysts' evaluation of firm performance interacts with CEO facial and vocal masculinity to jointly influence boards' dismissal decisions. Drawing on arguments from evolutionary

psychology (e.g., Spisak et al., 2012; Van Vugt and Grabo, 2015), we hypothesized that the relationship between CEO facial and vocal masculinity and dismissal would be moderated by analysts' evaluation of firm performance. Specifically, we proposed that a deterioration in analysts' evaluation would decrease masculine CEOs' dismissal risk, while improvements would increase their dismissal risk. Our findings support these arguments, indicating that boards are attuned to the perceived alignment between a CEO's facial and vocal attributes and the firm's performance context when making dismissal decisions. When a CEO's facial and vocal features are perceived as congruent (or incongruent) with the firm's performance situation, the CEO faces a lower (or higher) risk of being dismissed. These results suggest a double-edged sword to CEO facial and vocal masculinity. On the one hand, CEO facial and vocal masculinity gradually reduce and eventually reverse the positive dismissal risk of CEOs as analysts' evaluation of firm performance deteriorates. On the other hand, such masculinity exposes a CEO to greater dismissal risk as analysts' evaluation of performance improves.

These findings are novel and indicate the presence of important evolutionary contingencies shaping boards' dismissal decisions. While prior research has tended to treat circumstances such as poor firm performance as unilaterally negative events for CEOs that increase their dismissal risk, our study suggests that boards are likely influenced by a range of heuristics that cause them to vary systematically in their perceptions of a CEO's efficacy based on cues drawn from physical features like the face and voice (Grabo and Van Vugt, 2018). Thus, our study opens new avenues for future research to consider how the perceived fit between a CEO's observable features and the firm's performance situation influence boards' decision-making to further nuance our understanding of CEO-board relations.

In addition to the theoretical implications of our research, our findings are also practically relevant. We preface our practical implications with a note of caution, however, as our findings are a simplification of a complex phenomenon that is both socially and politically sensitive.

For CEOs, our study highlights an important facial and vocal masculinity bias that can differentially influence their risk of dismissal depending on how the firm is performing. Given CEOs are unable to objectively change their facial and vocal features, CEOs may seek to mitigate the negative consequences of such bias by using rhetorical strategies to manage the impressions of boards and other external stakeholders. For instance, as recent work has shown, CEOs can make attributions about the causes of the firm's performance to shape boards' dismissal decisions (e.g., Park et al., 2021).

For boards of directors, our findings offer a warning about the consequences of inferring leadership ability from CEOs' facial and vocal features. Indeed, boards may dismiss highly capable executives, or retain incapable ones, due to implicit stereotypes associated with facial and vocal fit with the firm's performance circumstances. To mitigate this bias, our results are consistent with prior studies (e.g., Nair et al., 2022) suggesting that boards be made aware of the masculinity bias affecting their decisions so they can take active steps to reduce its influence.

Limitations and Future Research

Our study is not without limitations. First, our sample consisted of CEOs from U.S. firms. Thus, it is possible that the U.S. context influenced the relationship we observed between CEO (facial and vocal) masculinity and dismissal. However, since prior studies have shown that the tendency to infer masculinity and leadership ability from an individual's fWHR and voice pitch exists in multiple contexts (Olivola et al., 2014), we believe our results will generalize to other contexts. Nonetheless, future research may seek to test our theory in alternative settings and cultural contexts and examine potential boundary conditions.

Second, our study focused on male CEOs only. While this is (unfortunately) not surprising as males account for approximately 97 percent of CEOs in our sample and female representation

in executive roles is abysmal globally, it imposes a gender-based boundary condition to our findings. Research has shown that the fWHR of females does not evoke the same masculine trait perceptions as it does for males (Haselhuhn et al., 2015). Thus, it is difficult to conclude whether our theory and findings will hold for female CEOs. Future research should therefore examine how the facial and vocal features of female CEOs influence dismissal and other important corporate governance decisions.

Finally, while we used several control variables to rule out alternative explanations and reduce the effect of potential confounding variables, we were not able to control for all possible confounding effects. Other personality factors of CEOs, such as the Big Five personality traits, may influence our results. Further, we were unable to control for the various channels through which boards are exposed to a CEO's face and voice, whether it be through face-to-face interactions, presentations, annual reports, or conference calls. Although, we anticipate the effects to be consistent across various channels given that fWHR and voice pitch are static features. Nonetheless, we were able to mitigate such limitations by using PSM procedure and additional analyses.

