CEO facial trustworthiness and corporate governance

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Abstract

Purpose – In this paper the authors aim to argue that the existence of a strong corporate governance mechanism (a formal credibility-enhancing mechanism) and the presence of a more trustworthy-looking CEO (an informal credibility-enhancing mechanism) are substitutes.

Design/methodology/approach – By using machine-learning-based facial-feature-point detection technique, the authors construct a proprietary facial-trustworthiness database for a large-scale of CEOs in the US listed companies. First, the authors manually search for qualifying CEO image from websites and annual reports. Second, by following the neuroscience and psychology literature, the authors use the machine-learning-based face detector to identify the facial features in the CEO photos to calculate a rich and reliable set of facial-trustworthiness measures. The authors then construct a composite facial-trustworthiness index for each CEO. After obtaining accounting data, the authors' final sample comprises 16,201 firm-year observations for 3,186 CEOs in the sample period of 2000-2018.

Findings – The results of the authors' regression analyses show a negative association between board monitoring intensity and CEOs' facial trustworthiness, indicating that board directors may factor CEOs' facial trustworthiness into their monitoring decisions. Moreover, the authors find that these results are mainly driven by CEOs whose tenure is below the third quartile (i.e. eight years). The authors further find stronger results for externally hired CEOs than internally promoted CEOs. Finally, the authors' results remain robust when using change models or subsample of CEO photos in recent years.

Originality/value – First, to the best of the authors' knowledge, this is the first study that adopts a large sample to provide systematic evidence on the directors' use of facial trustworthiness. This study extends the literature by documenting the impacts of CEOs' individual characteristics on the board monitoring intensity. Second, the results of this study emphasized the important role of perceptions based on executives' facial appearance in firm valuation, executive compensation and audit fee, and by presenting empirical evidence that CEOs' facial trustworthiness affects board monitoring intensity. Third, this study responds to the call for research on personalized trust by Hsieh *et al.* (2020).

Keywords CEO, Facial trustworthiness, Corporate governance

Paper type Research paper

1. Introduction

Studies in psychology and neuroscience document that people infer the trustworthiness of others from their faces quickly and with high consensus (Krumhuber *et al.*, 2007, Zebrowitz, Voinescu, & Collins, 1996). For example, players in the trust game invest less money in

partners who look less trustworthy (Ewing, Caulfield, Read, & Rhodes, 2015). Ewing *et al.* (2015) further show that facial trustworthiness is detected in people as young as five years old. Moreover, this bias tends to persist over time despite information demonstrating that the targets are indeed trustworthy (Van't Wout & Sanfey, 2008). Therefore, people place less trust in those who seem untrustworthy, which affects what should otherwise be rational economic decisions (Henrich *et al.*, 2001). Consistent with this argument, in business settings, the literature documents that a trustee's facial trustworthiness may affect a trustor's subsequent decision-making process in peer-to-peer lending (Duarte, Siegel, & Young, 2012), legal defense (Porter, ten Brinke, & Gustaw, 2010) and various trust games. Our paper extends the discussion of facial trustworthiness to the principal–agent setting in listed firms. According to agency theory (Jensen & Meckling, 1976), the divergence of interests between principals (shareholders) and agents (firm managers) makes it impossible for principals to fully trust agents. Therefore, corporate governance plays an important role as a formal credibility-enhancing mechanism. However, improving corporate governance is costly (Adams & Ferreira, 2007; Ferreira, Ferreira, & Raposo, 2011; Holmlstrom, 2004). We argue that to the extent that shareholders are affected by the CEO's facial trustworthiness (an informal credibility-enhancing mechanism), CEO facial trustworthiness is expected to play a complementary role in corporate governance.

In addition to extending the literature on the impact of facial trustworthiness, our study is important for the following three reasons. First, corporate governance has attracted increasing attention from academics and regulators since the recent series of corporate scandals such as Enron (Brick & Chidambaran, 2010; Faleye, Hoitash, & Hoitash, 2011; Linck, Netter, & Yang, 2008). For example, the New York Stock Exchange (NYSE) requires that all listed firms have only independent directors on the three main board committees (audit, compensation and nominating committees) whose main role is to monitor, signal small agency problems and build trust (Faleye *et al.*, 2011). However, given that corporate governance is costly, there is little evidence of an alternative corporate governance mechanism. Our study fills this research gap by exploring an informal credibility-enhancing mechanism (i.e. CEO facial trustworthiness) that may be an alternative way to build trust between shareholders and firm managers.

Second, while the CEO is responsible for making strategic choices to ensure their firm's financial success, the board of directors is responsible for hiring and firing the CEO (Johnson, Catherine, & Ellstrand, 1996). As Berns & Klarner (2017) point out in their review paper on CEO succession, the board of directors plays a key role in CEO succession. Directors on the board must identify the best candidate and ensure a smooth transition of leadership (Biggs, 2004). The board pays additional fees to executive search firms to find a suitable replacement and cover the costs of emergency board meetings (Favaro, Karlsson, & Neilson, 2012). We extend this line of research by examining whether CEO facial features also affect board decisions regarding CEO succession.

Third, trust is of particular interest in social capital research (Woolcock, 1998). Trust is commonly defined as "the belief that somebody [. . .] is good, sincere, honest, etc. and will not try to harm or trick you" (Deuter, Hey, Hancock, & Ashby, 2015). In the principal–agent setting (Fama & Jensen, 1983; Jensen & Meckling, 1976), trust is likely to be related to the principal's willingness to be vulnerable to the agent's actions based on the expectation that the agent will perform actions in the principal's best interest, irrespective of the latter's ability to monitor and control the agent (Schoorman, Mayer, & Davis, 2007). As the board of directors is responsible for monitoring top management on behalf of shareholders to align management goals with those of shareholders, Chami and Fullenkamp (2002) propose a model in which trust is a superior alternative to the standard tools used to mitigate agency problems. However, to the best of our knowledge, no study empirically examines whether

CEO facial trustworthiness can complement the credibility-enhancing role of corporate governance.

Our prediction is not without tension, for at least three reasons. First, during the CEO selection process, board directors consider many other characteristics of CEO candidates, including their ability (Conger, Finegold, & Lawler, 1998), industry knowledge (Parrino, 1997), talent (Martijn Cremers & Grinstein, 2014), reputation (Francis, Allen, Rajgopal, & Zang, 2008), social capital (Tian, Haleblian, & Rajagopalan, 2011), culture (Khurana, 2002) and location (Yonker, 2017). Thus, board directors may need to balance the need for CEO capabilities with the need for more trustworthy-looking CEOs. Second, studies show that independent directors with no financial or family ties to the CEO may have social ties such as friendship with the CEO (Hwang & Kim, 2009), which may weaken the association between CEO facial trustworthiness and corporate governance. Third, Ertimur, Rawson, Rogers and Zechman (2018) reveal that about 60% of CEOs were hired internally between 1992 and 2014 in the firms listed in the USA, which may also weaken the role of CEO facial trustworthiness.

Using the latest machine learning technique to detect facial feature points (Hsieh *et al.*, 2020; Kazemi & Sullivan, 2014; Sagonas, Tzimiropoulos, Zafeiriou, & Pantic, 2013), we construct a proprietary facial trustworthiness database for a large number of CEOs of companies listed in the U.S. First, we generate a list of 5,467 CEOs from the merged BoardEx and Compustat Execucomp datasets during 2000–2018. These two datasets provide board information and compensation data for our analysis. We then manually search Google Images, LinkedIn Photos, corporate websites and annual reports for eligible CEO photos, using a combination of name and affiliation for each CEO. Second, we use the machine learning-based face detector to identify facial features in each CEO photo and obtain a reliable set of facial trustworthiness measures, including inner brow ridge angle, face roundness, chin width and nose-to-lip distance. Studies show that these measures influence facial trustworthiness (Todorov, Baron, & Oosterhof, 2008). We then construct a composite facial trustworthiness index for each CEO (Hsieh *et al.*, 2020) because people tend to interpret an individual's face as an integrated whole (Taubert, Apthorp, Aagten-Murphy, & Alais, 2011). Last, we obtain accounting data from Compustat and stock return data from the Center for Research in Security Prices (CRSP) database. After excluding financial and utility firms, our final sample includes 16,201 firm-year observations for 3,186 CEOs for the 2000–2018 period.

