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Seeing is believing? Executives' facial trustworthiness, auditor tenure, and audit fees

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ABSTRACT

Psychology and neuroscience studies document that facial trustworthiness perceptions may affect observers' decision-making process. Our study examines whether auditors' perceptions of client executives' facial trustworthiness are associated with their audit fee decisions. We employ a machine-learning-based face-detection algorithm to measure executives' facial trustworthiness. We find that auditors charge 5.6% less audit fee to firms with trustworthy-looking CFOs than to those with untrustworthy-looking CFOs in initial audit engagements. Auditor tenure weakens the negative association between CFOs' facial trustworthiness and audit fee. Further evidence shows that CFO's facial trustworthiness is associated with neither financial reporting quality nor litigation risk.

"We look at a person and immediately a certain impression of his character forms itself in us. A glance, a few spoken words are sufficient to tell us a story about a highly complex matter."

(Asch, 1946)

1. Introduction

As the opening quote conveys, people may rapidly perceive character and personality from an individual's facial appearance (Oosterhof and Todorov, 2008). In this regard, the neuroscience literature identifies two key roles played by the amygdala in the human brain: (1) interpreting facial trustworthiness – defined as a trustor's perceptions of a trustee's ability, benevolence, and integrity (Mayer et al., 1995) based on the trustee's facial appearance; and (2) making

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trust-related decisions by triggering autonomic responses to emotional stimuli (Adolphs et al., 1998; Gupta et al., 2011; Todorov et al., 2008; Winston et al., 2002). Consistent with these findings in neuroscience, prior literature in business settings has documented that a trustee's facial trustworthiness may affect a trustor's subsequent decision-making process in peer-to-peer lending, legal defense, and various trust games (Duarte et al., 2012; Porter et al., 2010; Rezlescu et al., 2012; Schlicht et al., 2010; Tingley, 2014). Expanding this concept in an audit setting, the Public Company Accounting Oversight Board (PCAOB) Auditing Standards (AS) require auditors to communicate with management to assess the risks of material misstatement (see AS 2401 for an overview). This communication involves face-to-face interactions between auditors and client firms' executives. During initial and subsequent interactions, auditors may develop perceptions of client executives' facial trustworthiness and factor such perceptions into their subsequent decision-making. However, auditors' professional skepticism and the thoroughness of auditing process might motivate auditors not to focus on facial trustworthiness. Instead, auditors may rely primarily on other forms of evidence to assess the trustworthiness of management and the potential audit risks. The purpose of this study is to investigate whether and how auditors incorporate executive's facial trustworthiness into the pricing of their audit services.

Although empirical evidence on whether facial trustworthiness is correlated with actual behavior are mixed,[1] the psychology literature documents that people tend to extend less trust to an individual with lower facial trustworthiness (Chang et al., 2010; Duarte et al., 2012; Rezlescu et al., 2012; Schlicht et al., 2010; Stirrat and Perrett, 2010; Tingley, 2014; Van't Wout and Sanfey, 2008). Thus, auditors may be less trusting of the business information provided by client firms' CEOs and CFOs with low facial trustworthiness, and accordingly perceive a higher audit risk for such clients, necessitating a higher fee. Therefore, we propose and test the hypothesis that auditors charge a higher fee to client firms with untrustworthy-looking CEOs and CFOs to compensate for the higher perceived audit risk.

Prior studies suggest that gaining more relevant information about an individual's past behavior may weaken the impact of perceived facial trustworthiness when making strategic decisions related to that individual (Olivola et al., 2012; Rezlescu et al., 2012). Auditors accumulate more experience and knowledge about client firms' business facts as their tenure increases. Auditors with longer tenure may tend to rely more on their understanding of client firms' underlying risk factors and thus rely less on their initial perception of CEOs' and CFOs' facial trustworthiness. We, therefore, propose and test our second hypothesis that auditor tenure weakens the impact of facial trustworthiness on audit fee.

Using the latest machine-learning-based facial-feature-point detection technique (Dalal and Triggs, 2005; Kazemi and Sullivan, 2014; Sagonas et al., 2013), we construct a proprietary facial-trustworthiness database for CEOs and CFOs of U.S. listed companies. First, we develop a computer algorithm to collect CEO and CFO pictures from Google Images, based on the full name of each executive and his/her affiliated firm during the sample period of 2001−2014. Second, following the neuroscience and psychology literature (Dotsch and Todorov, 2012; Enlow and Hans, 2008; Livingston and Pearce, 2009; Robinson et al., 2014; Todorov et al., 2008; Vernon et al., 2014; Zebrowitz, 1997), we use a face detector to identify the facial features in the CEO and CFO pictures, thereby calculating a rich set of facial-trustworthiness measures, comprising: (i) angle of inner eyebrow ridge; (ii) face roundness; (iii) chin width; and (iv) nose-to-lip distance. We then construct a *composite* facial-trustworthiness index for each executive. Our analysis focuses mainly on this composite index, though it also considers individual facial features separately. This approach is based on the prior finding that people tend to interpret an individual's face as an integrated whole (Taubert et al., 2011). We perform two validity checks to confirm that our computer-measured facial trustworthiness index is a valid and reliable measure of individuals' assessments of facial trustworthiness.

We collect audit fee data from Audit Analytics, financial statement data from Compustat, and corporate governance data from RiskMetrics. Our final sample comprises 4411 firm-year observations for 1179 CEOs and 1360 CFOs from 845 firms in the sample period of 2001−2014. The results of our regression analyses show that auditors charge a higher audit fee to firms whose CFOs have lower facial trustworthiness, indicating that auditors do factor client CFOs' facial trustworthiness into their pricing decisions. We find, however, that CEOs' facial trustworthiness is not significantly related to auditors' pricing decisions. This is consistent with the view that CFOs play a more important role than CEOs in communicating with auditors (Fiolleau et al., 2009) and in shaping financial reporting strategies (Aier et al., 2005; Chava and Purnanandam, 2010; Ham et al., 2017; Jiang et al., 2010; Kim et al., 2011; Liu et al., 2016). Moreover, we find that the effect of CFOs facial trustworthiness on audit fee is weakened as auditor tenure becomes longer; this suggests that, during multiple rounds of audit engagements, auditors tend to develop a comprehensive understanding of their clients' internal control environment and business operation, and thus rely less on their initial perceptions of management facial trustworthiness when evaluating audit risks.

Based on the above findings, we further explore whether auditors' incorporation of executives' facial trustworthiness into audit pricing could be viewed as a rational behavior or the manifestation of a cognitive bias. We find that executives' facial trustworthiness is associated with neither clients' financial reporting quality nor litigation risk. The finding could be viewed

[1] Some studies suggest that facial trustworthiness might reflect trustworthy behavior (e.g., Verplaetse et al. (2007) and Porter et al. (2008)), while other studies find inconsistent results in various trust settings (e.g., Zebrowitz et al. (1996) and Rule et al. (2013)).

as an indication that, the impact of CFOs' facial trustworthiness on audit pricing is driven by auditors' cognitive heuristics. However, these results should be cautiously interpreted for the following reason: auditors' use of facial trustworthiness could be rational if it helps auditors to overcome any negative outcome of untrustworthy-looking executives. If auditors exert extra effort for firms with untrustworthy-looking executives, such additional audit effort may improve financial report quality and result in an insignificant difference in reporting quality between trustworthy and untrustworthy executives. Our results are also robust to a variety of sensitivity checks.

This study contributes to the literature in several ways. First, to the best of our knowledge, this is the first study that adopts a large sample to provide systematic evidence on auditors' use of facial trustworthiness. Our study, therefore, extends the auditing literature documenting the impacts of executives' individual characteristics on audit fee (Harjoto et al., 2015; Hrazdil et al., 2018; Judd et al., 2017; Kannan et al., 2014; Kim et al., 2015). Second, we provide further support to the literature on CFOs' important role in financial reporting (Aier et al., 2005; Chava and Purnanandam, 2010; Ham et al., 2017; Jiang et al., 2010; Kim et al., 2011; Liu et al., 2016) by documenting that auditors consider the facial trustworthiness of CFOs, but not CEOs, in pricing their audit services. Third, the results of our study extend the literature documenting the important role of perceptions based on executives' facial appearance in firm valuation (Blankespoor et al., 2017; Halford and Hsu, 2014) and executive compensation (Graham et al., 2016), by presenting empirical evidence that CFOs' facial trustworthiness affects auditors' assessment of audit risk and, thus, audit fee. Our study also responds to the call for research on personalized trust by Bottazzi et al. (2016).[2] Finally, but importantly, our study develops a novel methodology to measure facial trustworthiness using recent image processing techniques developed by prior neuroscience and psychology studies. This innovative individual-level trustworthiness measurement may indicate interesting and fruitful avenues for future research on the implications of personalized trust in various business settings.

The paper proceeds as follows. Section 2 discusses related research and formulates hypotheses. Section 3 discusses the data and research design. Section 4 then reports the empirical findings and additional analyses. The final section concludes the paper.

2. Literature review and hypotheses development

2.1. Facial trustworthiness and social decision making

The human face contains a variety of information used by observers to generate social perceptions and make judgments (Ballew and Todorov, 2007; Bar et al., 2006; Borkenau et al., 2009; Kim et al., 2018; Porter et al., 2008; Rule et al., 2009; Todorov et al., 2009, 2010; Willis and Todorov, 2006). Prior studies find that people may rapidly develop their perception of an individual's trustworthiness by observing his/her face (Ballew and Todorov, 2007; Bar et al., 2006; Borkenau et al., 2009; Cosmides and Tooby, 2000; Porter et al., 2008; Rule et al., 2009; Todorov et al., 2010; Todorov et al., 2009; Van't Wout and Sanfey, 2008; Willis and Todorov, 2006). Todorov et al. (2015) suggest that people can form trustworthiness perceptions based on a face in as short as 34 ms. Longer exposure to a face is likely to reinforce people's confidence in their initial trustworthiness perceptions, rather than altering prior judgments (Todorov et al., 2015; Willis and Todorov, 2006).

How people develop and respond to their trustworthiness perceptions toward others has been widely studied in the neuroscience literature. Neuroscience studies suggest that the human amygdala is responsible for interpreting facial trustworthiness (Todorov and Engell, 2008; Winston et al., 2002). In addition, the amygdala has been implicated in strategic decision making (Davis and Whalen, 2001), behavioral and physiological responses to reward and punishment (Paton et al., 2006), loss aversion development (De Martino et al., 2010), self-control behavior and future-oriented activities targeting specific rewards (Hernádi et al., 2015), and cost and benefit analysis (Chang et al., 2015). The neuroscience literature also suggests that trustworthiness perceptions based on facial features are formed instantaneously and unconsciously (Evans, 2008; McClure et al., 2004).