Conclusion

Overall, our paper has provided a novel evolutionary psychology account of CEO dismissal that highlights how CEOs' facial and vocal features bias boards' assessments of a CEO. Our findings extend prior work on dismissal by showing how the facial and vocal features of CEOs are also evaluated with regards to their perceived fit with analysts' evaluations of firm performance. We hope our study stimulates further scholarly investigation into how CEOs' observable features factors into boards' assessments and governance decisions.

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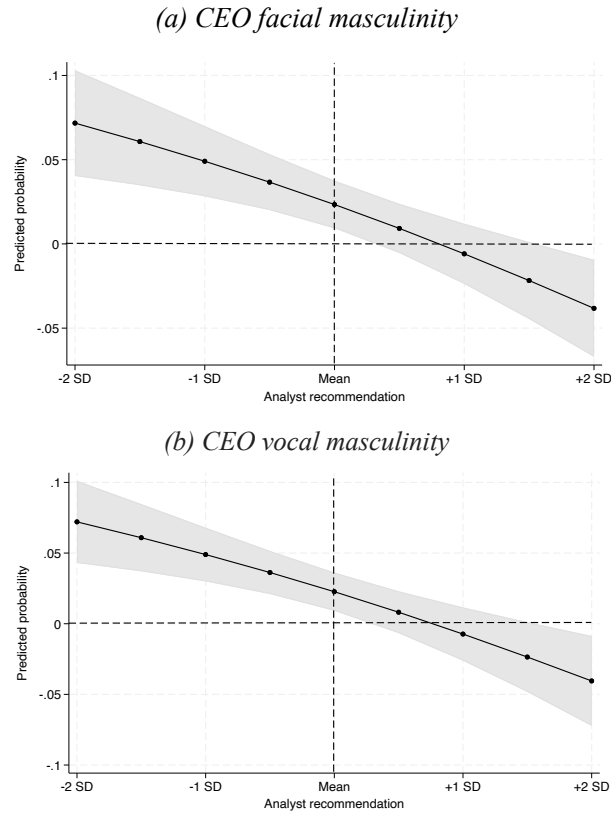
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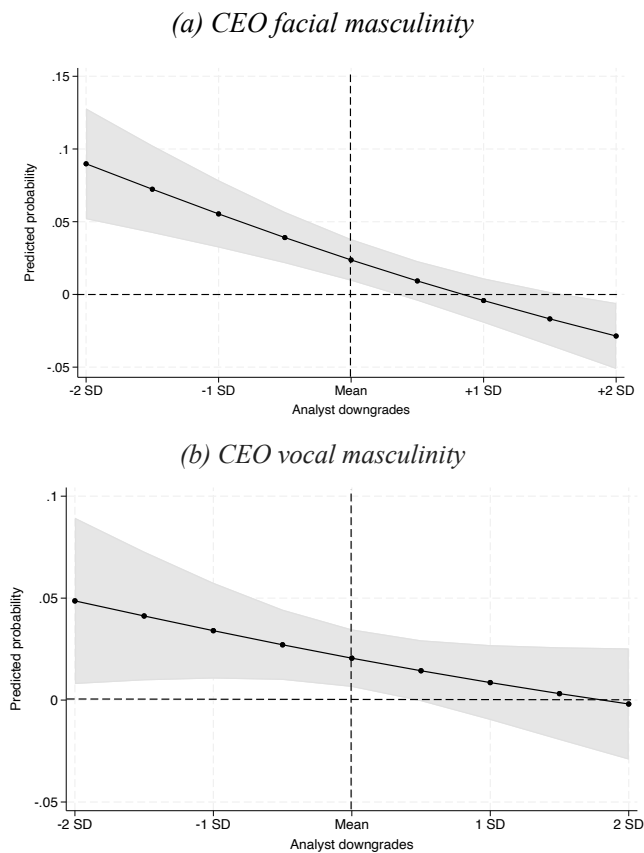
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Figure 1. Marginal effects of (a) CEO facial masculinity and (b) CEO vocal masculinity on CEO dismissal given analyst recommendation



Notes. The graph shows the average marginal effects of (a) CEO facial masculinity and (b) CEO vocal masculinity on the probability of CEO dismissal at different levels of analyst recommendation with 95% confidence intervals. The graphs are based on coefficient estimates from Model 6 and 11 of Table II, respectively, and plotted in one standard deviation shifts ranging from two standard deviations below (-2 SD) to two standard deviations above (+2 SD) the mean of analyst recommendation.