We use three sets of proxies to measure corporate governance. Our first set of proxies is related to board structure, as the effectiveness of corporate governance may depend on how the board is structured. Following prior studies, our proxies for good board structure include more independent directors, greater gender diversity on the board, smaller boards, stronger board monitoring and higher corporate governance indices (i.e. reverse G-index) (Khanna, Han Kim, & Lu, 2015). Following Vafeas (1999) and Brick and Chidambaran (2010), our second set of proxies is related to board activity, i.e. the number of annual board meetings and the number of "director days," which is the product of the number of board meetings and the percentage of independent directors. We choose these two variables because the number of meetings alone does not fully capture the level of board monitoring, and both the percentage of independent directors and the time they devote to monitoring are important (Brick & Chidambaran, 2010). Following Bergstresser and Philippon (2006), our third set of proxies is related to CEO incentive alignment. These proxies capture the portion of a hypothetical CEO's total compensation that would come from a 1 percentage point increase in their firm's equity value, which may align CEO incentives with those of shareholders.

The regression results show a negative association between the level of corporate governance and CEO facial trustworthiness, indicating that board directors may factor CEO facial trustworthiness in their corporate governance decisions. Moreover, we find that these results are mainly driven by CEOs whose tenure is less than the third quartile

(i.e. eight years). We also find more pronounced results for CEOs hired externally than for those promoted internally. This result is consistent with the finding that when firms hire external CEOs, shareholders are more likely to be affected by their facial features because of the high levels of information asymmetry and uncertainty about the true capabilities of these external candidates (Graham, Campbell, & Puri, 2017). Finally, our results remain robust when using alternative models and a subsample of CEO photos taken in recent years.

This study contributes to the literature in several ways. First, to the best of our knowledge, this study is the first to use a large sample to provide systematic evidence of directors' and shareholders' use of facial trustworthiness in their corporate governance decisions. Therefore, our study extends the corporate governance literature on the association between CEO characteristics and the level of corporate governance. Second, our study expands the literature on the importance of executives' facial appearance in firm valuation (Blankespoor, Hendricks, & Miller, 2017; Halford & Hsu, 2014), executive compensation (Graham *et al.*, 2017) and audit fees (Hsieh *et al.*, 2020), by presenting empirical evidence that CEO facial trustworthiness is related to corporate governance. Third, our study responds to the call of Hsieh *et al.* (2020) for further research on personalized trust. They suggest that the development of an innovative individual-level trustworthiness measure may provide interesting and fruitful avenues for future research on the implications of personalized trust in various business settings. Last, using agency theory, our study provides empirical support for the role of trust in the principal–agent setting. We suggest that the existence of a strong corporate governance mechanism (a formal credibility-enhancing mechanism) and the presence of a more trustworthy-looking CEO (an informal credibility-enhancing mechanism) are substitutes.

The paper proceeds as follows. Section 2 discusses related studies and presents our hypothesis. Section 3 presents the data and research design. Section 4 reports the empirical results and the results of additional analyses. The final section concludes the paper.

2. Literature review and hypothesis development

2.1 Facial trustworthiness

Studies find that people can quickly determine an individual's trustworthiness by looking at their face (Rule, Ambady, & Adams, 2009; Todorov *et al.*, 2008). For example, Todorov, Olivola, Dotsch and Mende-Siedlecki (2015) show that people can form facial trustworthiness perceptions in just 34 milliseconds. To some extent, longer exposure to a face is likely to reinforce people's confidence in their initial trustworthiness perceptions, rather than altering their prior judgments (Todorov *et al.*, 2015). The neuroscience literature also suggests that trustworthiness perceptions based on facial features are formed instantaneously and unconsciously (McClure, Laibson, George, & Cohen, 2004).

A large number of neuroscience studies show that people develop and respond to their trustworthiness perceptions of others, thanks to the amygdala (Todorov *et al.*, 2008). For instance, the amygdala affects strategic decision-making (Davis & Whalen, 2001), loss aversion development (De Martino, Camerer, & Adolphs, 2010), self-control behavior and future-oriented activities targeting specific rewards (Hernádi, Grabenhorst, & Schultz, 2015). Laboratory experiments show that people are more willing to trust an individual with a trustworthy-looking face (Duarte *et al.*, 2012; Schlicht, Shimojo, Camerer, Battaglia, & Nakayama, 2010; Tingley, 2014; Van't Wout & Sanfey, 2008). Tingley (2014) finds that people tend to invest more money in trustworthy-looking individuals. People also tend to lend money to borrowers who seem trustworthy in a peer-to-peer lending setting (Duarte *et al.*, 2012).

Some recent studies suggest that executives' facial appearance also plays a crucial role in various corporate settings. For example, Halford and Hsu (2014) find that CEOs with higher facial attractiveness are associated with better returns around their job announcements and

higher returns to acquirers around acquisition announcements. Graham *et al.* (2017) find that CEO facial competence, rather than facial attractiveness, is important for CEO selection and compensation. Additionally, Blankespoor *et al.* (2017) find that investors' overall perceptions of managerial competence, trustworthiness and attractiveness are positively associated with firm valuations in initial public offerings. Hsieh *et al.* (2020) find that chief financial officer (CFO) facial trustworthiness is associated with lower audit fees. However, there is little evidence as to whether CEO facial trustworthiness is related to corporate governance.

2.2 Facial trustworthiness, agency theory and board monitoring intensity
As mentioned, in the principal–agent setting (Fama & Jensen, 1983; Jensen & Meckling, 1976), trust is likely to be related to the principal's willingness to be vulnerable to the agent's actions based on the expectation that the agent will perform actions in the principal's best interest, irrespective of the latter's ability to monitor and control the agent (Schoorman *et al.*, 2007). Chami and Fullenkamp (2002) formally incorporate trust into the principal–agent setting and propose a model in which trust acts as an alternative monitoring mechanism. Moreover, as suggested by agency theory (Fama & Jensen, 1983; Jensen & Meckling, 1976), strong corporate governance is essential to resolve conflicts that arise from the separation of ownership and control rights and help build trust (Daily, Dalton, & Cannella, 2003; Johnson *et al.*, 1996). Directors on the board monitor the top management team, including the CEO, on behalf of the firm's shareholders. In other words, the main responsibilities of the board include ratifying the decisions of the top management team and monitoring their performance. Having the power to hire and fire managers and set their compensation allows the board to fulfill these responsibilities.

A strong corporate governance mechanism can help build trust between shareholders and firm managers via two main strategies. One strategy is to expend effort or pay to monitor the agent, so that both the principal and the agent can work directly on the task at hand. The other strategy is to align the incentives of the principal with those of the agent. The main incentive alignment mechanism is through compensation contracts that modify the agent's incentives. For example, tying executive compensation to firm performance, such as stock options, can incentivize executives to act in the interests of shareholders (Bergstresser & Philippon, 2006). Taken together, if shareholders place more trust in trustworthy-looking CEOs than in their less trustworthy-looking counterparts, CEO facial trustworthiness is expected to play a complementary role in corporate governance. Therefore, we predict that CEO facial trustworthiness is negatively associated with the level of corporate governance.

> *H1. Ceteris paribus*, CEO facial trustworthiness is negatively associated with board monitoring intensity.