Prior studies document that facial trustworthiness is associated with certain structural facial features (Dotsch and Todorov, 2012; Enlow and Hans, 2008; Robinson et al., 2014; Todorov et al., 2008). For example, Enlow and Hans (2008) find that shallow cheeks and low eyebrow ridges tend to be perceived as low trustworthiness. Todorov et al. (2008) suggest that upward-angled inner eyebrow ridges, pronounced cheekbones, a wide chin, and a shallow nose sellion relate to high facial trustworthiness. Dotsch and Todorov (2012) identify a smooth and small face, a smiling mouth, and open eyes as indicators of facial trustworthiness, while a downturned mouth with thick lips, angry-looking eyes, sagging cheeks, and a bald spot on the top of the head indicate facial untrustworthiness. Using the "bubbles" technique, Robinson et al. (2014) find that the eye and mouth areas of the human face particularly correlate with trustworthiness judgments. People with round faces are perceived

[2] Bottazzi et al. (2016, p. 2288) "acknowledge that personalized trust likely matters for investments too. While we do not have the data to further disentangle these two types of trust, future research might try to do so."

as being more trustworthy and innocent (Livingston and Pearce, 2009; Zebrowitz, 1997).[3] The distance between the mouth and the nose is another important facial feature for trustworthiness judgments (Todorov et al., 2008). Vernon et al. (2014) report that the nose-to-lip distance correlates negatively with approachability, which corresponds closely to facial trustworthiness in the study of Oosterhof and Todorov (2008). Some studies suggest that facial expressions may also affect people's trustworthiness judgments. For example, facial emotional expressions, especially smiling, may influence facial trustworthiness (Eckel and Wilson, 1998; Éthier-Majcher et al., 2013; Krumhuber et al., 2007; Scharlemann et al., 2001). Moreover, face typicality, which is extracted from faces previously seen by the perceiver, is also viewed as a critical determinant when evaluating facial trustworthiness (Sofer et al., 2015).

People's appearance-based inferences about individuals tend to be highly correlated with one another (Kim and Rosenberg, 1980; Oosterhof and Todorov, 2008; Rosenberg et al., 1968; Rule et al., 2013). Laboratory experiments show that people are more willing to trust an individual with a trustworthy-looking facial appearance (Chang et al., 2010; Duarte et al., 2012; Rezlescu et al., 2012; Schlicht et al., 2010; Stirrat and Perrett, 2010; Tingley, 2014; Van't Wout and Sanfey, 2008). Rezlescu et al. (2012) and Tingley (2014) find that people tend to invest more money in trustworthy-looking individuals. In a peer-to-peer lending setting, people tend to lend money to borrowers who appear trustworthy (Duarte et al., 2012). Some recent studies suggest that executives' facial appearance also play 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 acquirer returns upon acquisition announcement. Graham et al. (2016) find that CEOs' facial competence, rather than facial attractiveness, is important for CEO selection and compensation. Additionally, Blankespoor et al. (2017) find that investors' overall perceptions of management competence, trustworthiness, and attractiveness are positively associated with firm valuations in initial public offerings.[4] However, evidence is awaited on how auditors may respond to their perceptions of client executives' facial trustworthiness when making various decisions during audit engagements. Our study fills this void in the literature by investigating how executives' facial trustworthiness may affect audit fee decisions.

2.2. Facial trustworthiness and audit fee

In theory, audit fee is determined by audit efforts and litigation risks (Choi et al., 2008, 2009; Kim et al., 2012). Empirical evidence have shown that auditors incorporate management integrity into their judgment and decision making when assessing inherent risks and control risks associated with audit engagements (Ayers and Kaplan, 1998; Beaulieu, 2001; Kizirian et al., 2005; Shaub, 1996).

Auditing standards emphasize the importance of assessing management's values and integrity throughout the audit. AS 2110 requires auditors to make judgments about the integrity of their clients' management team, including CEOs and CFOs, based on face-to-face communication and interactions. The International Standard on Auditing 260 also requires the auditor team to enhance auditor−client communications by establishing an effective two-way communication throughout the audit engagement process. AS 2401 also asserts the importance of understanding CEOs and CFOs, stating that “management has a unique ability to perpetrate fraud because it frequently is in a position to directly or indirectly manipulate accounting records and present fraudulent financial information.” In line with the fraud triangle, the PCAOB claims that the occurrence of fraudulent behavior is related to the personality and ethical values of top executives; when they encounter unethical situations, managers' attitudes toward unethical behavior may affect their judgment or decision making, thus influencing the likelihood of their fraudulent behaviors. Consequently, the PCAOB requires auditors to identify top managers' personal beliefs or ethical standards as a risk factor for fraudulent financial reporting. During face-to-face inquiries and communication about auditing issues, auditors may cognitively develop their perceptions about top managers' ethical values and level of integrity based on factors that they observe, such as the facial trustworthiness of management.

Nevertheless, AS 1015 requires auditors to “neither assume that management is dishonest” or “honest” when exercising professional skepticism. Therefore, auditors should assume no bias in management's representations *ex ante* and exercise their professional skepticism during their audit engagement (see Nelson (2009) for a review). However, prior studies suggest that auditors' perceived management integrity has an effect on auditors' skeptical judgements (Earley et al., 2010; Kerler and Killough, 2009; Robertson, 2010). Specifically, auditors who view management as being of high integrity exhibit a lack of professional skepticism (Earley et al., 2010; Robertson, 2010), while auditors with lower trust in client's management subsequently make higher assessments of fraud risk (Beaulieu, 2001; Kerler and Killough, 2009). Thus, trustworthy-looking management may affect auditor's professional skepticism.

Auditors need to rely on the information provided by management to determine clients' audit risks, audit hours, and their bid for the audit engagement. In practice, auditors interact significantly with their clients' management teams when making

[3] Livingston and Pearce (2009) suggest that a round face is the primary feature of a baby-faced appearance, regardless of race, gender, or age. Baby-faced individuals are perceived more trustworthy than mature-faced individuals (Berry and Zebrowitz-McArthur, 1988; Gorn et al., 2008; Livingston and Pearce, 2009).

[4] Regarding the measurement of facial features, Halford and Hsu (2014) calculate CEOs' facial attractiveness using www.Anaface.com, which provides geometry-based facial attractiveness measurements for user-uploaded photographs. Graham et al. (2016) invited 438 graduate and undergraduate students to rate CEOs' facial competence and beauty on a 1 to 5 scale. Blankespoor et al. (2017) employ the “thin-slice” approach, asking viewers to provide their perceptions of CEOs after watching 30-s video clips of their roadshow presentations for initial public offerings.

audit fee decisions. For example, Fiolleau et al. (2009) document that management, especially CFOs, plays an important role in selecting auditors and in determining the information to be distributed to audit committees and auditors. Management tends to spend a significant amount of time interviewing and evaluating potential auditors. Cohen et al. (2010) also identify management as the dominant player in hiring, communicating with, and evaluating auditors. Thus, auditors may rely heavily on their communications with client firms' management when judging audit risks and estimating audit hours to make audit fee decisions. Auditors tend to seek external validation of data when they perceive management integrity to be low (Kizirian et al., 2005). Auditors respond to the assessed risks of material misstatement by adjusting the nature, timing, and extent of auditing procedures, for example, as reflected in audit staffing allocations (AS 2301). Chang et al. (2017) argue that the key factor determining audit fee is audit firms' staffing efficiency, since staff is a significant and scarce resource and audit pricing is mainly based on the hourly rates of auditors assigned to an audit engagement. When auditors perceive higher risks of material misstatement, they need to allocate more staff hours to identify issues and corroborate audit evidence; they also need to perform substantive testing and increase sample size or perform analytical procedures at a more detailed level (AS 2301). Therefore, the facial trustworthiness of CEOs and CFOs could affect auditors' pricing decisions.

To summarize, auditors may associate untrustworthy-looking executives with low management integrity and high audit risk, which leads to an audit fee premium. To provide systematic evidence on this unexplored issue, we propose and test our first hypothesis, stated in alternative form:

H1. Ceteris paribus, auditors charge a higher audit fee to clients whose CEOs and CFOs have lower facial trustworthiness.

2.3. Facial trustworthiness, auditor tenure, and audit fee

Although auditors may experience information asymmetry during their initial audit engagement, a richer set of information accumulated via repeated audit engagements may provide a better foundation for auditors to evaluate audit risks and make more accurate audit fee decisions. During the audit process, auditors can comprehensively investigate firms' internal control effectiveness and financial-reporting quality based on their professional knowledge and due-diligence audit procedures. These information sources may help auditors develop a comprehensive evaluation of management integrity and audit risks. When engaged in multi-period audits, auditors may retrospectively link the relevant, available, and detected behavior of their clients back to prior judgments on the integrity of top management based on their facial trustworthiness and correct any prior misjudgments accordingly.

More specifically, during the initial audit engagement, auditors have limited information about a client's financial and operational environments. When auditors perceive lower trustworthiness of their clients' CEOs and CFOs, they may charge a higher fee because they perceive higher audit risks. During the auditing process, the information asymmetry between auditors and auditees decreases. As auditors obtain more information to evaluate audit risks and adjust their initial judgment of executives' trustworthiness, top managers' facial trustworthiness becomes less important and less relevant. Thus, auditors with longer tenure may rely less on management facial trustworthiness and more on their understanding of clients' business environment and other relevant information, such as internal control effectiveness and financial reporting quality.

Moreover, in prior studies investigating the effects of facial trustworthiness on strategic decision making in repeated trust games (Chang et al., 2010; Olivola et al., 2012; Rezlescu et al., 2012), the effect of facial trustworthiness becomes weakened as perceivers accumulate more information in repeated games. For example, Olivola et al. (2012) find that facial appearance-based inferences still influence Republican voters even when clear information about the candidate's character is available. Chang et al. (2010) conducted a repeated trust game and find that both implicit initial perception and subsequent perceptions of facial trustworthiness influence participants' decision-making process independently and synergistically. They argue that facial trustworthiness perception is a belief about the probability of reciprocation based on initial implicit judgments, and is dynamically updated based on experience that weakens, but does not eliminate, the impact of initial facial trustworthiness perception on participants' strategic decisions. In another trust game experiment, Rezlescu et al. (2012) demonstrate that the facial trustworthiness premium is 42% for decisions based solely on faces and remains significant, although it decreases to 6% when a partner's reputational information is also available.

Drawing on the above discussions, we anticipate that as auditor tenure increases, auditors accumulate more relevant information about their clients' internal control environment and business operations through continuous interactions with client firms' executives. Such continuous interactions may weaken the impact of auditors' initial perceptions of the facial trustworthiness of client CEOs and CFOs on audit fee decisions. We therefore propose and test our second hypothesis, stated in alternative form:

H2. Ceteris paribus, auditor tenure weakens the negative association between client CEOs' and CFOs' facial trustworthiness and audit fee.

3. Research methodology

3.1. Facial trustworthiness measurements

To construct our facial trustworthiness measurements, we search for qualifying CEO and CFO image son Google Images. We first generate a list of CEOs and CFOs from the RiskMetrics database for the sample period of 2001−2014. We then search on Google Images for business headshots using a combination of name and affiliation for each of the listed CEOs and CFOs. We require the image search to render high quality pictures representing the executives with a single front-facing face.