Figure 2. Marginal effects of (a) CEO facial masculinity and (b) CEO vocal masculinity on CEO dismissal given analyst downgrades



Notes. The graph shows the average marginal effects of (a) CEO facial masculinity and (b) CEO vocal masculinity on the probability of CEO dismissal at different levels of analyst downgrades with 95% confidence intervals. The graphs are based on coefficient estimates from Model 6 and 11 of Table II, respectively, and plotted in one standard deviation shifts ranging from two standard deviations below (-2 SD) to two standard deviations above (+2 SD) the mean of analyst downgrades.

Table I. Descriptive statistics and correlations

	<i>Mean</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
1. CEO dismissal	0.16	0.37									
2. CEO facial masculinity	1.95	0.13	0.01								
3. CEO vocal masculinity	-132.66	18.21	0.03	-0.05							
4. Analyst recommendation	2.43	0.47	0.11	-0.03	0.01						
5. Analyst downgrades	2.87	4.81	0.04	0.04	0.04	-0.02					
6. Voluntary turnover	0.19	0.40	-0.12	0.08	0.03	-0.04	0.02				
7. CEO age	4.20	0.12	-0.04	-0.09	-0.01	0.01	0.00	0.04			
8. CEO compensation	8.40	1.49	0.05	-0.03	-0.03	-0.03	0.23	0.02	-0.16		
9. CEO ownership	0.04	1.22	0.01	-0.11	-0.24	0.00	-0.07	-0.09	0.23	-0.09	
10. CEO tenure	2.75	0.40	-0.05	0.09	-0.18	-0.04	0.14	-0.22	0.08	-0.00	0.13
11. CEO duality	0.65	0.48	0.00	0.00	-0.06	0.05	0.11	0.02	0.11	0.08	0.00
12. Firm size	8.61	1.83	0.09	0.07	0.08	-0.00	0.63	0.07	0.12	0.35	-0.10
13. Firm age	2.87	0.34	-0.05	0.16	-0.17	0.03	0.32	0.11	-0.10	0.14	0.00
14. Operating cash flow	0.11	0.07	-0.10	0.00	-0.08	-0.02	-0.03	-0.06	-0.02	0.10	0.10
15. Sales growth	0.07	0.19	-0.08	-0.05	-0.03	-0.14	-0.14	-0.01	-0.01	-0.00	-0.00
16. Return-on-equity	0.13	0.24	-0.08	0.04	-0.03	-0.03	0.09	-0.03	-0.01	0.10	0.00
17. Board size	9.63	2.48	0.11	0.17	0.06	-0.07	0.32	-0.00	0.14	0.13	-0.05
18. Board independence	0.69	0.29	0.16	0.15	0.10	-0.10	0.18	0.05	-0.07	0.15	-0.06
19. Analyst coverage	12.42	8.10	-0.09	-0.02	0.03	-0.24	0.35	0.01	-0.01	0.20	0.00
			<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>	<i>16</i>	<i>17</i>	<i>18</i>
10. CEO tenure											
11. CEO duality			0.12								
12. Firm size			0.21	0.17							
13. Firm age			0.36	0.07	0.36						
14. Operating cash flow			0.11	0.09	-0.07	0.07					
15. Sales growth			-0.08	-0.01	-0.16	-0.20	0.11				
16. Return-on-equity			0.14	0.10	0.10	0.16	0.46	0.10			
17. Board size			0.21	0.11	0.53	0.23	-0.02	-0.15	0.14		
18. Board independence			0.09	0.09	0.26	0.23	0.13	-0.10	0.11	0.51	
19. Analyst coverage			0.13	0.05	0.47	0.17	0.23	0.02	0.20	0.30	0.22

Notes: Correlations larger than |0.02| are significant at the $p < 0.05$ level. Correlation matrix is based on standardized variables. Performance variables are not based on capturing residuals such that analyst recommendation is the average recommendation and analyst downgrades is the total number of downgrades.