However, this hypothesis is not without tension. Some studies argue that board monitoring does not matter or is a result of, rather than a solution to, agency problems (Linck *et al.*, 2008). For example, some scholars argue that the board serves at the whim of the CEO and is therefore ineffective in monitoring and advising (Bebchuk & Fried, 2005; Mace, 1971). Therefore, if corporate governance is not a mechanism that increases trust between shareholders and firm managers, CEO facial trustworthiness may not play a complementary role in corporate governance.

3. Research methodology
3.1 Facial trustworthiness measures
To construct our facial trustworthiness measures, we first generate a list of 5,467 CEOs from the merged BoardEx and Compustat Execucomp datasets between 2000 and 2018. We then

manually search Google Images, LinkedIn Photos, corporate websites and annual reports for eligible CEO photos, using a combination of name and affiliation for each CEO. When possible, we cross-check the photos from these various sources to ensure that they indeed correspond to the CEOs on our list. Following Hsieh *et al.* (2020), we choose high-quality photos of CEOs' front facing portraits using the computer program algorithm. After screening for high-quality photos, we are left with 28,235 firm-year observations with valid photos of 4,938 CEOs.

To measure CEO facial trustworthiness, we follow Hsieh *et al.* (2020) and use the classic histogram of oriented gradients (HOG) face detector, combined with a linear classifier and sliding window detection scheme (Kazemi & Sullivan, 2014). This method applies machine learning algorithms to detect 68 facial landmarks in the photos and determine the position and shape of the faces. In particular, we measure the angle of the inner brow ridge (*Eyebrow*) using the average of the two eyebrow angles for the left and right eyebrows. A lower *Eyebrow* value suggests an upward-angled inner brow ridge, which is generally perceived as more trustworthy (Todorov *et al.*, 2008). We also calculate *Face_Shape* by the roundness of a face. A higher *Face_Shape* value suggests a rounder face, which is associated with higher perceived trustworthiness (Todorov *et al.*, 2008). Next, we calculate *Chin_Angle* by the angle of the chin. A higher *Chin_Angle* value suggests a wider chin, which correlates with higher perceived trustworthiness (Todorov *et al.*, 2008). Finally, *Philtrum* is the nose-to-lip distance scaled by upper facial length. *Philtrum* is negatively associated with perceived trustworthiness (Todorov *et al.*, 2008).

The literature suggests that when exposed to faces, people quickly develop a "holistic representation" by processing information from various facial features to form an integrated perceptual whole (Taubert *et al.*, 2011). Thus, we follow Hsieh *et al.* (2020) and construct a composite facial trustworthiness index (i.e. CEO_Trust) by integrating these four facial features. Specifically, we construct Trust_CEO using the following steps. First, we reverse the signs of *Eyebrow* and *Philtrum* (i.e. Eyebrow_Reverse and Philtrum_Reverse, respectively) by multiplying each measure by −1, as studies suggest that facial trustworthiness is inversely related to these two facial features. Second, we calculate the standardized values of Eyebrow_Reverse, Face_Shape, Chin_Angle and Philtrum_Reverse by rescaling each measure to a mean of 0 and a standard deviation of 1, so that different facial features are comparable. Finally, we construct Trust_CEO by averaging the four standardized facial measures. A higher Trust_CEO value suggests higher facial trustworthiness.

As shown in Panel A of Table 1, after excluding all observations with missing CEO photos, we further remove financial firms (SIC 4900–4999) because of their unique corporate governance. To conduct our empirical tests, we also eliminate firm-year observations with missing values for the variables of interest and those whose CEO tenure is less than one year. These sample selection procedures generate a final sample of 16,201 firm-year observations with 3,168 unique CEOs for our investigation. Panel B presents the distribution of the sample based on the 12 industries classified by Fama and French (1997). Panel B shows that 22.73% (i.e. 3,682) of our firm-year observations belong to Business Equipment, followed by 14.13% (2,289) belonging to Manufacturing, 13.93% (2,257) to Wholesale, Retail, Some Services and 13.22% (2,141) classified as Other. In addition, only 2.64% (i.e. 428) of our firm-year observations belong to Telephone and Television Transmission, 3.16% (i.e. 512) to Consumer Durables, 3.60% (i.e. 584) to Chemicals and Allied Products and 4.59% (i.e. 744) to Energy. The number of observations in other industries is usually between 1,000 and 2,000.

3.2 Corporate governance measures

As corporate governance is very complex, there is no direct measurement. Therefore, we use three sets of proxies to measure the level of corporate governance. Our first set of proxies is

related to board structure, including board independence, board gender diversity, board size, board monitoring intensity and board governance (e.g. Khanna *et al.*, 2015). Our second set of proxies is related to board activity, including the number of annual board meetings and the number of "director days" (i.e. the product of the number of meetings and the percentage of independent directors) (Brick & Chidambaran, 2010; Vafeas, 1999). Our third set of proxies is related to CEO incentive alignment, including CEO incentives and CEO ownership.

3.2.1 Board monitoring structure. We use five proxies to measure the intensity of board monitoring. First, Bd_Ind is the percentage of independent directors on the board. The independence of directors is an important determinant of board monitoring and has been a focus of shareholder and regulator activity; indeed, an important provision of the 2002 Sarbanes–Oxley (SOX) Act is to increase the independence of the board of directors. The monitoring role played by independent directors is also well documented in the literature (Weisbach, 1988). For example, Weisbach (1988) finds that CEO turnover following poor performance is positively related to the number of independent directors. Thus, firms that need strong corporate governance are more likely to have high board independence (i.e. high Bd_Ind).

Second, Bd_Female is the percentage of female directors on the board. According to Adams and Ferreira (2009), female directors have better board attendance records and a greater likelihood of joining monitoring committees than male directors do. Thus, firms that need strong corporate governance are more likely to have more female directors on the board (i.e. high Bd_Female).

Panel A: Sample selection procedures

	No. Obs	No. CEOs
Non-duplicate firm-year obs in the merged dataset between BoardEx and Compustat Execucomp from 2000 to 2018	30,241	5,467
Less: Observations with missing CEO photos	(2,006)	(529)
Observations with CEOs' tenure less than 1 year	(3,342)	(405)
Observations with firms in finance industry (SIC between 6000 and 6999)	(4,661)	(831)
Observations with missing main variables	(4,031)	(534)
Final sample	*16,201*	*3,168*

Panel B: Sample distribution by industries

Fama and French 12 industries classification	Obs	Percent (%)
Consumer Non-Durables	978	6.04
Consumer Durables	512	3.16
Manufacturing	2,289	14.13
Energy	744	4.59
Chemicals and Allied Products	584	3.60
Business Equipment	3,682	22.73
Telephone and Television Transmission	428	2.64
Utilities	907	5.60
Wholesale, Retail and Some Services	2,257	13.93
Healthcare, Medical Equipment and Drugs	1,679	10.36
Other	2,141	13.22
Total	*16,201*	100

Table 1.
Sample selection procedures and sample distribution

Note(s): This table reports sample selection process in panel A and sample distribution by industries classification based on Fama and French 12 industries classification (Fama & French, 1997) in panel B. Our final sample consists of 19,347 firm-year observations including 3,583 CEOs from 2000 to 2018

Third, Bd_Size is the total number of directors on the board. A small board can better monitor the CEO because small groups are more cohesive, more productive and can oversee the firm more effectively, whereas large groups underperform in monitoring because of problems such as social loafing and high coordination costs (Khanna *et al.*, 2015). Therefore, firms that need strong corporate governance are more likely to have small boards (i.e. low Bd_Size).

Fourth, Bd_IntM equals 1 if a majority of independent directors serve on at least two of the three main board committees (i.e. audit, nominating and compensation committees), and 0 otherwise. According to Faleye *et al.* (2011), independent directors are monitoring intensive if they serve on at least two of these three committees. As each director sits on two committees on average, they argue that monitoring-intensive directors are less likely to join advisory committees (i.e. finance/investment/strategy and executive committees). Thus, they aggregate the measure of board monitoring intensity to the board level to identify firms in which independent directors, as a group, are clearly devoted to their monitoring duties. As such, firms that need strong corporate governance are more likely to have independent directors performing monitoring duties (i.e. high Bd_IntM).