To collect such CEO and CFO pictures from Google Images, we develop a computer algorithm that takes the following steps.[5] First, we limit the number of search attempts to five images of 64 by 64 pixel minimum[6] for each of our target CEOs and CFOs. Our trained face detector first detects the position of the face in a given image based on an ensemble of regression trees (Kazemi and Sullivan, 2014; Sagonas et al., 2013). More specifically, we treat each image as a series of facial feature points in a two-dimensional space, in which one point represents a pixel of the image. As illustrated in Appendix A-1, our trained face detector recognizes the 68 facial points on the pictures that we collect from Google Images. Pictures that contain more than one detected face are not considered further. Based on the 68 facial points, we develop the algorithm to calculate and compare three paired distances of facial points on the right side and the left side of a given face to determine whether the image depicts the front view. If the differences for all the three paired distances are within 20%, our algorithm determines that the image contains the front view and is suitable for further use.[7] Otherwise, our algorithm automatically abandons the image file. If an image search attempt returns a single front-facing face, we move to the next target person. If five attempts are exhausted without finding a suitable image, our algorithm returns a missing value for this target person. Finally, we validate all images returned by the computer program algorithm by manually examining all photographs in our sample to ensure that images contain a single front-facing face.[8] We collect a total of 7875 firm-year observations with pictures of both the CEO and CFO from 1449 listed firms.

We employ the classic Histogram of Oriented Gradients (HOG) face detector, combined with a linear classifier and sliding window detection scheme (Kazemi and Sullivan, 2014), to detect 68 facial landmark points for faces shown in the images and determine the position and the shape of the faces.[9] Appendix A-1 provides a detailed illustration of the 68 facial points that we use to calculate the facial features to construct our facial trustworthiness measures. The face detector is trained by the *iBUG 300-W face landmark* dataset, which contains 1.7 gigabyte manually landmarked facial image files and is developed by the Intelligent Behavior Understanding Group.[10] The facial feature points of the training data have been labeled for different types of faces (colors, darkness and brightness, poses, decorations, emotions, backgrounds, etc.), and may thus produce reliable results for any types of facial feature analysis not affected by noise, such as eyeglasses, shown on the faces being analyzed.[11]

Next, using the pictures in our image sample, we follow prior psychology literature to measure facial trustworthiness by analyzing the facial features of CEOs and CFOs (Livingston and Pearce, 2009; Todorov et al., 2008; Vernon et al., 2014; Zebrowitz, 1997). Although previous studies suggest that static facial features and transient facial expressions may both affect people's perceptions of an individual's trustworthiness (Dotsch and Todorov, 2012; Eckel and Wilson, 1998; Enlow and Hans, 2008; Éthier-Majcher et al., 2013; Krumhuber et al., 2007; Robinson et al., 2014; Scharlemann et al., 2001; Todorov et al., 2008), our study focuses only on two-dimensional (2-D) static facial features (e.g., eyebrow shape, face shape, chin angle, and philtrum length) because they are relatively constant biometric information for a given individual

[5] Our Google Images picture collection was undertaken from November to December 2016. We use both the name and firm of an executive as search terms to find each executive's picture during the time period of their role at that particular firm. Using this picture search strategy ensures that the picture we collect properly depicts the incumbent executive with whom the firms' auditor interacted in a specific year, and may thus, to some extent, alleviate the concern that facial structures may change as people age. We conduct two additional analyses to alleviate the concern that executives (especially of smaller, less-widely known firms) are misidentified in Google Images. First, we randomly select 10 CEOs and 10 CFOs from the bottom 1st percentile of firm size based on total assets and manually confirm that the image is of the CEO/CFO in question. Second, we retest our hypotheses using firms with total assets from the bottom tertile, bottom quartile, and bottom quintile of our sample. The results across these subsamples are consistent with our main findings.

[6] Our HOG face detector is able to effectively detect the facial landmark points with a minimum pixel requirement of 32*32. To ensure more accurate and sensitive detection, we set the minimum pixels for our Google Image searches as 64*64.

[7] Based on the 68 facial points (as illustrated in Appendix A-1), the three paired distances for comparisons are: 1) the distance between P_{18} and P_{22} vs. P_{23} and P_{27}; 2) the distance between P_1 and P_{28} vs. P_{17} and P_{28}; and 3) the distance between P_3 and P_{34} vs. P_{15} and P_{34}. The difference between paired distances is calculated as the absolute value of the difference between paired distances divided by the smaller of the paired distances. We choose 20% as the threshold to determine the position of a face in an image. If any of the three percentage differences exceeds 20%, it is highly likely that the image shows the side view of a face or an exaggerated facial expression, as indicated by facial asymmetry.

[8] We manually exclude 36 pictures that contain more than one face and 46 cartoonized portraits. In our executive's facial trustworthiness database, totally we identify 3530 CEOs' pictures and 4096 CFOs' pictures with single frontal faces for facial trustworthiness measurements. The error rate of our picture collection computer algorithm is approximately 1.06% (=(36 + 46)/(36 + 46+3530 + 4096)).

[9] Milborrow and Nicolls (2008) define a facial landmark point as a distinguishable facial point (a pixel) in the picture under consideration. Our HOG face detector is first trained by pictures with manually landmarked faces contained in the database (Sagonas et al., 2013). Next, our HOG face detector applies the facial landmark point identification skills gained from machine learning to the CEOs' and CFOs' pictures collected from Google Images. A facial landmark point is identified through a similarity transformation that minimizes the average Euclidean distance between shape points (Milborrow and Nicolls, 2008). A set of 68 facial landmark points forms the shape of a face.

[10] The Intelligent Behavior Understanding Group is operated by the Department of Computing at Imperial College of London. This group's core expertise is machine analysis of human behavior using face analysis, body gesture analysis, visual, audio, and multimodal analysis, etc. More detailed information on their computing algorithm is available at https://ibug.doc.ic.ac.uk/home.

[11] In a sensitivity test, we remove all executives' pictures with eyeglasses from our sample and retest our hypotheses. Our results remain robust.

and are also consistent with the 2-D format of our sample images.[12] Rezlescu et al. (2012) also suggest that the static facial features, which are difficult to mimic, may affect people's trustworthiness perceptions, not only in situations when people lack background information, but also when people possess rich information about the decision subject. Thus, the static facial features provide relevant and valid measurement for facial trustworthiness.

As illustrated in Appendix A-2, we calculate the angle of the inner eyebrow ridge (*EYEBROW*) by identifying the angles of both left- and right-side eyebrows and then averaging the two eyebrow angles. A smaller *EYEBROW* suggests an upward-angled inner eyebrow ridge, which correlates with higher perceived facial trustworthiness (Todorov et al., 2008). We also calculate *FACE_SHAPE,* which captures the roundness of a face. A larger *FACE_SHAPE* suggests a rounder face, which correlates with higher perceived trustworthiness (Livingston and Pearce, 2009; Todorov et al., 2008; Zebrowitz, 1997). Next, we calculate *CHIN_ANGLE*, defined as the angle of the chin. A larger *CHIN_ANGLE* suggests a wider chin, which correlates with higher perceived trustworthiness (Todorov et al., 2008). Finally, *PHILTRUM* is the nose-to-lip distance scaled by the upper facial length. *PHILTRUM* correlates negatively with perceived trustworthiness (Todorov et al., 2008; Vernon et al., 2014).

Prior 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 construct a composite facial trustworthiness index by integrating these four individual facial features. More specifically, we execute the following steps to construct our composite facial trustworthiness index. First, we reverse the signs of *EYEBROW* and *PHILTRUM* by multiplying each of the two measures by −1, since prior studies suggest that facial trustworthiness is inversely related to these two facial features. Second, we calculate the standardized value of reversed *EYEBROW*, *FACE_SHAPE*, *CHIN_ANGLE*, and reversed *PHILTRUM* by rescaling each facial trait measure to a mean of 0 and a standard deviation of 1 for comparability across different facial features. Third, we average the four standardized values of the separate features.[13] A high composite trustworthiness index suggests a high level of the facial trustworthiness.

Next, we merge the 7875 firm-year observations of CEOs' and CFOs' facial trustworthiness data with the audit fee data from Audit Analytics. This process eliminates 840 firm-year observations from 88 firms due to missing values in the audit fee data. We then merge the rest of the observations with the financial information from Compustat, auditor data from Audit Analytics, and corporate governance information from RiskMetrics. The merging process further eliminates 2624 firm-year observations. As summarized in Table 1, our sample selection process leaves a final sample of 4411 firm-year observations from 845 firms from 2001 to 2014. This final sample includes 1179 CEOs and 1360 CFOs for our investigation.

3.2. External validity of facial trustworthiness measures

Since most facial trustworthiness measures in prior studies were developed by human ratings (Duarte et al., 2012; Taubert et al., 2011; Todorov et al., 2008; Vernon et al., 2014), we examine the external validity of our computer-based facial trustworthiness measure to evaluate whether it is a good surrogate for real human perceptions. To this end, we randomly select twenty executives' images, comprising pictures of five CEOs and five CFOs from both the top and bottom quintiles of our facial trustworthiness measure. We survey 1000 independent raters on Amazon Mechanical Turk (MTurk) to obtain their ratings of the facial trustworthiness for the twenty executives whose images were randomly selected. In the rating process, all twenty pictures are shown to the raters one by one in a random sequence. The survey does not disclose any information about the corresponding executive's name or their firm's name. Following Duarte et al. (2012), we ask raters to rate the trustworthiness of the pictured person using one question: "Based on the picture, how trustworthy do you think this person is?" Responses were given on a five-point scale from 1 (NOT trustworthy) to 5 (VERY trustworthy) for each picture. Among the 1000 completed responses, 107 responses fail the attention check and 42 responses present a constant response pattern, and are thus removed from further analyses, leaving a final sample of 851 for our external validity check. For each picture, we average responses across the 851 independent raters to obtain an average judgment of survey participants' trustworthiness ratings (*TRUST_RATING*).

Appendix B reports the results of external validity checks. Figure B1 in Appendix B presents a comparison of facial trustworthiness ratings for our validity check subsamples. We employ box-and-whisker plots to demonstrate the rating

[12] During an audit engagement, auditors may be exposed to a rich array of facial expressions, such as smiling, calmness, frowning, etc., when interacting with client CEOs and CFOs. Compared with static facial structures, these transient facial expressions are temporary and cannot be captured solely by an executive's photograph. We add the caveat, however, that our facial trustworthiness measurement methodology is not able to identify transient facial expressions properly. Additionally, we acknowledge the possibility that facial expressions may affect static facial features, such as eyebrow position and nose-to-lip distance. Since the executives' professional headshots usually do not exhibit exaggerated facial expressions, we hence expect that facial expressions do not affect our facial trustworthiness measurements in a significant manner. Moreover, our facial trustworthiness measurements are 2-D, since the CEO and CFO pictures we collected from Google Images are in 2-D format. Prior literature also indicates that some three-dimensional (3-D) measurements, such as pronounced cheekbones and shallow nose sellion (Enlow and Hans, 2008; Todorov et al., 2008; Vernon et al., 2014) are associated with more trustworthy-looking faces. However, because 2-D pictures lack the depth dimension, we cannot calculate 3-D trustworthiness measurements from them.

[13] The standardization takes the facial feature value for each individual executive minus the sample mean of such facial feature divided by the sample standard deviation. We define the standardized value of reversed *EYEBROW*, standardized value of *FACE_SHAPE*, standardized value of *CHIN_ANGLE*, and standardized value of reversed *PHILTRUM* as $EYEBROW_{rstd}$, $FACE\_SHAPE_{std}$, $CHIN\_ANGLE_{std}$, and $PHILTRUM_{rstd}$, respectively. We calculate the executive's facial trustworthiness index based on the following equation: $TRUSTWORTHINESS\_CEO/CFO = [EYEBROW_{rstd} + FACE\_SHAPE_{std} + CHIN\_ANGLE_{std} + PHILTRUM_{rstd}]/4$

Table 1
Sample selection process.