Table II. Logistic regression analysis for CEO dismissal

Variable	Baseline		Analyst recommendation					Analyst downgrades				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	
	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)	
CEO facial masculinity		0.210*	0.173†	0.232*	0.199*	0.307**	0.233**	0.206*	0.283**	0.208*	0.293**	
		(0.086)	(0.092)	(0.095)	(0.093)	(0.098)	(0.087)	(0.092)	(0.096)	(0.092)	(0.096)	
CEO vocal masculinity		0.224*	0.197*	0.228*	0.240*	0.295**	0.230*	0.210*	0.239*	0.213*	0.247**	
		(0.090)	(0.093)	(0.094)	(0.095)	(0.095)	(0.090)	(0.093)	(0.094)	(0.093)	(0.095)	
CEO facial masculinity × CEO vocal masculinity			-0.102	-0.092	-0.036	-0.020		-0.077	-0.047	-0.078	-0.065	
			(0.091)	(0.092)	(0.096)	(0.096)		(0.090)	(0.089)	(0.090)	(0.089)	
Analyst recommendation		0.236**	0.245**	0.183*	0.214**	0.096						
		(0.080)	(0.081)	(0.083)	(0.082)	(0.086)						
CEO facial masculinity × Analyst recommendation				-0.236**		-0.384***						
				(0.082)		(0.090)						
CEO vocal masculinity × Analyst recommendation					-0.251**	-0.391***						
					(0.085)	(0.090)						
Analyst downgrades							-0.313	-0.321	-0.129	-0.365	-0.231	
							(0.201)	(0.201)	(0.195)	(0.209)	(0.204)	
CEO facial masculinity × Analyst downgrades									-0.355***		-0.359***	
									(0.087)		(0.079)	
CEO vocal masculinity × Analyst downgrades										-0.080	-0.151	
										(0.107)	(0.096)	
CEO voluntary turnover	-2.171***	-2.242***	-2.274***	-2.241***	-2.276***	-2.217***	-2.347***	-2.380***	-2.447***	-2.369***	-2.459***	
	(0.243)	(0.254)	(0.257)	(0.259)	(0.260)	(0.263)	(0.257)	(0.261)	(0.262)	(0.261)	(0.261)	
CEO age	0.170†	0.213*	0.215*	0.215*	0.196*	0.184*	0.220*	0.220*	0.275**	0.223*	0.283**	
	(0.090)	(0.091)	(0.091)	(0.091)	(0.092)	(0.093)	(0.093)	(0.093)	(0.096)	(0.093)	(0.096)	
CEO compensation	0.409***	0.517***	0.515***	0.519***	0.502***	0.501***	0.471***	0.470***	0.535***	0.469***	0.534***	
	(0.099)	(0.115)	(0.115)	(0.115)	(0.114)	(0.116)	(0.111)	(0.111)	(0.111)	(0.113)	(0.114)	
CEO ownership	0.047	0.057	0.050	0.069	0.027	0.042	0.050	0.044	0.014	0.051	0.023	
	(0.067)	(0.069)	(0.069)	(0.070)	(0.069)	(0.070)	(0.070)	(0.070)	(0.071)	(0.071)	(0.072)	
CEO tenure	-0.523***	-0.528***	-0.535***	-0.571***	-0.556***	-0.628***	-0.547***	-0.553***	-0.535***	-0.556***	-0.547***	
	(0.089)	(0.091)	(0.091)	(0.092)	(0.092)	(0.095)	(0.090)	(0.091)	(0.092)	(0.091)	(0.092)	
CEO duality	0.969***	0.952***	0.940***	1.035***	1.013***	1.213***	1.023***	1.015***	1.090***	1.008***	1.079***	
	(0.170)	(0.170)	(0.171)	(0.175)	(0.173)	(0.182)	(0.171)	(0.171)	(0.175)	(0.171)	(0.175)	
Firm size	1.672***	1.613***	1.615***	1.596***	1.657***	1.660***	1.910***	1.918***	1.779***	1.941***	1.848***	
	(0.139)	(0.146)	(0.146)	(0.147)	(0.147)	(0.149)	(0.214)	(0.215)	(0.212)	(0.217)	(0.215)	