Fifth, Bd_RG is a composite measure based on the G-index, which is also widely used as a measure of shareholder monitoring intensity (Cai, Liu, Qian, & Yu, 2015; Gompers, Ishii, & Metrick, 2003). Specifically, the G-index is computed using data compiled by Investor Responsibility Research Center (IRRC) as the equally weighted sum of 24 individual shareholder rights practices across five characteristics (i.e. regulations that delay a takeover, protect management, limit what shareholders can vote on, limit a takeover and state laws). These 24 governance attributes are coded as follows: a value of 1 indicates stronger anti-takeover protection (and therefore weaker shareholder rights and monitoring) and a value of 0 indicates greater market exposure for corporate control (and therefore better shareholder rights and monitoring). In other words, lower values indicate greater shareholder rights and shareholder monitoring intensity, and vice versa. For ease of interpretation, we follow Cai *et al.* (2015) and use the reverse G-index (Board_RG_index), which equals 24 minus the original G-index value. Thus, firms that need strong corporate governance are likely to have a high Bd_RG value.

3.2.2 Board monitoring activity. Our second set of proxies is related to board activity: the number of annual board meetings (Bd_Meet) and the number of "director days" (Moni_Meet). We include Moni_Meet because the number of board meetings alone does not fully capture the level of board monitoring, as both the percentage of independent directors and the time they spend on monitoring are important (Brick & Chidambaran, 2010). Vafeas (1999) examines the number of board meetings in a sample of 307 firms from 1990 to 1994 and finds that the frequency of board meetings is positively related to the level of corporate governance. He argues that if increased board activity contributes to better board monitoring, independent directors are likely to attend more board meetings to enhance their ability to monitor management. As such, firms that need strong corporate governance are more likely to have high board activity (i.e. high Bd_Meet and Moni_Meet).

3.2.3 CEO incentive alignment. Corporate governance analysis cannot be independent of incentive compensation contracts, an important mechanism for aligning the interests of CEO and shareholders (Brick & Chidambaran, 2010). Studies document that CEO exposure to their firm's stock prices is a way to align the incentives of the top management team with the interests of shareholders (Bergstresser & Philippon, 2006). For example, Jensen and Murphy (1990) show that, on average, CEOs saw only a \$3 increase in the value of their stock and option portfolios for every \$1,000 increase in shareholder wealth over the 1974–1986 period, suggesting that CEOs had little incentive to maximize shareholder value. Mehran (1995) finds that firm performance is positively related to the percentage of equity held by managers and to the percentage of their compensation that is equity-based. Raheja (2005) suggests that the

board of directors will be smaller when the incentives of insiders and shareholders are aligned. He also argues that when such alignment exists, insiders are less likely to take risky projects, reducing the need for external monitoring and resulting in smaller and less independent boards, which suggests that CEO incentive alignment plays a complementary role in corporate monitoring.

Therefore, following prior studies, we adopt two proxies for CEO incentive alignment: pay–performance sensitivity (PPS; CEO_Incent) and CEO ownership (CEO_Owner). Following Bergstresser and Philippon (2006), PPS (CEO_Incent) is measured as ONEPCT/ONEPCT + SALARY + BONUS, where ONEPCT equals $0.01 \times$ PRICE $\times$ (SHARES + OPTIONS). PRICE is the firm's share price, SHARES is the number of shares held by the CEO and OPTIONS is the number of options held by the CEO. This measure is normalized to capture the portion of a hypothetical CEO's total compensation that would come from a one percentage point increase in their firm's equity value. Following Linck *et al.* (2008), CEO_Owner is calculated as the percentage of a firm's shares held by the CEO. Taken together, firms that need strong corporate governance have higher PPS and CEO ownership (i.e. high *CEO_Incent* and CEO_Owner).

3.3 Research design

H1 predicts a lower level of corporate governance for more trustworthy-looking CEOs than for less trustworthy-looking CEOs. To test H1, we specify Eq. (1):

$$
\begin{aligned}
\text{Proxies(Corprate Governance}_{i,t}) = {} & \alpha_0 + \alpha_1 \text{CEO\_Trust}_{i,t-1} + \alpha_2 \text{Firmsize}_{i,t-1} \\
& + \alpha_3 \text{Bus\_Seg}_{i,t-1} + \alpha_4 \text{ROE}_{i,t-1} + \alpha_5 \text{Return}_{i,t-1} \\
& + \alpha_6 \text{BigN}_{i,t-1} + \alpha_7 \text{BM}_{i,t-1} + \alpha_8 \text{Leverage}_{i,t-1} \\
& + \alpha_9 \text{Firm\_Age}_{i,t-1} + \alpha_{10} \text{RD}_{i,t-1} + \alpha_{11} \text{Return\_Std}_{i,t-1} \\
& + \alpha_{12} \text{Insti\_Owner}_{i,t-1} + \alpha_{13} \text{CEO\_Overconf}_{i,t-1} \\
& + \alpha_{14} \text{CEO\_Age}_{i,t-1} + \alpha_{15} \text{CEO\_Female}_{i,t-1} \\
& + \alpha_{16} \text{CEO\_Tenure}_{i,t-1} + \varepsilon
\end{aligned}
$$

(1)

In Eq. (1), the dependent variables are the proxies described in Section 3.2: Bd_Ind, Bd_Female, Bd_Size, Bd_IntM, Bd_RG, Bd_Meet, Moni_Meet, CEO_Incent and CEO_Owner. The key variable of interest is our composite measure of CEO facial trustworthiness (i.e. Trust_CEO). H1 predicts a negative coefficient on Trust_CEO.

We control for a set of control variables that are shown to affect corporate governance. In particular, we control for firm size (Firmsize), measured by the natural logarithm of total assets, because large firms are more complex and require greater monitoring (Linck *et al.*, 2008). We control for Bus_Seg, the number of active business segments, because it affects board monitoring costs (Faleye *et al.*, 2011). We control for return on equity (ROE) and Return because board monitoring intensity is likely to be high in firms with poor past performance (Bhagat and Bolton, 2008). We control for BigN (indicator equal to 1 if a firm uses one of the Big N audit firms, and 0 otherwise) because BigN is positively associated with corporate governance (Farber, 2005). We control for BM (book value of equity/market value of equity), RD (R&D expenditure) and Return_Std (standard deviation of returns in the previous year) because they are shown to be related to monitoring and advisory costs (Linck *et al.*, 2008). Studies show that a firm's operational risk is positively correlated with board monitoring

(Dey, 2008). Therefore, we control for operational risk by including Leverage (the leverage ratio). We also control for Insti_Owner (institutional ownership) because board monitoring can benefit from institutional investors who have information advantages (Demiralp, D'Mello, Schlingemann, & Subramaniam, 2011).

Furthermore, we control for four CEO characteristics that may be related to board monitoring. Goel and Thakor (2008) find that overconfident managers are more likely to be promoted to the position of CEO, implying that the board values certain attributes of overconfident managers. Therefore, we control for CEO overconfidence (CEO_Overconf). Following prior studies (Hribar & Yang, 2016), CEO_Overconf is a dummy variable equal to 1 if the CEO holds options with an average moneyness of at least 67% more than once during our sample period. We control for CEO age (CEO_Age) because younger CEOs are more likely to pursue empire building and invest in risky projects (Yim, 2013), triggering more intensive board monitoring. As CEO gender is associated with board structure, we also control for CEO_Female, which takes a value of 1 if the CEO is a women and 0 otherwise (Frye and Pham, 2018). Last, studies show that long-tenured CEOs tend to have greater bargaining power and are therefore associated with less monitoring, including lower board independence (Linck et al., 2008) and fewer board meetings (Ryan, Wang, & Wiggins, 2009). Therefore, we control for CEO_Tenure (i.e. the number of years the CEO has held the position of CEO).