	# of Firm-year Observations	# of Firms
Samples with CEOs' and CFOs' Facial Data Available	7875	1449
-Sample without Audit Fee Data Available	840	88
-Sample with Missing Value in Control Variable	2624	516
= Final Sample for Data Analysis	4411	845

Note: Table 1 reports sample selection process. Our sample consists of 4411 firm-year observations, 1179 CEOs and 1360 CFOs from 845 firms from year 2001−2014.

divergence. As shown in the figure, the mean trustworthiness rating is 3.68 for the top quintile CEOs and CFOs and 2.64 for the bottom quintile CEOs and CFOs. The difference between these two ratings is highly significant (t-stat. = 6.73, $p < 0.001$), suggesting that human ratings of facial trustworthiness are consistent with our computer-generated ratings. In addition, we calculate Pearson's correlation coefficients between the mean trustworthiness rating from the 851 raters and our computer-generated trustworthiness index. As shown in Table B1 in Appendix B, the correlation coefficient is 0.834, which is significant at the 1% level (t-stat. = 6.41, $p < 0.001$). Furthermore, we calculate Pearson's correlation coefficients between human-rated trustworthiness and the standardized individual facial feature measures. We find that $EYEBROW_{rstd}$ (t-stat. = 4.79, $p < 0.001$), $FACE\_SHAPE_{std}$ (t-stat. = 4.87, $p < 0.001$), $CHIN\_ANGLE_{std}$ (t-stat. = 5.62, $p < 0.001$), and $PHILTRUM_{rstd}$ (t-stat. = 2.31, $p = 0.03$) are significantly correlated with human trust ratings, with correlation coefficients ranging from 0.478 to 0.798. Overall, our external validity checks suggest that our computer-based facial trustworthiness measurement provides a valid proxy for human trustworthiness perceptions.

Some studies suggest that facial aging may cause changes to soft tissue and bone structure (Kahn and Shaw, 2010; Longo et al., 2013; Mendelson and Wong, 2012), which may alter executives' facial structures and bias our computer-based measurements. Although our sample period is not long enough to allow significant changes in an executive's facial features, there is still a concern about whether our trustworthiness measures are consistent for the same executive across different time periods. We, therefore, manually select 40 CEOs and CFOs in our sample who had worked for two different firms at different times within our sample period.[14] The correlation coefficients between the earlier and later pictures of the four individual facial feature measures and the trustworthiness index are reported in Table B2 of Appendix B. For pictures of the same executive taken at an earlier and a later time, we observe that ratings for the four separate facial features and the facial trustworthiness index are significantly and highly correlated (ranging from 0.756 to 0.908). This suggests that an executive's facial trustworthiness is a consistent measure throughout our sample period and, thus, that our computer-based facial trustworthiness measures are reliable.

3.3. Research design

3.3.1. CEOs' and CFOs' facial trustworthiness and audit fee

H1 predicts that auditors charge a lower audit fee to companies with more trustworthy-looking CEOs and CFOs. To test H1, we specify the following regression in Eq. (1):

$$\begin{aligned} AUDIT\_FEE_{i,t} = {} & \alpha_0 + \alpha_1 TRUSTWORTHINESS\_CEO_{i,t} + \alpha_2 TRUSTWORTHINESS\_CFO_{i,t} \\ & + \alpha_3 AUTENURE_{i,t} + \alpha_4 LN\_ASSETS_{i,t} + \alpha_5 ACC\_FILER_{i,t} + \alpha_6 LEV_{i,t} \\ & + \alpha_7 ARINV_{i,t} + \alpha_8 GC_{i,t} + \alpha_9 RESTATE_{i,t} + \alpha_{10} LOSS_{i,t} + \alpha_{11} ROA_{i,t} \\ & + \alpha_{12} CASH\_FLOW_{i,t} + \alpha_{13} FOREIGN_{i,t} + \alpha_{14} BUS\_SEGMENT_{i,t} \\ & + \alpha_{15} REPORTLAG_{i,t} + \alpha_{16} BIG4_{i,t} + \alpha_{17} BD\_SIZE_{i,t} + \alpha_{18} BD\_IND_{i,t} \\ & + \alpha_{19} AC\_SIZE_{i,t} + \Sigma\lambda_{i,t} YEAR_{i,t} + \Sigma\varphi_{i,t} FIRM_{i,t} + \Sigma\omega_{i,t} CEO\_AGE\_GROUP_{i,t} \\ & + \Sigma\mu_{i,t} CFO\_AGE\_GROUP_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

In Eq. (1), the dependent variable *AUDIT_FEE* is the natural logarithm of audit fee, and the key variables of interest are the two composite measures of CEOs' facial trustworthiness and CFOs' facial trustworthiness. We expect to observe negative coefficients for both *TRUSTWORTHINESS_CEO* and *TRUSTWORTHINESS_CFO*.

[14] There are 10 CEOs and 34 CFOs who had worked for two or more different firms in our sample. Therefore, there are 44 pairs (10 + 34) of pictures available for this validity test. Every pair of pictures depicts the same executive but during different time periods. For example, a hypothetical executive Tom Smith had worked for Firm A from 2001 to 2007, and for Firm B from 2008 to 2014. We collected two pictures of Tom Smith based on combined keywords "Tom Smith Firm A" and "Tom Smith Firm B," respectively. If Tom Smith's facial features do not change significantly during our sample period, we should observe a high correlation of the trustworthiness index between these two pictures. For four executives, the different combined keywords yield the exact same picture; thus, they are excluded from our testing sample. The final sample for this validity test comprises 40 pairs of pictures. Each pair depicts the same executive during different time periods when he/she worked for different firms.

We include auditor tenure (*AUTENURE*) in Eq. (1) to control for its impact on audit fee (Hay, 2013). We control for client size because large companies require more audit efforts, thus necessitating a higher fee (Choi et al., 2008; Hay et al., 2006; Simunic, 1980).[15] Firm size is proxied by the natural logarithm of total assets (*LN_ASSET*) and the SEC filing status indicator, which equals 1 for an accelerated filer, and 0 otherwise (*ACC_FILER*). Clients' business operation risk has been found to correlate positively with audit fee because it increases inherent audit risks (Gist, 1994). We, therefore, control for client business risk by including the leverage ratio (*LEV*) and the liquidity ratio captured by accounts receivables plus inventories scaled by total assets (*ARINV*) (Beck and Mauldin, 2014). In addition, the going concern opinion indicator (*GC*) suggests higher business risks and more audit efforts to identify associated issues. We, therefore, expect *GC* to correlate positively with audit fee (Beck and Mauldin, 2014). However, an announcement of a financial restatement (*RESTATE*) may indicate low auditor efforts and/or underestimated audit risks, so *RESTATE* is expected to correlate negatively with audit fee (Beck and Mauldin, 2014).

In addition, Degeorge et al. (1999) suggest that firms with inferior financial performance are more likely to engage in earnings management. Firm profitability is also an important risk indicator affecting audit fee decisions, since auditors are exposed to more risks when their clients are in financial distress (Simunic, 1980). Therefore, we control for *LOSS*, that equals 1 for firms with negative earnings, and 0 otherwise, as well as return on assets (*ROA*) and operating cash flows scaled by total assets (*CASH_FLOW*) (Beck and Mauldin, 2014; Huang et al., 2007). Clients' international operations may increase the difficulty for auditors in collecting and examining audit evidence, thus increasing audit efforts. Therefore, we adopt an indicator variable, *FOREIGN,* to control for the effects of international operations; *FOREIGN i*s coded 1 if a firm reports any foreign income, and 0 otherwise (Beck and Mauldin, 2014; Huang et al., 2007). We also control for audit complexity using the total number of active business segments (*BUS_SEGMENT*) as suggested by prior studies (Ghosh and Lustgarten, 2006; Hay et al., 2006).

We control for audit report time lag (*REPORTLAG*) because a longer delay in issuing the auditor's report may indicate a higher probability that auditors encountered problems or difficulties resolving issues concerning a client's financial statements (Knechel and Payne, 2001) and thus auditors are likely to charge to their clients a higher fee with longer reporting lags (Hay et al., 2006). Moreover, we include *BIG4* as a control variable because Big 4 audit firms tend to charge a higher audit fee for their superior audit quality (Choi et al., 2008). We also control for industry-adjusted client-specific governance factors, including the size of the board (*BD_SIZE*), the independence of the board of directors (*BD_IND*), and the size of the audit committee (*AC_SIZE*). Finally, we control for year- and firm-fixed effects, as well as CEOs' and CFOs' age-group fixed effects.[16] All continuous variables are winsorized at the 1st and 99th percentiles, and standard errors are clustered by auditor-years. Appendix C provides detailed variable definitions.

In addition to the cross-sectional level regression, we also conduct the following change regression analysis to alleviate concerns about correlated omitted variables. This change model cancels out the time-invariant unobserved variables, thus alleviating concerns over potential endogeneity (Beck and Mauldin, 2014; Brown et al., 2011). In Eq. (2), our analysis focuses on whether changes in facial trustworthiness, which arise from CEO and CFO turnovers, are associated with changes in audit fee. For this purpose, we construct the change variable as the change from year $t-1$ to year t.[17] We estimate the following regression in Eq. (2) with standard errors clustered by auditor-year levels:

$$\begin{aligned} \Delta AUDIT\_FEE_{i,t} = {} & \alpha_0 + \alpha_1 \Delta TRUSTWORTHINESS\_CEO_{i,t} + \alpha_2 \Delta TRUSTWORTHINESS\_CFO_{i,t} \\ & + \alpha_3 \Delta AUTENURE_{i,t} + \alpha_4 \Delta LN\_ASSETS_{i,t} + \alpha_5 \Delta ACC\_FILER_{i,t} + \alpha_6 \Delta LEV_{i,t} \\ & + \alpha_7 \Delta ARINV_{i,t} + \alpha_8 \Delta GC_{i,t} + \alpha_9 \Delta RESTATE_{i,t} + \alpha_{10} \Delta LOSS_{i,t} + \alpha_{11} \Delta ROA_{i,t} \\ & + \alpha_{12} \Delta CASH\_FLOW_{i,t} + \alpha_{13} \Delta FOREIGN_{i,t} + \alpha_{14} \Delta BUS\_SEGMENT_{i,t} \\ & + \alpha_{15} \Delta REPORTLAG_{i,t} + \alpha_{16} \Delta BIG4_{i,t} + \alpha_{17} \Delta BD\_SIZE_{i,t} + \alpha_{18} \Delta BD\_IND_{i,t} \\ & + \alpha_{19} \Delta AC\_SIZE_{i,t} + \Sigma \lambda_{i,t} YEAR_{i,t} + \Sigma \omega_{i,t} CEO\_AGE\_GROUP_{i,t} \\ & + \Sigma \mu_{i,t} CFO\_AGE\_GROUP_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

3.3.2. CEOs' and CFOs' facial trustworthiness, auditor tenure, and audit fee

H2 predicts that auditor tenure weakens the effect of CEOs' and CFOs' facial trustworthiness on audit fee. To test for this moderating role of auditor tenure in the relation between executives' facial trustworthiness and audit fee, we specify the following regression in Eq. (3), adding the interaction terms of auditor tenure with CEOs' and CFOs' facial trustworthiness:

[15] We also use the natural logarithm of total market value instead of the logarithm of total assets to proxy for firm size in a sensitivity test, as a firm's value is less likely to be influenced by its operating structure. Our results remain robust.