Firm age	-1.145*** (0.123)	-1.160*** (0.125)	-1.158*** (0.125)	-1.137*** (0.125)	-1.190*** (0.126)	-1.187*** (0.127)	-1.165*** (0.126)	-1.162*** (0.126)	-1.205*** (0.128)	-1.166*** (0.127)	-1.216*** (0.129)
Operating cash flow	-0.073 (0.090)	-0.101 (0.092)	-0.107 (0.092)	-0.134 (0.093)	-0.105 (0.092)	-0.145 (0.094)	-0.054 (0.091)	-0.057 (0.091)	-0.070 (0.092)	-0.055 (0.091)	-0.067 (0.092)
Sales growth	-0.143† (0.077)	-0.111 (0.078)	-0.103 (0.079)	-0.105 (0.079)	-0.113 (0.079)	-0.125 (0.079)	-0.168* (0.078)	-0.162* (0.078)	-0.176* (0.080)	-0.160* (0.078)	-0.169* (0.079)
Return-on-equity	-0.704*** (0.090)	-0.687*** (0.092)	-0.682*** (0.092)	-0.688*** (0.092)	-0.673*** (0.091)	-0.675*** (0.092)	-0.700*** (0.092)	-0.696*** (0.092)	-0.729*** (0.095)	-0.688*** (0.092)	-0.715*** (0.095)
Board size	-0.348** (0.107)	-0.394*** (0.109)	-0.390*** (0.109)	-0.412*** (0.110)	-0.400*** (0.110)	-0.437*** (0.112)	-0.398*** (0.109)	-0.397*** (0.109)	-0.399*** (0.110)	-0.396*** (0.109)	-0.404*** (0.110)
Board independence	1.112*** (0.128)	1.176*** (0.130)	1.151*** (0.131)	1.172*** (0.131)	1.168*** (0.132)	1.210*** (0.134)	1.153*** (0.130)	1.133*** (0.131)	1.135*** (0.132)	1.131*** (0.131)	1.132*** (0.132)
Analyst coverage	-0.872*** (0.104)	-0.835*** (0.114)	-0.820*** (0.115)	-0.842*** (0.116)	-0.827*** (0.115)	-0.867*** (0.117)	-0.899*** (0.112)	-0.890*** (0.112)	-0.874*** (0.113)	-0.892*** (0.112)	-0.882*** (0.113)
Year fixed effects	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry fixed effects	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Log-likelihood	-746.999	-736.215	-735.589	-731.451	-731.169	-722.025	-734.511	-734.151	-726.421	-733.869	-725.190
Observations	2,900	2,880	2,880	2,880	2,880	2,880	2,868	2,868	2,868	2,868	2,868

Notes: Standardized coefficients for all continuous variables. Standard errors reported in parentheses.

† $p \leq 0.1$; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

Table III. Marginal effects analysis

	<i>Analyst recommendation</i>		<i>Analyst downgrades</i>	
	<i>CEO facial masculinity</i>	<i>CEO vocal masculinity</i>	<i>CEO facial masculinity</i>	<i>CEO vocal masculinity</i>
	<i>dy/dx (SE)</i>	<i>dy/dx (SE)</i>	<i>dy/dx (SE)</i>	<i>dy/dx (SE)</i>
-2 SD	0.072*** (0.016)	0.072*** (0.015)	0.090*** (0.019)	0.049* (0.021)
-1.5 SD	0.061*** (0.013)	0.061*** (0.012)	0.072*** (0.015)	0.041* (0.016)
-1 SD	0.049*** (0.011)	0.049*** (0.010)	0.055*** (0.012)	0.034** (0.012)
-0.5 SD	0.037*** (0.008)	0.036*** (0.008)	0.039*** (0.009)	0.027** (0.009)
Mean	0.023** (0.007)	0.023** (0.007)	0.024** (0.007)	0.021* (0.007)
+0.5 SD	0.009 (0.007)	0.008 (0.008)	0.009 (0.007)	0.014† (0.008)
+1 SD	-0.006 (0.009)	-0.007 (0.010)	-0.004 (0.008)	0.009 (0.009)
+1.5 SD	-0.022† (0.012)	-0.024† (0.013)	-0.017† (0.009)	0.003 (0.012)
+2 SD	-0.038** (0.015)	-0.040* (0.016)	-0.029* (0.012)	-0.002 (0.014)

Notes: Standard errors reported in parentheses. Estimates based on full model results in Table II (Model 6 for analyst recommendation and Model 11 for analyst downgrades).

† $p \leq 0.1$; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.