Finally, we control for firm and year fixed effects and CEO age group fixed effects. We winsorize all continuous variables at the first and 99th percentiles and cluster all standard errors by industry and year. Appendix provides detailed variable definitions.

4. Empirical analysis and results
4.1 Descriptive analysis
Table 2 presents the descriptive statistics. The mean values of the different CEO facial trustworthiness measures are very close to 0 because these variables are standardized to have a mean of 0 and a standard deviation of 1 (Hsieh et al., 2020). In terms of board structure, on average, 71% of the directors are independent directors, 11.4% are women, the boards are made up of 11 directors on average and 57% of the boards are monitoring intensive. The mean value of Bd_RG (14.688) is close to the mean of 14.99 reported by Cai et al. (2015). Regarding board activity, on average, there are 7.061 annual board meetings, which is comparable to the 7.26 annual board meetings reported by Brick and Chidambaran (2010). Moni_Meet has a mean value of 4.325. In terms of CEO incentive alignment, the mean of CEO_Incent is 0.175. This value is lower than the value of 0.244 reported by Bergstresser and Philippon (2006) because their sample covers the period from 1996 to 2001. The difference is reasonable because the implementation of SOX in 2002 increased board monitoring, which may reduce the need for CEO incentive alignment (Guthrie, Kwon, & Jan, 2017). The mean value of CEO_Owner is 0.027, which is very close to the mean of 0.028 reported by Kim and Lu (2011). In terms of control variables, their values are largely consistent with prior studies. For example, the mean value of Insti_Owner is 0.607, which is slightly lower than the mean of 0.65 reported by Chen, Lu and Sougiannis (2012). The mean value of CEO_Age is 55.9, which is close to the mean age of 55 years reported by Faleye (2007) and Fee and Hadlock (2004).

4.2 Multivariate analysis results
4.2.1 Results for board structure. Columns (1) through (5) of Table 3 present the results of the effect of CEO facial trustworthiness on board structure, including Bd_Ind, Bd_Female, Bd_Size, Bd_IntM and Bd_RG, respectively. The results show that Trust_CEO is

	N	Mean	Std.Dev	Q1	Median	Q3
Facial trustworthiness measures						
Trust_CEO	16,201	−0.001	0.531	−0.374	0.001	0.367
Chin_Angle	16,201	0.010	1.014	−0.741	−0.056	0.634
Eyebrow_Reverse	16,201	−0.008	1.004	−0.652	0.018	0.688
Face_Shape	16,201	0.009	1.015	−0.717	−0.031	0.654
Philtrum_Reverse	16,201	−0.015	0.994	−0.681	0.020	0.647
Board monitoring structure						
Bd_Ind	16,201	0.710	0.134	0.615	0.688	0.857
Bd_Female	16,201	0.114	0.097	0.000	0.111	0.167
Bd_Size	16,201	11.140	3.258	9.000	11.000	14.000
Bd_IntM	16,201	0.571	0.495	0.000	1.000	1.000
Bd_RG	5,306	14.688	2.526	13.000	15.000	16.000
Board monitoring activities						
Bd_Meet	4,385	7.061	2.734	5.000	6.000	8.000
Moni_Meet	4,385	4.325	1.885	3.000	4.000	5.250
CEO incentive alignment						
CEO_Incent	16,162	0.175	0.174	0.040	0.125	0.259
CEO_Owner	12,854	2.710	5.902	0.172	0.540	1.840
Control variables						
Firmsize	16,201	7.453	1.588	6.305	7.319	8.490
Bus_Seg	16,201	3.081	2.146	1.000	3.000	4.000
ROE	16,201	0.088	0.375	0.046	0.114	0.185
Return	16,201	0.284	0.649	−0.097	0.186	0.512
BigN	16,201	0.895	0.306	1.000	1.000	1.000
BM	16,201	0.473	0.355	0.244	0.404	0.621
Leverage	16,201	0.514	0.228	0.352	0.515	0.661
Firm_Age	16,201	25.337	19.630	11.000	19.000	35.000
RD	16,201	0.034	0.060	0.000	0.001	0.045
Return_Std	16,201	0.026	0.013	0.017	0.023	0.032
Insti_Owner	16,201	0.614	0.351	0.417	0.740	0.892
CEO_Overconf	16,201	0.594	0.491	0.000	1.000	1.000
CEO_Age	16,201	56.312	7.083	52.000	56.000	61.000
CEO_Female	16,201	0.033	0.179	0.000	0.000	0.000
CEO_Tenure	16,201	6.465	5.613	3.000	5.000	8.000

Note(s): This table reports the sample size, mean, percentiles and standard deviations of our sample variables. The sample consists of 16,201 firm-year observations including 3,168 CEOs from 2000 to 2018. All continuous variables are winsorized at the first and 99th percentiles. Variable definitions are provided in Appendix

Table 2.
Descriptive statistics

significantly negatively associated with Bd_Ind (−0.008, $p < 0.01$), Bd_Female (−0.003, $p < 0.05$), Bd_IntM (−0.252, $p < 0.01$) and Bd_RG (−0.091, $p < 0.05$). Trust_CEO is significantly positively associated with Bd_Size (0.084, $p < 0.05$). We then examine the economic significance of these results by following an approach similar to that adopted by Beck and Mauldin (2014). To this end, we compute changes in the board structure proxies resulting from a change in Trust_CEO from the 25th percentile (−0.374) to the 75th percentile (0.367). For this interquartile change in Trust_CEO, we find that Bd_Ind decreases by 0.6%, Bd_Female decreases by 0.2%, Bd_Size increases by 0.62%, and Bd_RG decreases by 0.067%. Taken together, the results support H1, suggesting that CEO facial trustworthiness plays an important role in board structure. The control variables generally show results similar to those reported in previous studies, as discussed in Section 3.3.