[16] We construct the age-group indicators using ten-year age groups from 20 to 29 to 81–89. We include the age-group fixed effects in our regressions to control for the possible impact of the aging process on human facial structures (Kahn and Shaw, 2010; Longo et al., 2013; Mendelson and Wong, 2012).

[17] Following Kim et al. (2015), we include the change from year t-1 to year t in all control variables from Eq. (1) except for dummy variables that have same value in two consecutive years. Therefore, we drop firm-fixed effects in Eq. (2). Our results are robust if firm-fixed effects are controlled in change model specification.

$$\begin{aligned} AUDIT\_FEE_{i,t} = {} & \beta_0 + \beta_1 TRUSTWORTHINESS\_CEO_{i,t} \\ & + \beta_2 TRUSTWORTHINESS\_CEO_{i,t} * AUTENURE_{i,t} + \beta_3 TRUSTWORTHINESS\_CFO_{i,t} \\ & + \beta_4 TRUSTWORTHINESS\_CFO_{i,t} * AUTENURE_{i,t} + \beta_5 AUTENURE_{i,t} + \beta_6 LN\_ASSETS_{i,t} \\ & + \beta_7 ACC\_FILER_{i,t} + \beta_8 LEV_{i,t} + \beta_9 ARINV_{i,t} + \beta_{10} GC_{i,t} + \beta_{11} RESTATE_{i,t} + \beta_{12} LOSS_{i,t} \\ & + \beta_{13} ROA_{i,t} + \beta_{14} CASH\_FLOW_{i,t} + \beta_{15} FOREIGN_{i,t} + \beta_{16} BUS\_SEGMENT_{i,t} \\ & + \beta_{17} REPORTLAG_{i,t} + \beta_{18} BIG4_{i,t} + \beta_{19} BD\_SIZE_{i,t} + \beta_{20} BD\_IND_{i,t} \\ & + \beta_{21} AC\_SIZE_{i,t} + \Sigma \lambda_{i,t} YEAR_{i,t} + \Sigma \varphi_{i,t} FIRM_{i,t} + \Sigma \omega_{i,t} CEO\_AGE\_GROUP_{i,t} \\ & + \Sigma \mu_{i,t} CFO\_AGE\_GROUP_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{3}$$

In Eq. (3), all variables are as defined earlier, and their detailed definitions are provided in Appendix C. Standard errors are clustered at the auditor-year level. We expect to observe positive coefficients (β_2 and β_4) for both interaction terms.

4. Empirical analysis and results

4.1. Descriptive analysis

Table 2 tabulates the descriptive statistics. Panel A reports the descriptive statistics of the composite facial trustworthiness index and individual facial feature measures for CEOs and CFOs. *TRUSTWORTHINESS_CEO* and *TRUSTWORTHINESS_CFO* have mean values of −0.033 and −0.018, respectively. Since both values are very close to zero, the CEOs' and CFOs' facial trustworthiness in our sample is, on average, not skewed. The difference between CEOs' facial trustworthiness and CFOs' facial trustworthiness is statistically insignificant (t-stat. = −1.165), suggesting that, on average, CEOs and CFOs in our sample do not differ significantly in their facial trustworthiness. We also report the standardized values of the four separate facial features of CEOs and CFOs for further comparison. The descriptive data indicate that these separate facial features are all comparable for CEOs and CFOs in terms of the central tendency and dispersion, although there are small differences in mean values across samples.

In Table 2 Panel B, we further report sample descriptive statistics for audit fee and other control variables. The average audit fee is about 4.3 million dollars. On average, auditor tenure for our sample firms is 15.512 years. The mean value of total assets is about 3.88 billion dollars. Most of our sample firms are accelerated filers, with a mean value of 0.985 for the indicator variable

Table 2
Descriptive statistics.

	N.	Mean	25%	50%	75%	Std. Dev.
Panel A: Descriptive statistics of executives' facial trustworthiness measurements						
TRUSTWORTHINESS_CEO	4411	−0.033	−0.487	−0.032	0.381	0.646
TRUSTWORTHINESS_CFO	4411	−0.018	−0.440	−0.026	0.348	0.602
$EYEBROW_{rstd}$*_CEO*	4411	0.008	−0.691	−0.006	0.682	0.979
$EYEBROW_{rstd}$*_CFO*	4411	−0.028	−0.710	−0.007	0.617	0.955
$FACE\_SHAPE_{std}$*_CEO*	4411	−0.019	−0.684	−0.062	0.637	0.983
$FACE\_SHAPE_{std}$*_CFO*	4411	0.024	−0.590	−0.027	0.600	0.940
$CHIN\_ANGLE_{std}$*_CEO*	4411	−0.046	−0.715	−0.088	0.556	0.970
$CHIN\_ANGLE_{std}$*_CFO*	4411	0.033	−0.614	−0.011	0.612	0.967
$PHILTRUM_{rstd}$*_CEO*	4411	−0.063	−0.701	0.198	0.726	1.022
$PHILTRUM_{rstd}$*_CFO*	4411	−0.087	−0.660	0.137	0.690	1.010
Panel B: Descriptive statistics of other variables						
AUDIT_FEE[a]	4411	4,321,854	1,015,712	2,255,089	5,036,390	5,737,058
AUTENURE	4411	15.512	7.000	13.000	23.000	10.521
LN_ASSET	4411	8.263	7.044	8.178	9.392	1.621
ACC_FILER	4411	0.985	1.000	1.000	1.000	0.132
LEV	4411	0.541	0.411	0.550	0.677	0.198
ARINV	4411	0.234	0.105	0.214	0.322	0.158
GC	4411	0.001	0.000	0.000	0.000	0.030
RESTATE	4411	0.130	0.000	0.000	0.000	0.336
LOSS	4411	0.138	0.000	0.000	0.000	0.345
ROA	4411	0.048	0.022	0.049	0.086	0.072
CASH_FLOW	4411	0.105	0.062	0.098	0.143	0.068
FOREIGN	4411	0.336	0.000	0.000	1.000	0.472
BUS_SEGMENT	4411	3.521	1.000	3.000	5.000	2.288
REPORTLAG	4411	54.065	49.000	56.000	60.000	12.649
BIG4	4411	0.959	1.000	1.000	1.000	0.197
BD_SIZE	4411	0.415	0.000	0.000	1.000	0.493
BD_IND	4411	0.575	0.000	1.000	1.000	0.494
AC_SIZE	4411	0.439	0.000	0.000	1.000	0.496

Note: Table 2 reports the sample size, mean, percentiles, and standard deviations of our sample variables. $EYEBROW_{rstd}$ is the standardized value of reversed value of *EYEBROW*. $FACE\_SHAPE_{std}$ is the standardized value of *FACE_SHAPE* value. $CHIN\_ANGLE_{std}$ is the standardized value of *CHIN_ANGLE* value. $PHILTRUM_{rstd}$ is the standardized value of reversed value of *PHILTRUM*. Variable definitions are provided in Appendix C.

[a] Descriptive statistics of raw audit fees in dollar amount is reported.

ACC_FILER. As suggested by the descriptive statistics, most of our sample firms do not have going-concern issues. About 13.0% of our sample firms restated their financial statements, and about 13.8% reported losses. About 33.6% of the firms in our sample have foreign operations, and the mean value of active business segments is 3.52. Approximately 95.9% are audited by Big-4 auditors. The average reporting lag is about 54 days, with a standard deviation of 12.65 days.

Table 3 presents the correlation matrix. As shown in the table, audit fee correlates significantly and negatively with both CEOs' facial trustworthiness and CFOs' facial trustworthiness. In addition, CEOs' and CFOs' facial trustworthiness measures are significantly correlated with the control variables representing firm size, firm risks, operation complexity, and corporate governance quality in our model specifications.[18]

To visualize the association between facial trustworthiness, auditor tenure, and audit fee, we divide the CEOs' and CFOs' facial trustworthiness distributions into three equally sized groups: Low_Trust, Mid_Trust, and High_Trust. Said and Todorov (2011) suggest that people are more sensitive to trustworthy- and untrustworthy-looking faces than to faces in the center of the trustworthiness spectrum. Thus, we plot audit fee over the first ten years of auditor tenure for firms with low-trust and high-trust executives. As illustrated in Figs. 1 and 2, auditors tend to charge a lower initial audit fee when they start to work with high-trust CEOs and CFOs than when they start to work with low-trust CEOs and CFOs. However, this discrepancy in the audit fee between high-trust CEOs and CFOs and low-trust CEOs and CFOs decreases with longer auditor tenure. As auditor tenure increases, the audit fee is generally less influenced by the facial trustworthiness of CEOs and CFOs. Though only suggestive of the underlying relations among audit fee, executives' facial trustworthiness, and auditor tenure, the visual illustrations in Figs. 1 and 2 highlight the role of auditor tenure in shaping the relation between audit fee and facial trustworthiness and are in line with the prediction in H2.

Table 3
Correlation matrix. Panel A: Variables *AUDIT_FEE* to *RESTATE*. Panel B: Variables *LOSS* to *AC_SIZE*

	1	2	3	4	5	6	7	8	9	10
Panel A: Variables *AUDIT_FEE* to *RESTATE*										
1.AUDIT_FEE										
2.TRUSTWORTHINESS_CEO	**−0.058**									
3.TRUSTWORTHINESS_CFO	**−0.033**	**0.086**								
4.AUTENURE	**0.254**	**−0.001**	**−0.066**							
5.LN_ASSET	**0.792**	**−0.048**	**−0.054**	**0.255**						
6.ACC_FILER	**0.057**	**0.038**	**0.006**	**0.055**	**0.080**					
7.LEV	**0.371**	**−0.047**	**−0.067**	**0.153**	**0.461**	**0.007**				
8.ARINV	−0.022	0.051	0.045	0.010	−0.195	0.030	0.000			
9.GC	0.014	0.024	−0.006	−0.037	0.020	0.003	0.046	−0.014		
10.RESTATE	**−0.064**	**−0.044**	**−0.012**	**−0.052**	**−0.014**	**−0.007**	**0.022**	**−0.048**	**0.011**	
11.LOSS	**−0.084**	**0.008**	**0.005**	**−0.094**	**−0.156**	**−0.084**	**0.038**	**0.019**	**0.010**	**0.046**
12.ROA	0.026	0.015	−0.007	0.056	0.053	0.104	−0.206	0.034	−0.037	−0.032
13.CASH_FLOW	**−0.084**	**0.009**	**0.022**	**−0.063**	**−0.064**	**0.043**	**−0.267**	**−0.118**	**−0.029**	**−0.016**
14.FOREIGN	**0.219**	**0.021**	**0.093**	**−0.022**	**0.010**	**0.022**	**−0.090**	**0.084**	**−0.021**	**−0.015**
15.BUS_SEGMENT	**0.355**	**−0.055**	**−0.049**	**0.082**	**0.291**	**0.051**	**0.185**	**0.029**	**−0.004**	**−0.018**
16.REPORTLAG	0.028	0.035	0.049	−0.048	−0.178	−0.060	−0.022	0.005	0.008	−0.024
17.BIG4	**0.211**	**−0.031**	**−0.044**	**0.139**	**0.195**	**0.038**	**0.140**	**−0.023**	**0.006**	**0.015**
18.BD_SIZE	**−0.372**	**0.020**	**0.089**	**−0.222**	**−0.388**	**−0.051**	**−0.207**	**0.023**	**0.021**	**0.029**
19.BD_IND	**0.168**	**−0.002**	**−0.028**	**0.042**	**0.125**	**0.021**	**0.156**	**−0.009**	**0.011**	**−0.006**
20.AC_SIZE	**−0.092**	**0.015**	**0.046**	**−0.039**	**−0.130**	**0.003**	**−0.040**	**0.042**	**0.019**	**0.013**