| | Monitoring structure | | | | | Monitoring activities | | CEO incentive alignment | |
	(1) Bd_Ind	(2) Bd_Female	(3) Bd_Size	(4) Bd_IntM	(5) Bd_RG	(6) Bd_Meet	(7) Moni_Meet	(8) CEO_Incent	(9) CEO_Owner
Trust_CEO	−0.008*** (0.002)	−0.003** (0.001)	0.084** (0.043)	−0.252*** (0.086)	−0.091** (0.045)	−0.475*** (0.177)	−0.320*** (0.113)	−0.006* (0.003)	−0.321*** (0.105)
Firmsize	−0.014*** (0.002)	0.002 (0.001)	0.860*** (0.039)	−0.285*** (0.082)	0.159*** (0.044)	−0.045 (0.216)	0.040 (0.130)	0.024*** (0.003)	−0.454*** (0.092)
Bus_Seg	0.003*** (0.001)	−0.000 (0.001)	0.008 (0.013)	0.068*** (0.025)	0.014 (0.011)	−0.010 (0.054)	−0.007 (0.036)	0.000 (0.001)	−0.063* (0.032)
ROE	0.001 (0.002)	0.004*** (0.001)	−0.031 (0.041)	0.077 (0.080)	0.022 (0.028)	−0.070 (0.131)	−0.047 (0.082)	0.005* (0.003)	0.037 (0.089)
Return	0.000 (0.001)	−0.001 (0.001)	−0.010 (0.022)	−0.065 (0.052)	0.038** (0.019)	−0.120* (0.066)	−0.105* (0.043)	0.007*** (0.002)	0.046 (0.051)
BigN	−0.004 (0.004)	0.006** (0.003)	−0.141* (0.085)	0.256 (0.196)	0.106 (0.071)	0.030 (0.193)	−0.044 (0.128)	0.011 (0.010)	−0.275 (0.284)
BM	0.016*** (0.003)	0.005** (0.002)	−0.170*** (0.066)	−0.082 (0.140)	−0.049 (0.071)	−0.184 (0.224)	−0.163 (0.146)	−0.042** (0.005)	0.168 (0.143)
Leverage	0.007 (0.006)	0.000 (0.004)	0.257** (0.124)	−0.350 (0.263)	0.292** (0.130)	−1.216** (0.547)	−0.582* (0.307)	−0.056** (0.013)	0.861*** (0.282)
Firm_Age	0.000 (0.000)	0.001*** (0.000)	0.025*** (0.008)	0.018 (0.015)	−0.022 (0.015)	−0.206 (0.166)	−0.099 (0.123)	0.000 (0.000)	0.040 (0.066)
RD	0.201** (0.099)	−0.019 (0.022)	2.697*** (0.597)	−0.668 (1.302)	−5.114*** (1.837)	−0.600 (2.162)	0.142 (1.329)	0.135** (0.061)	−3.325*** (1.181)
Returns_Std	0.005 (0.005)	−0.082 (0.061)	−17.978*** (1.961)	5.517 (4.045)		27.581*** (8.633)	12.846*** (5.427)	0.131 (0.210)	0.326 (4.296)
Insti_Owner	−0.013*** (0.002)	0.008** (0.004)	−0.425*** (0.096)	0.315* (0.187)	0.082 (0.102)	0.167 (0.381)	0.072 (0.244)	0.021*** (0.007)	−0.980*** (0.201)
CEO_Overconf	−0.001*** (0.000)	0.005*** (0.002)	0.137*** (0.044)	0.010 (0.090)	−0.050 (0.041)	−0.229 (0.184)	−0.136 (0.114)	0.068*** (0.004)	−0.434*** (0.111)
CEO_Age	−0.001*** (0.000)	−0.000*** (0.000)	0.009* (0.006)	0.010 (0.012)	0.005 (0.005)	0.027 (0.019)	0.020 (0.012)	0.000 (0.000)	0.086*** (0.014)
CEO_Female	0.012* (0.006)	0.064*** (0.005)	−0.454*** (0.131)	−0.241 (0.218)	−0.045 (0.088)	−1.715* (0.941)	−0.810 (0.525)	−0.010 (0.010)	−0.155 (0.453)
CEO_Tenure	0.000 (0.000)	−0.000*** (0.000)	−0.016*** (0.004)	0.002 (0.008)	0.006 (0.004)	−0.032* (0.018)	−0.022* (0.012)	0.002*** (0.000)	0.105*** (0.015)
Observations	16,201	16,201	16,201	9,643	5,306	4,385	4,385	16,162	12,854
CEO Age Group	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj./Pseudo R^2	0.709	0.720	0.811	0.263	0.954	0.512	0.569	0.635	0.804

Note(s): This table presents the results of a multivariate analysis of how CEOs' facial trustworthiness affects board monitoring intensity. We include year and firm fixed effects, as expressed in Eq. (1). Columns (1) to (5) report results for the proxies of monitoring structure including Bd_Ind, Bd_Female, Bd_Size, Bd_IntM, and Bd_RG, respectively. Columns (6) and (7) present results for the proxies of monitoring activities including Bd_Meet and Moni_Meet, respectively. Columns (8) and (9) present results for the proxies of CEO incentive alignment including CEO_Incent and CEO_Owner, respectively. See Appendix for variable definitions. Robust standard errors are clustered at the year and firm level. The standard errors are reported in parentheses. ***, ** and * indicates p-values of 1, 5 and 10%, respectively

Table 3.
CEO trustworthiness and corporate governance

4.2.2 Results for monitoring activity. Columns (6) and (7) of Table 3 present the results of the effect of CEO facial trustworthiness on board activity, including Bd_Meet and Moni_Meet, respectively. The results show that Trust_CEO is significantly negatively associated with Bd_Meet (-0.475, $p < 0.01$) and Moni_Meet (-0.320, $p < 0.01$), supporting our prediction that CEO facial trustworthiness affects board activity. The control variables generally show results similar to those reported in previous studies, as discussed in Section 3.3. In terms of economic significance, for the interquartile change in Trust_CEO, we find that Bd_Meet decreases by 0.351 and Moni_Meet decreases by 0.237.

4.2.3 Results for CEO incentive alignment. Columns (8) and (9) of Table 3 present the results of the effect of CEO facial trustworthiness on CEO incentive alignment, including CEO_Incent and CEO_Owner, respectively. Trust_CEO is significantly negatively associated with CEO_Incent (-0.006, $p < 0.10$) and CEO_Owner (-0.321, $p < 0.01$), further supporting H1 and suggesting that CEO facial trustworthiness plays an important role in CEO incentive alignment. Again, the control variables generally show results similar to those reported in previous studies, as discussed in Section 3.3. In terms of economic significance, for the interquartile change in Trust_CEO, we find that CEO_Incent decreases by 0.004 and CEO_Owner decreases by 0.238.

Overall, the results in Table 3 show consistent and strong evidence for the negative association between CEO facial trustworthiness and the level of corporate governance, including board structure, board activity and CEO incentive alignment.

4.3 Additional analyses and robustness tests

4.3.1 Short vs. long CEO tenure. We examine whether our results differ for CEOs whose tenure is below or above the third quartile (i.e. eight years). We expect our results to be driven by short-tenured CEOs because directors must rely more on their first impressions of CEOs when their experience working with CEOs is limited. The information accumulated from working with CEOs may help directors develop a comprehensive evaluation of management integrity. This prediction is consistent with the view that the effect of CEO facial trustworthiness weakens as perceivers gain more information through repeated games (Olivola, Sussman, Tsetsos, Kang, & Todorov, 2012). To test this prediction, we conduct subsample tests by examining firm-year observations with CEO_Tenure below and above the third quartile separately. The results are reported in Table 4. Panel A (B) examines the impact of CEO tenure on the association between CEO facial trustworthiness and board structure (board activity and CEO incentive alignment). Consistent with our prediction, we find results similar to our main results for the subsample of firm-year observations with CEO_Tenure below the third quartile. When CEO_Tenure is above the third quartile, we find that CEO facial trustworthiness is not associated with board monitoring intensity. Overall, the results in Table 4 provide supporting evidence that the negative association between CEO facial trustworthiness and the level of corporate governance is mainly driven by short-tenured CEOs (i.e. less than eight years).

4.3.2 Internally promoted CEOs vs. externally hired CEOs. In general, directors on the board have many interactions with internal CEO candidates over a number of years, so they have rich information on internally appointed CEOs. In contrast, directors have almost no direct interaction with externally hired CEOs before interviewing them and must rely on their first impressions (Graham *et al.*, 2017). It is more difficult to verify and interpret the track record of external CEO candidates; thus, it is not surprising that a consultant is involved in both the identification of potential candidates and the performance of due diligence. Because of severe information asymmetry, psychology theory suggests that directors are more likely to scrutinize external candidates than internal candidates (Graham *et al.*, 2017). Furthermore, shareholders or investors are less familiar to the externally hired CEOs than internally

Panel A: CEO trustworthiness and board monitoring structure

Dep =	Bd_Ind		Bd_Female		Bd_Size		Bd_IntM		Bd_RG	
	(1) CEO_Tenure < 8	(2) CEO_Tenure ≥ 8	(3) CEO_Tenure < 8	(4) CEO_Tenure ≥ 8	(5) CEO_Tenure < 8	(6) CEO_Tenure ≥ 8	(7) CEO_Tenure < 8	(8) CEO_Tenure ≥ 8	(9) CEO_Tenure < 8	(10) CEO_Tenure ≥ 8
Trust_CEO	−0.007*** (0.002)	−0.012 (0.010)	−0.003** (0.002)	0.000 (0.007)	0.081* (0.048)	0.169 (0.189)	−0.218** (0.099)	−0.250 (0.472)	−0.093** (0.046)	−0.719 (0.566)
Observations	11,457	4,744	11,457	4,744	11,457	4,744	6,215	1,854	3,965	1,341
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO Age Group	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj./pseudo R^2	0.718	0.774	0.723	0.792	0.811	0.859	0.232	0.256	0.949	0.973

Panel B: CEO trustworthiness, board monitoring activities and CEO incentive alignment

Dep =	Bd_Meet		Moni_Meet		CEO_Incent		CEO_Owner	
	(1) CEO_Tenure < 8	(2) CEO_Tenure ≥ 8	(3) CEO_Tenure < 8	(4) CEO_Tenure ≥ 8	(5) CEO_Tenure < 8	(6) CEO_Tenure ≥ 8	(7) CEO_Tenure < 8	(8) CEO_Tenure ≥ 8
Trust_CEO	0.419** (0.189)	0.492 (1.961)	0.270** (0.115)	1.159 (1.476)	−0.08** (0.004)	−0.015 (0.017)	−0.167* (0.099)	0.995 (0.636)
Observations	3,265	1,120	3,265	1,120	11,438	4,724	9,325	3,529
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO Age Group	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.485	0.589	0.553	0.651	0.622	0.750	0.774	0.887

Note(s): This table reports results examining whether our results are driven by shorter tenure CEOs. We conduct subsample analysis by separately examining firm-year observations when the CEO_Tenure is below the Q3 (i.e. 8 years) and above the Q3. Panel A examines the impact of CEOs' facial trustworthiness on board monitoring structure, while Panel B examines the impact of CEOs' facial trustworthiness on board monitoring activities and CEO incentive alignment. See Appendix for variable definitions. Robust standard errors are clustered at the firm and year level. The standard errors are reported in parentheses. ***, ** and * indicates p-values of 1, 5 and 10%, respectively

Table 4.
Robustness tests:
shorter vs longer CEO
tenure

promoted CEOs. Thus, externally hired CEOs' facial trustworthiness is more likely to influence the credibility than internally promoted CEOs. Taken together, our main results are expected to be more pronounced for CEOs hired externally than for CEOs promoted internally.

To test this prediction, we follow Graham *et al.* (2017) and identify internally promoted CEOs and externally hired CEOs. Specifically, we compare the date a CEO joins the firm and the date they become CEO. If the duration exceeds (is less than) 12 months, we classify that CEO as internally promoted (externally hired). We conduct subsample tests by analyzing internally promoted CEOs and externally hired CEOs separately. The results are reported in Table 5. Panel A examines the impact of CEO facial trustworthiness on board structure, while Panel B examines the impact of CEO facial trustworthiness on board activity and CEO incentive alignment. Consistent with our prediction, we find results similar to our main results for externally hired CEOs for all nine measures of corporate governance, but the results for internally promoted CEOs are much weaker. When CEOs are promoted internally, Trust_CEO is significantly associated with only four of the nine proxies for board monitoring intensity (i.e. Bd_Female, Bd_IntM, CEO_Incent and CEO_Owner).

4.3.3 Four dimensions of CEO facial trustworthiness. Finally, we examine whether our results remain robust when using each of the four facial features separately to measure CEO facial trustworthiness. According to H1, all four facial trait measures (i.e. Chin_Angle, Eyebrow_Reverse, Face_Shape and Philtrum_Reverse) are expected to be negatively associated with board monitoring intensity.

The results are reported in Table 6. Panels A, B and C report results examining whether the four measures are associated with board structure, board activity and CEO incentive alignment, respectively. We find that the four measures are negatively associated with board monitoring intensity with only five exceptions. These results further support H1, indicating that CEO facial trustworthiness plays an important complementary role in corporate governance. Although not tabulated for brevity, we find that the control variables have similar effects on board monitoring as those found in the main analysis using our composite facial trustworthiness measure.

5. Conclusion

Using a machine learning-based technique for facial feature point detection, which is well developed in the field of computer science (Dalal & Triggs, 2005; Kazemi & Sullivan, 2014; Sagonas *et al.*, 2013), we construct a novel CEO facial trustworthiness database for companies listed in the USA and investigate whether and how directors on the board incorporate CEO facial trustworthiness into their corporate governance decisions. Our results suggest that the level of corporate governance is negatively associated with CEO facial trustworthiness, although the results are mainly driven by CEOs whose tenure is less than eight years. To the best of our knowledge, our study is the first to provide systematic evidence of the correlation between CEO facial trustworthiness and the level of corporate governance using a large sample.

However, we are still concerned that our main variable of interest, CEO facial trustworthiness, is endogenous. This concern is partially mitigated by the fact that an individual's facial structure is a predetermined biogenetic measure. Although we cannot completely rule out endogeneity, the "born with" nature of facial trustworthiness renders this concern unlikely in our study. Furthermore, as both corporate governance and CEO facial trustworthiness can influence shareholder trust, we suggest that they may be complementary and do not attempt to document any causality between them.

Panel A: CEO trustworthiness and board monitoring structure

Dep =	Bd_Ind		Bd_Female		Bd_Size		Bd_IntM		Bd_RG	
	(1) Inside CEO	(2) Outside CEO	(3) Inside CEO	(4) Outside CEO	(5) Inside CEO	(6) Outside CEO	(7) Inside CEO	(8) Outside CEO	(9) Inside CEO	(10) Outside CEO
Trust_CEO	0.002 (0.002)	−0.008*** (0.003)	−0.004*** (0.002)	−0.004** (0.002)	0.019 (0.034)	0.123** (0.062)	−0.157*** (0.033)	−0.175*** (0.067)	0.082 (0.054)	−0.269** (0.116)
Observations	12,020	4,181	12,020	4,181	12,020	4,181	12,002	4,157	4,201	1,105
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO Age Group	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj./Pseudo R^2	0.404	0.525	0.303	0.323	0.614	0.622	0.116	0.133	0.219	0.345

Panel B: CEO trustworthiness, board monitoring activities and CEO incentive alignment

Dep =	Bd_Meet		Moni_Meet		CEO_Incent		CEO_Owner	
	(1) Inside CEO	(2) Outside CEO	(3) Inside CEO	(4) Outside CEO	(5) Inside CEO	(6) Outside CEO	(7) Inside CEO	(8) Outside CEO
Trust_CEO	0.062 (0.159)	−0.238*** (0.083)	−0.013 (0.095)	−0.161*** (0.059)	−0.010*** (0.004)	−0.013*** (0.002)	−0.219* (0.127)	−0.231*** (0.084)
Observations	3,402	983	3,402	983	11,988	4,174	9,464	3,390
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO Age Group	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.169	0.286	0.196	0.350	0.357	0.360	0.260	0.401

Note(s): This table reports results examining whether our results are stronger for external hired CEOs than internal promoted CEOs. Following Graham et al. (2017), we identify which CEOs are promoted from within the company and which CEOs are hired externally. We compare the date when the executive joins the company and the date he becomes CEO. If this exceeds 12 months, we classify this as an internal promoted CEO, otherwise the CEO is externally hired. We repeat our tests and separately analyze internal promoted CEOs and externally hired CEOs. Panel A examines the impact of CEO on board monitoring structure, while Panel B examines the impact of CEO trustworthiness on board monitoring activities and CEO incentive alignment. See Appendix for variable definitions. All regressions include year, industry, and headquarter state fixed effects. Robust standard errors are clustered at the year and industry level. The standard errors are reported in parentheses. ***, ** and * indicates p-values of 1, 5 and 10%, respectively