	11	12	13	14	15	16	17	18	19	20
Panel B: Variables *LOSS* to *AC_SIZE*										
11.LOSS										
12.ROA	−0.663									
13.CASH_FLOW	**−0.286**	**0.581**								
14.FOREIGN	**0.032**	**0.023**	**0.034**							
15.BUS_SEGMENT	**−0.021**	**−0.027**	**−0.097**	**0.009**						
16.REPORTLAG	0.045	−0.090	−0.114	0.023	−0.030					
17.BIG4	**−0.027**	**−0.017**	**−0.041**	**0.017**	**0.064**	**−0.027**				
18.BD_SIZE	**0.075**	**−0.074**	**−0.065**	**−0.031**	**−0.177**	**0.133**	**−0.090**			
19.BD_IND	**−0.015**	**0.018**	**−0.015**	**0.067**	**0.067**	**−0.069**	**0.077**	**−0.093**		
20.AC_SIZE	**0.012**	**−0.035**	**−0.058**	**0.039**	**−0.003**	**0.038**	**−0.038**	**0.288**	**0.086**	

Note: Pearson correlations are reported. Boldface indicates significance at the 5% level (two-tailed p-values). Variables are defined in Appendix C.

[18] The correlation between executives' facial trustworthiness and firm's fundamentals echoes with the argument by Graham et al. (2016) that firms' external executive hiring decisions may correspond with firms' fundamental characteristics. We perform an additional analysis in section 4.3.3, using subsamples of internally promoted executives and externally hired executives to rule out a possible alternative explanation to our results that auditors actually respond to firms' fundamentals when making audit fee decisions. We find that our results are consistent for both internally promoted CFOs and externally hired CFOs.

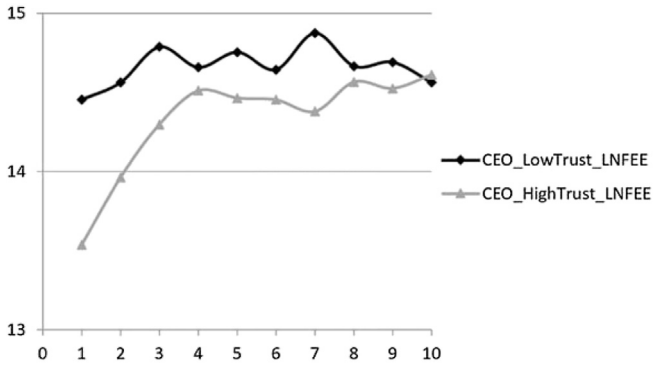

Fig. 1. CEOs' facial trustworthiness, auditor tenure, and audit fees.

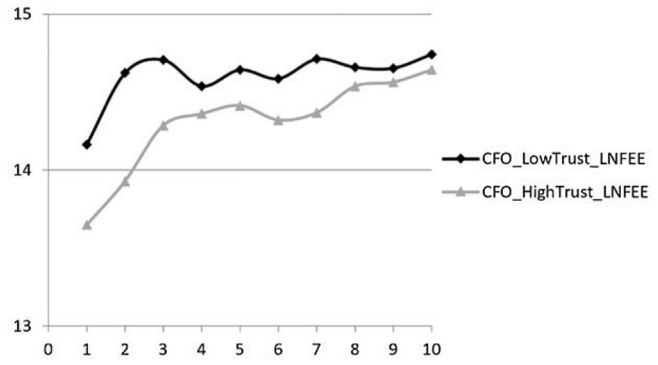

Fig. 2. CFOs' facial trustworthiness, auditor tenure, and audit fees. *Note:* Fig. 1 (Fig. 2) plots CEOs' (CFOs') perceived facial trustworthiness, auditor tenure, and natural log transformation of annual audit fees. The time trends for High_Trust group and Low_Trust group are depicted. We use the 33rd percentile and 67th percentile as cut off points for CEOs' facial trustworthiness and CFOs' facial trustworthiness to divide our sample (4411 firm-year observations) into low-trust, mid-trust, and high-trust groups, respectively. We have 1473 (1469) observations for the low-trust group and 1469 (1469) observations for the high-trust group of CEOs (CFOs) facial trustworthiness. For ease of data plotting, we drop the observations with auditor tenure longer than 10 years. Fig. 1 include 502 firm-year observations with CEOs from low-trust group vs. 502 firm-year observations with CEOs from high-trust group. Fig. 2 include 517 firm-year observations with CFOs from low-trust group vs. 515 firm-year observations with CFOs from high-trust group. We do not require a constant sample over 10 years in order to preserve more observations within each year.

4.2. Results of multivariate analysis

4.2.1. Results for H1

Table 4 Panel A presents the results of a multivariate analysis of how CEOs' and CFOs' facial trustworthiness affects audit fee. We include year-, firm-, and CEO and/or CFO age-group- fixed effects, as expressed in Eq. (1). Column A of Table 4 shows that CEOs' facial trustworthiness does not significantly influence audit fee. However, in column B of Table 4, CFOs' facial trustworthiness is significantly and negatively associated with audit fee (-0.031, *t-stat.* $= -2.94$). When both CEOs' and CFOs' facial trustworthiness are included in the regression model, we find the same pattern: CEOs' facial trustworthiness is not related to audit fee but the coefficient of CFOs' facial trustworthiness (-0.030, *t-stat.* $= -2.83$) is negative and significant at the 1% level. These results provide supporting evidence for H1, suggesting that CFOs' facial trustworthiness plays an important role in the pricing of audit services.[19] Our finding that auditors charge a lower audit fee to trustworthy-looking CFOs also highlights the crucial role of CFOs in financial reporting, which has been well documented in prior literature (Aier et al., 2005; Chava and Purnanandam, 2010; Ham et al., 2017; Jiang et al., 2010; Kim et al., 2011; Liu et al., 2016).

[19] Since our sample include both male and female executives, we review the literature on face stimuli by focusing on gender issues and find that some prior studies focus only on male subjects (Graham et al., 2016; Robinson et al., 2014; Rule and Ambady, 2008; Winston et al., 2002), while many other studies employ both male and female subjects in assessing facial features (Blankespoor et al., 2017; Halford and Hsu, 2014; Livingston and Pearce, 2009; Oosterhof and Todorov, 2008; Todorov et al., 2008; Todorov and Engell, 2008; Vernon et al., 2014). To address the potential executive's gender difference that may influence auditor's facial trustworthiness perceptions, we follow Blankespoor et al. (2017) to repeat our hypotheses testing using the two sub-sample groups, i.e., a male CFO group and a female CFO group. We identify 4099 observations in male CFO group and 312 observations in female CFO group. Our results are robust for both CFO gender groups. Moreover, we introduce a dummy variable *GENDER*, which equals to 1 if the CFO is female, and 0 otherwise, and an interaction term *TRUSTWORTHINESS_CFO*GENDER* to empirically test whether male and female facial trustworthiness are perceived differently in an audit setting. We find insignificant coefficient on the interaction term, suggesting that auditors' trustworthiness perceptions based on CFO's facial features are not conditional on CFO's gender. The results are not tabulated for brevity.

Table 4
Executives' facial trustworthiness and audit fees.

Variables[a,b]	Sign	Column A[c]		Column B[c]		Column C[c]	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel A: CEOs' and CFOs' facial trustworthiness index and audit fees (DV = *AUDIT_FEE*)							
TRUSTWORTHINESS_CEO	−	0.001	0.14			0.002	0.19
TRUSTWORTHINESS_CFO	−			−0.031***	−2.94	−0.030***	−2.83
AUTENURE	?	0.002	1.36	0.002	1.43	0.002	1.38
LN_ASSTS	+	0.387***	26.04	0.389***	26.38	0.389***	26.32
ACC_FILER	+	0.770***	16.90	0.773***	17.97	0.771***	17.75
LEV	+	0.142***	3.22	0.145***	3.23	0.145***	3.22
ARINV	+	0.192***	2.82	0.204***	2.91	0.203***	2.91
GC	+	0.924***	6.88	0.938***	7.10	0.937***	6.95
RESTATE	−	−0.020	−1.49	−0.020	−1.46	−0.020	−1.51
LOSS	+	0.045***	2.82	0.046***	2.89	0.046***	2.88
ROA	−	−0.104	−1.20	−0.112	−1.33	−0.107	−1.27
CASH_FLOW	−	0.086	0.91	0.109	1.11	0.097	1.02
FOREIGN	+	0.034**	2.40	0.036**	2.51	0.034**	2.47
BUS_SEGMENT	+	0.011***	3.59	0.011***	3.58	0.011***	3.54
REPORTLAG	+	0.006***	9.35	0.006***	9.10	0.006***	9.31
BIG4	+	−0.027	−0.84	−0.026	−0.81	−0.028	−0.88
BD_SIZE	−	−0.016	−1.29	−0.018	−1.48	−0.018	−1.45
BD_IND	−	−0.011	−1.07	−0.011	−1.12	−0.011	−1.12
AC_SIZE	−	0.001	0.02	0.001	0.09	0.000	0.00
Intercept		*YES*		*YES*		*YES*	
YEAR FIXED EFFECT		*YES*		*YES*		*YES*	
FIRM FIXED EFFECT		*YES*		*YES*		*YES*	
CEO AGE GROUP		*YES*				*YES*	
CFO AGE GROUP				*YES*		*YES*	
N		4411		4411		4411	
Adj-R^2		0.955		0.954		0.955	

Variables[a,b]	Sign	*Separated Trustworthiness Measures*[c]							
		$EYEBROW_{rstd}$		$FACE\_SHAPE_{std}$		$CHIN\_ANGLE_{std}$		$PHILTRUM_{rstd}$	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel B: Separated facial feature measures and audit fees (DV = *AUDIT_FEE*)									
Facial_Features_CEO	−	−0.002	−0.33	0.001	0.10	0.004	0.58	−0.003	−0.51
Facial_Features_CFO	−	−0.016**	−2.25	−0.013**	−2.09	−0.013*	−1.95	−0.009*	−1.76
N		4411		4411		4411		4411	
Adj-R^2		0.955		0.955		0.955		0.955	

[a] $EYEBROW_{rstd}$ is the standardized value of reversed value of *EYEBROW*. $FACE\_SHAPE_{std}$ is the standardized value of *FACE_SHAPE* value. $CHIN\_ANGLE_{std}$ is the standardized value of *CHIN_ANGLE* value. $PHILTRUM_{rstd}$ is the standardized value of reversed value of *PHILTRUM*. Other variables are defined in Appendix C.
[b] All continuous variables are winsorized at the 1st and 99th percentiles.
[c] T-statistics are reported and ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively. Intercept, control variables, firm fixed effects, year fixed effects, CEOs' age-group fixed effects, and/or CFOs' age-group fixed effects are controlled but not reported for brevity. Standard errors are clustered at the auditor-year level.