Table 5.
Robustness tests: internal promoted CEOs vs. external hired CEOs

Panel A: CEO trustworthiness and board monitoring structure

Dep =	Bd_Ind (1)	Bd_Ind (2)	Bd_Ind (3)	Bd_Ind (4)	Bd_Female (5)	Bd_Female (6)	Bd_Female (7)	Bd_Female (8)	Bd_Meet (9)	Bd_Meet (10)	Bd_Size (11)	Bd_Size (12)	Moni_Meet (13)	Bd_InM (14)	Bd_InM (15)	(16)	Moni_Meet (17)	Moni_Meet (18)	Bd_RG (19)	Bd_RG (20)
Chin_Angle	-0.004*** (0.001)				-0.002** (0.001)				0.036* (0.022)				-0.164*** (0.049)	-0.097** (0.048)			-0.067*** (0.024)			
Eyebrow_Reverse		-0.001 (0.001)				-0.002*** (0.001)				0.048** (0.024)					-0.103** (0.048)			-0.046* (0.027)	-0.065*** (0.023)	
Face_Shape			-0.005*** (0.001)				-0.002*** (0.001)				0.055*** (0.019)					0.037 (0.045)				
Philtrum_Reverse				-0.001 (0.001)				-0.002*** (0.001)				0.053** (0.024)								-0.123*** (0.031)
Observations	16,201	16,201	16,201	16,201	16,201	16,201	16,201	16,201	16,201	16,201	16,201	16,201	5,306	5,306	5,306	5,306	9,643	9,643	9,643	9,643
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj/Pseudo R^2	0.709	0.705	0.709	0.709	0.720	0.720	0.713	0.720	0.785	0.785	0.811	0.811	0.954	0.215	0.954	0.220	0.263	0.263	0.263	0.263

Panel B: CEO trustworthiness and board monitoring activities

	Bd_Meet (1)	Bd_Meet (2)	Bd_Meet (3)	Bd_Meet (4)	Moni_Meet (5)	Moni_Meet (6)	Moni_Meet (7)	Moni_Meet (8)
Chin_Angle	-0.078** (0.039)				-0.030 (0.026)			
Eyebrow_Reverse		-0.179*** (0.040)				-0.114*** (0.027)		
Face_Shape			-0.082** (0.041)				-0.047* (0.027)	
Philtrum_Reverse				0.081** (0.040)				0.056** (0.027)
Observations	4,378	4,378	4,378	4,378	4,378	4,378	4,378	4,378
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.176	0.184	0.176	0.180	0.229	0.232	0.229	0.225

Panel C: CEO trustworthiness and CEO incentive alignment

	CEO_Incent (1)	CEO_Incent (2)	CEO_Incent (3)	CEO_Incent (4)	CEO_Owner (5)	CEO_Owner (6)	CEO_Owner (7)	CEO_Owner (8)
Chin_Angle	-0.003*** (0.001)				-0.204*** (0.062)			
Eyebrow_Reverse		-0.003* (0.002)				-0.181** (0.090)		
Face_Shape			-0.000 (0.002)				-0.178*** (0.059)	
Philtrum_Reverse				-0.004*** (0.001)				-0.146** (0.073)
Observations	16,162	16,162	16,162	16,162	12,854	12,854	12,854	12,854

(continued)

Table 6.
Robustness tests: Four
dimensions of CEO
trustworthiness

Panel C: CEO trustworthiness and CEO incentive alignment

	(1) CEO_Incent	(2) CEO_Incent	(3) CEO_Incent	(4) CEO_Incent	(5) CEO_Owner	(6) CEO_Owner	(7) CEO_Owner	(8) CEO_Owner
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.300	0.300	0.264	0.301	0.382	0.385	0.383	0.385

Note(s): This table report results examining whether our results remain robust when using each of four individual facial features to measure CEO trustworthiness. Based on the prediction of our H1, all four individual facial trait measures (i.e. Chin_Angle, Eyebrow_Reverse, Face_Shape and Philtrum_Reverse) are expected to be negatively associated with board monitoring intensity. Panels A, B, and C report results examining whether the four individual facial trustworthiness trait measures are associated with board monitoring structure, board monitoring activities, and CEO incentive alignment, respectively. See Appendix for variable definitions. All regressions include firm and year fixed effects. Robust standard errors are clustered at the firm and year level. The standard errors are reported in parentheses. ***, ** and * indicates p-values of 1, 5 and 10%, respectively

Table 6.

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Appendix

	Definitions
Variable of interests	
Trust_CEO	Composite measure of facial trustworthiness for CEOs, equals the average of the CEOs' standardized values of *Eyebrow_Reverse*, *Face_Shape*, *Chin_Angle* and *Philtrum_Reverse*. The standardized facial feature is computed as the facial feature minus the sample mean, scaled by the sample standard deviation
Chin_Angle	The angle of the chin. Details are in Hsieh *et al.* (2020)
Eyebrow_Reverse	The angles of both left- and right-side eyebrows and then averaging the two eyebrow angles, multiplied by -1. Detailed measurement is provided in Hsieh *et al.* (2020)
Face_Shape	The roundness of a face. Details are in Hsieh *et al.* (2020)
Philtrum_Reverse	The nose-to-lip distance scaled by the upper facial length, multiplied by -1. Details are in Hsieh *et al.* (2020)
Board monitoring structure	
Bd_Ind	Equals 1 if a majority (more than 50%) of directors on board are independent and 0 otherwise (source: BoardEx)
Bd_Female	The percentage of female directors on board (source: BoardEx)
Bd_Size	The total number of directors on board (source: BoardEx)
Bd_IntM	Equals 1 if a majority of independent directors serve on at least two of the three principal board committees (i.e. audit committee, nomination committee and compensation committee), and 0 otherwise (source: BoardEx)
Bd_RG	A proxy for the level of shareholder rights as measured by the Gompers-Ishii-Metric Governance Index (source: Institutional Shareholder Services)
Board monitoring activities	
Bd_Meet	Annual number of board meetings (source: Execucomp)
Moni_Meet	Product of the percentage of independent directors and the number of annual board meetings (source: Execucomp)
CEO incentive alignment	
CEO_Incent	Equals to ONEPCT/ONEPCT + SALARY + BONUS, where ONEPCT equals 0.01 × PRICE × (SHARES + OPTIONS). PRICE is the company share price, SHARES is the number of shares held by the CEO and OPTIONS is the number of options held by the CEO (source: Execucomp)
CEO_Owner	Percent of firm's shares held by the CEO (source: Execucomp)
Control variables	
Firmsize	Natural log of total assets at the beginning of the misstatement period (source: Compustat)
Bus_Seg	Number of active business segments for which a firm reports operations (source: Compustat)
ROE	Return on equity for the year prior to the restatement, calculated as operating income before interest and taxes divided by total equity (source: Compustat)
Return	The cumulative stock return in the preceding year (source: CRSP)
BigN	Indicator that equals one if a firm uses one of the Big N auditors and zero otherwise (source: Audit Analytic)
BM	Book value of equity/market value of equity (source: Compustat)
Leverage	Total liabilities divided by total assets (source: Compustat)
Firm_Age	Number of years since the firm was first listed on CRSP (source: CRSP)
RD	R&D expenditures/Total assets (if missing, set to zero) (source: Compustat)

Table A1.
Variable measurement

(continued)

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Table A1.

	Definitions
Return_Std	Standard deviation of daily stock returns the 12 months in the preceding fiscal year (source: CRSP)
Insti_Owner	1 if the firm received a SOX 404 audit opinion from Deloitte, PricewaterhouseCoopers, Ernst & Young, or KPMG during the misstatement period and 0 otherwise (source: Audit Analytics)
CEO_Overconf	Dummy variable, equals 1 if the CEO is overconfident according to the Hold67 measurement in prior studies (Hribar & Yang, 2016) and 0 otherwise (source: Execucomp)
CEO_Age	CEO's age (source: Execucomp)
CEO_Female	1 if the CEO is female, and 0 otherwise (source: BoardEx)
CEO_Tenure	Number of years that the CEO has served as CEO (source: BoardEx)

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