Other control variables show results similar to those reported in previous studies (Beck and Mauldin, 2014; Huang et al., 2007). Specifically, audit fee is significantly and positively associated with our proxies for firm size (*LN_ASSETS* and *ACC_FILER*), suggesting that auditors tend to charge larger firms a higher fee. We also find that audit fee is positively associated with two proxies for business operation risks (*LEV* and *GC*), indicating that auditors charge a higher fee to client firms with higher risks. *LOSS*, a financial-performance measure, is positively and significantly associated with audit fee. This evidence is consistent with prior findings that auditors are exposed to higher risks, and thus command higher audit fee, when client firms suffer financial distress (Simunic, 1980). Firms with foreign operations (*FOREIGN*) and more active business segments (*BUS_SEGMENT*) tend to have a higher audit fee. *REPORTLAG* is also positively related to audit fee, in line with the view that longer audit reporting lags reflect more problems in the audit engagement processes, in turn leading to a higher fee (Knechel and Payne, 2001).[20]

We further examine whether and how auditors respond to each of four individual facial features. In Table 4 Panel B, we use each individual facial trait as a proxy for facial trustworthiness and retest H1. To simplify the interpretation of our results, we first reverse the signs of *EYEBROW* and *PHILTRUM* so that their predicted effects on audit fee are negative. We standardize each individual facial trait measurement by taking the difference between its raw value and its sample mean and then dividing the

[20] The adjusted R^2 in our model specifications is comparable with those reported in audit fee regression models with client firm fixed effects in prior studies (e.g., Goodwin and Wu (2014)).

difference by its standard deviation. All four individual facial trait measures (i.e., $EYEBROW_{rstd}$, $FACE\_SHAPE_{std}$, $CHIN\_ANGLE_{std}$, and $PHILTRUM_{rstd}$) are expected to correlate negatively with audit fee. Consistent with our main results in Panel A, we find no significant effects of CEOs' separate (individual) facial feature measures on audit fee, as presented in Panel B. However, all four separate facial feature measures for CFOs are negatively associated with audit fee. These results lend further support to H1, indicating that CFOs' facial trustworthiness plays a significant role in audit pricing decisions. Though not tabulated for brevity, we find that other control variables exhibit similar effects on audit fee as found in the main analysis using the composite facial trustworthiness measure.

Table 5 reports results of the change regression in Eq. (2). There are 243 CEO changes and 343 CFO changes in our sample. Our sample is an unbalanced panel data with missing year observations for firms included in our sample during 2001–2014. The change values in year *t* can be calculated when both year *t-1* and year *t* firm-year observations are included in the sample. As shown in column A of Table 5 Panel A, the change in CEOs' facial trustworthiness (arising from CEO turnovers) is not significantly associated with audit fee change at the conventional level. However, in column B of Table 5 Panel A, the change in CFOs' facial trustworthiness (arising from CFO turnovers) is negatively and significantly associated with audit fee change (-0.031, *t-stat.* $= -2.34$). In column C, when both changes in CEOs' and CFOs' facial trustworthiness are included in the model specification, we find that only the change in CFOs' facial trustworthiness is significantly and negatively related to audit fee change. The results suggest that an increase in CFOs' facial trustworthiness is associated with a decrease in audit fee. To summarize, the results of our change regression in Eq. (2) are highly consistent with those of the level regression in Eq. (1) and lend further support to the prediction of H1. The results for all other control variables in the change regression are, overall, similar to those reported in the level regression, as tabulated in Table 4 Panel A.

Next, we perform a change regression analysis using individual facial traits of CEOs and CFOs as proxies for CEOs' and CFOs' facial trustworthiness. Table 5 Panel B reports the results, which are also consistent with H1. Specifically, the results indicate that changes in $EYEBROW_{rstd}$ (-0.019, *t-stat.* $= -2.18$), $FACE\_SHAPE_{std}$ (-0.016, *t-stat.* $= -2.05$), and $CHIN\_ANGLE_{std}$ (-0.015, *t-stat.* $= -1.81$) for CFOs are negatively correlated with change in audit fee, suggesting that the increase in CFOs' facial trustworthiness measured by inner eyebrow ridge, face roundness, and chin angle correlates with a decrease in audit fee. However, we do not find a significant association between a change in $PHILTRUM_{rstd}$ for CFOs and a change in audit fee

Table 5
Change analysis of executives' facial trustworthiness and audit fees.

Variables[a,b]	Sign	Column A[c]		Column B[c]		Column C[c]	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel A: Change of CEOs' and CFOs' facial trustworthiness index and audit fees (DV = *ΔAUDIT_FEE*)							
ΔTRUSTWORTHINESS_CEO	−	−0.011	−1.15			−0.012	−1.17
ΔTRUSTWORTHINESS_CFO	−			−0.031**	−2.34	−0.031**	−2.35
ΔAUTENURE	?	0.006***	3.65	0.006***	3.83	0.006***	3.71
ΔLN_ASSTS	+	0.433***	12.15	0.430***	11.99	0.433***	12.04
ΔACC_FILER	+	omitted[d]		omitted[d]		omitted[d]	
ΔLEV	+	0.099	1.62	0.091	1.44	0.098	1.58
ΔARINV	+	0.191*	1.83	0.210**	2.01	0.192*	1.83
ΔGC	+	0.808***	33.97	0.802***	33.51	0.809***	34.20
ΔRESTATE	−	−0.017*	−1.71	−0.017*	−1.76	−0.017*	−1.75
ΔLOSS	+	0.020	1.37	0.019	1.33	0.019	1.28
ΔROA	−	−0.145**	−2.19	−0.141**	−2.10	−0.148**	−2.23
ΔCASH_FLOW	−	0.156*	1.87	0.163*	1.96	0.158*	1.90
ΔFOREIGN	+	0.005	0.28	0.007	0.38	0.005	0.32
ΔBUS_SEGMENT	+	0.001	0.41	0.002	0.49	0.002	0.46
ΔREPORTLAG	+	0.005***	4.60	0.005***	4.62	0.005***	4.61
ΔBIG4	+	0.002	0.05	0.001	0.04	0.004	0.09
ΔBD_SIZE	−	−0.010	−1.03	−0.009	−0.97	−0.010	−1.00
ΔBD_IND	−	0.001	0.10	0.003	0.04	0.001	0.13
ΔAC_SIZE	−	−0.001	−0.22	−0.002	−0.33	−0.002	−0.27

Variables[a,b]	Sign	*Separated Trustworthiness Measures*[c]							
		$\Delta EYEBROW_{rstd}$		$\Delta FACE\_SHAPE_{std}$		$\Delta CHIN\_ANGLE_{std}$		$\Delta PHILTRUM_{rstd}$	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel B: Change of separated facial feature measures and audit fees (DV = *ΔAUDIT_FEE*)									
ΔFacial_Features_CEO	−	−0.001	−0.47	−0.010	−1.27	−0.007	−0.78	−0.015	−1.46
ΔFacial_Features_CFO	−	−0.019**	−2.18	−0.016**	−2.05	−0.015*	−1.81	−0.004	−0.46
N		3164		3164		3164		3164	
Adj-R^2		0.280		0.282		0.282		0.280	

[a] $EYEBROW_{rstd}$ is the standardized value of reversed value of *EYEBROW*. $FACE\_SHAPE_{std}$ is the standardized value of *FACE_SHAPE* value. $CHIN\_ANGLE_{std}$ is the standardized value of *CHIN_ANGLE* value. $PHILTRUM_{rstd}$ is the standardized value of reversed value of *PHILTRUM*. Other variables are defined in Appendix C.

[b] All continuous variables are winsorized at the 1st and 99th percentiles.

[c] T-statistics are reported and ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively. Intercept, control variables, year fixed effects, CEOs' age-group fixed effects, and/or CFOs' age-group fixed effects are controlled but not reported for brevity. Standard errors are clustered at the auditor-year level.

[d] *ΔACC_FILER* is omitted because of collinearity.

(−0.004, *t-stat.* = −0.46). Consistent with the results in Table 4, we find that none of the changes in CEOs' individual facial traits correlates with a change in audit fee. Nevertheless, the results in change regression analyses should be interpreted with caution, as the turnover in CEOs and CFOs may also correlate with other changes in firms' fundamental characteristics that simultaneously affect the audit fees. Overall, our results from both the level and change regressions employing both the composite and separate facial trustworthiness measures provide evidence that the firms with a more trustworthy-looking CFO enjoy a lower audit fee.

4.2.2. Results for H2

H2 predicts that when auditors have longer tenure, they rely less on the facial trustworthiness of auditees' CEOs and CFOs when making audit fee decisions. To test H2, we estimate Eq. (3) and report the results in Table 6.

In Table 6 Panel A, column A presents the results of the regression including CEOs' facial trustworthiness (*TRUSTWORTHINESS_CEO*), auditor tenure (*AUTENURE*), and the interaction between them (*TRUSTWORTHINESS_CEO*AUTENURE*). Consistent with the results of the main effect in Table 4, neither the main effect (captured by the coefficient of CEOs' facial trustworthiness) nor the interaction effect (captured by the coefficient of the interaction term) is significant. Column B reports the result of the regression including CFOs' facial trustworthiness (*TRUSTWORTHINESS_CFO*), auditor tenure (*AUTENURE*), and the interaction item (*TRUSTWORTHINESS_CFO*AUTENURE*). Consistent with the results in Tables 4 and 5, the coefficient of CFOs' facial

Table 6
Auditor tenure, executives' facial trustworthiness and audit fees.

Variables[a,b]	Sign	Column A[c]		Column B[c]		Column C[c]	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel A: Auditor tenure, CEOs' and CFOs' facial trustworthiness index and audit fees (DV = *AUDIT_FEE*)							
TRUSTWORTHINESS_CEO	−	0.001	0.01			0.002	0.09
*TRUSTWORTHINESS_CEO*AUTENURE*	+	0.000	0.07			0.000	−0.03
TRUSTWORTHINESS_CFO	−			−0.069***	−3.90	−0.067***	−3.79
*TRUSTWORTHINESS_CFO*AUTENURE*	+			0.002***	2.93	0.002***	2.88
AUTENURE	?	0.002	1.37	0.002	1.45	0.002	1.41
LN_ASSET	+	0.387***	26.08	0.390***	26.40	0.390***	26.39
ACC_FILER	+	0.770***	16.90	0.778***	17.63	0.775***	17.48
LEV	+	0.142***	3.22	0.138***	3.11	0.138***	3.11
ARINV	+	0.192***	2.81	0.201***	2.84	0.200***	2.85
GC	+	0.925***	6.92	0.943***	7.13	0.942***	7.00
RESTATE	−	−0.020	−1.49	−0.020	−1.50	−0.021	−1.55
LOSS	+	0.045***	2.81	0.045***	2.88	0.045***	2.86
ROA	−	−0.104	−1.19	−0.116	−1.39	−0.112	−1.32
CASH_FLOW	−	0.086	0.91	0.106	1.08	0.094	0.99
FOREIGN	+	0.034**	2.41	0.034**	2.38	0.033**	2.34
BUS_SEGMENT	+	0.011***	3.59	0.011***	3.56	0.011***	3.51
REPORTLAG	+	0.006***	9.34	0.006***	9.05	0.006***	9.26
BIG4	+	−0.028	−0.85	−0.024	−0.78	−0.027	−0.84
BD_SIZE	−	−0.016	−1.29	−0.017	−1.41	−0.017	−1.38
BD_IND	−	−0.011	−1.07	−0.012	−1.24	−0.012	−1.24
AC_SIZE	−	0.001	0.02	0.001	0.05	−0.001	−0.03
Intercept		*YES*		*YES*		*YES*	
YEAR FIXED EFFECT		*YES*		*YES*		*YES*	
FIRM FIXED EFFECT		*YES*		*YES*		*YES*	
CEO AGE GROUP		*YES*				*YES*	
CFO AGE GROUP				*YES*		*YES*	
N		4411		4411		4411	
Adj-R^2		0.955		0.954		0.955	

Variables[a,b]	Sign	*Separated Trustworthiness Measures*[c]							
		$EYEBROW_{rstd}$		$FACE\_SHAPE_{std}$		$CHIN\_ANGLE_{std}$		$PHILTRUM_{rstd}$	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel B: Auditor tenure, separated facial feature measures and audit fees (DV = *AUDIT_FEE*)									
Facial_Features_CEO	−	−0.005	−0.37	0.007	0.60	0.002	0.13	−0.009	−0.68
*Facial_Features_CEO*AUTENURE*	+	0.000	0.20	−0.000	−0.63	0.000	0.14	0.000	0.57
Facial_Features_CFO	−	−0.031***	−2.81	−0.033***	−3.03	−0.036***	−3.20	−0.021**	−2.07
*Facial_Features_CFO*AUTENURE*	+	0.001*	1.94	0.001**	2.35	0.001**	2.51	0.001*	1.77
N		4411		4411		4411		4411	
Adj-R^2		0.955		0.955		0.955		0.955	

[a] $EYEBROW_{rstd}$ is the standardized value of reversed value of *EYEBROW*. $FACE\_SHAPE_{std}$ is the standardized value of *FACE_SHAPE* value. $CHIN\_ANGLE_{std}$ is the standardized value of *CHIN_ANGLE* value. $PHILTRUM_{rstd}$ is the standardized value of reversed value of *PHILTRUM*. Other variables are defined in Appendix C.
[b] All continuous variables are winsorized at the 1st and 99th percentiles.
[c] T-statistics are reported and ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively. Intercept, control variables, firm fixed effects, year fixed effects, CEOs' age-group fixed effects, and/or CFOs' age-group fixed effects are controlled but not reported for brevity. Standard errors are clustered at the auditor-year level.

trustworthiness is negative and significant at less than the 1% level (−0.069, *t-stat.* = −3.90). More importantly, we find that the coefficient of the interaction term is positive and significant at the 1% level (0.002, *t-stat.* = 2.93). This finding is consistent with the prediction of H2 that longer auditor tenure weakens the negative correlation between CFOs' facial trustworthiness and audit fee. The above finding suggests that as auditor tenure increases, incumbent auditors accumulate more knowledge about their clients' executives and business operations, and as a result, auditors rely less on CFO's facial features to judge audit risk (and thus audit fees).

In column C of Table 6 Panel A, we report the results of the regression including both CEOs' and CFOs' facial trustworthiness and their interactions with auditor tenure. As shown in column C, we find consistent results showing a negative effect of CFOs' facial trustworthiness on audit fee (−0.067, *t-stat.* = −3.79) and a positive effect of the interaction between CFOs' facial trustworthiness and auditor tenure (0.002, *t-stat.* = 2.88). In addition, we find that both the main and interaction effects of CEOs' facial trustworthiness remain insignificant. Overall, the results suggest that audit fee is influenced by auditors' perceptions of CFOs' (but not CEOs') trustworthiness based on facial features.[21] This is because auditors gain more client-specific knowledge about audit engagement risks as the auditor-client relationship accumulates. The results for the control variables are highly consistent with those reported in prior studies (Abbott et al., 2003; Beck and Mauldin, 2014; Choi et al., 2008; Huang et al., 2007) and those in Table 4. In short, the results in Table 6 Panel A support the prediction of H2 regarding the effect of CFO facial trustworthiness.

We now examine the economic significance of CFOs' facial trustworthiness and audit fee by following a similar approach adopted by Beck and Mauldin (2014). For this purpose, we compute the audit fee change arising from the change in facial trustworthiness from the 25th percentile (−0.440) to the 75th percentile (0.348) of the *TRUSTWORTHINESS_CFO* distribution. For this inter-quartile change in CFOs' facial trustworthiness, we find that the audit fee decreases by about 2.5% on average and decreases by 5.6% for the first-year audit engagement, keeping other audit fee determinants constant.[22] Considering the mean audit fee of 4.3 million per year and the mean auditor tenure of 15.51 years in our sample, firms with trustworthy-looking CFOs may save approximately US$242,000 in the first-year audit and an average of US$108,000 annually over the 15 years, relative to firms with untrustworthy-looking CFOs.[23]

We also reexamine H2 by replacing the composite facial trustworthiness measure in Eq. (3) with each of the four individual facial features to further explore how auditor tenure attenuates the impact of executives' facial trustworthiness on audit fee. The results in Table 6 Panel B show that the coefficients of *Facial_Features_CFO* are all negative and highly significant whereas those of the interaction term, *Facial_Features_CFO*AUTENURE*, are all positive and significant at the conventional level for all four individual facial feature measures. These results suggest a significant moderating effect of auditor tenure on the association between CFOs' facial trustworthiness measurements and audit fee. Overall, these results are highly consistent with the main results and thus support the H2 prediction that auditor tenure weakens the negative relation between CFOs' facial trustworthiness and audit fee.

4.3. Additional analyses and robustness tests

4.3.1. Rational behavior or cognitive bias

Our main regression results suggest that auditors tend to factor executives' facial trustworthiness into their audit pricing decisions. A natural question arises of whether it is rational to have audit pricing being affected by executives' facial trustworthiness. The negative association between executives' facial trustworthiness and audit fee may be explained by two contradictory interpretations. First, an executive's face may be an observable and reliable indicator of a firm's actual behavior, e.g., more trustworthy-looking CFOs may indeed be more trustworthy in financial reporting behavior. In this case, auditors *rationally* treat an untrustworthy-looking executive as a signal of higher audit risks. Second, the incorporation of executives' facial trustworthiness into audit pricing may reflect auditors' *cognitive bias*, defined as the tendency of individuals to make systematic judgment errors when making decisions (Kahneman and Tversky, 1972).[24] In this case, an executive's facial trustworthiness is unlikely to be correlated with a firm's actual behavior or its consequences, such as financial reporting quality.

[21] Prior literature suggests that the amygdala tends to respond more strongly to untrustworthy faces and trustworthy faces (Oosterhof and Todorov, 2008; Winston et al., 2002). Thus, we drop the middle spectrum of facial trustworthiness observations and rerun the main analyses. Specifically, we only keep observations that fall into top and bottom facial trustworthiness tertiles, quartiles, and quintiles, respectively. The untabulated results are largely consistent with our main findings.

[22] In our main regression of CFO's facial trustworthiness, given the coefficient of −0.031 for *TRUSTWORTHINESS_CFO* in column B of Table 4 Panel A, when CFO's facial trustworthiness increases from the first quartile (at the 25th percentile) to the third quartile (at the 75th percentile), the resulting change in the logged value of audit fee (*AUDIT_FEE*) amounts to [(-0.031*0.348) − (−0.031*-0.440) = −0.0244]. Therefore, the audit fee, on average, decreases by about 2.5 percent [$e^{0.0244}$–1=0.025]. In the regression with interaction effects of CFO's facial trustworthiness, given the coefficient of −0.069 for *TRUSTWORTHINESS_CFO* as shown in column B of Table 6 Panel A, the logged value of audit fee (*AUDIT_FEE*) change amounts to [(-0.069*0.348) − (−0.069*-0.440) = −0.0544]. Thus, the first-year audit fee decreases by about 5.6 percent [$e^{0.0544}$–1 = 0.056].

[23] These percentage decreases in audit fee are economically significant and comparable with those reported in prior studies. For example, Beck and Mauldin (2014) explore the economic significance of audit fee changes associated with the recession, and find a 4.3% decrease in audit fees during the recession period (2008−2009).

[24] Tversky and Kahneman (1974) argue that people use cognitive heuristics as "shortcuts" to reduce the complexity of decision-making processes. These cognitive heuristics sometimes lead to "severe and systematic errors" (Kahneman and Tversky, 1972; Tversky and Kahneman, 1974). Cognitive biases often impair auditors' decisions (Knapp and Knapp, 2012). Experimental studies provide evidence that auditors tend to mentally "anchor" a biased expectation based on unverified values (Biggs and Wild, 1985; Heintz et al., 1999; McDaniel and Kinney, 1995); such biased expectations adversely affect the quality of auditors' analytical procedures (Pike et al., 2013). Moreover, auditors' subsequent adjustments away from the initial anchor tend to be insufficient (Knapp and Knapp, 2012).

To distinguish between these two conflicting perspectives, we investigate whether executives' composite facial trustworthiness measure is associated with firm-level financial reporting quality, measured by: (i) discretionary accruals, estimated using the modified Jones model developed by Dechow et al. (1995); (ii) accrual quality, estimated using the Dechow and Dichev (2002) model; and (iii) discretionary accruals, estimated using the McNichols (2002) model. We also add firm- and year-fixed effects to the regression models to respectively control for firm-specific and time-variate omitted factors that may influence a firm's financial reporting quality. As shown in the first three columns of Table 7, for both CEOs and CFOs, facial trustworthiness is unrelated to any of the three discretionary accruals measures. We further evaluate the relation between our trustworthiness measures and securities class action lawsuits, as recorded by Stanford Law School Securities Class Action Clearinghouse (Rogers and Stocken, 2005). As shown in the last column of Table 7, neither CEOs' nor CFOs' facial trustworthiness is significantly associated with the likelihood of securities class action lawsuits. The above evidence, though limited in nature, indicates that executives' facial trustworthiness is unrelated to the quality of financial reporting and the likelihood of lawsuits. Taken together, these findings are in line with the evidence reported in the auditor cognitive heuristics literature (Biggs and Wild, 1985; Heintz et al., 1999; Knapp and Knapp, 2012; McDaniel and Kinney, 1995; Pike et al., 2013) and suggest that the negative association between executives' facial trustworthiness and audit fee reflects auditors' cognitive bias rather than their rational pricing decisions. A caveat in this analysis is that higher audit fees arising from more audit staffing hours allocated to audit engagements for firms with untrustworthy CFOs may also result in better financial reporting quality and lower litigation likelihood. This may thus confound the interpretations of our results. In this scenario, insignificant differences in financial reporting qualities and litigation risks observed between client firms with trustworthy-looking CFOs and those with untrustworthy-looking CFOs could be attributable to the possibility that auditors' excessive efforts contribute to enhanced financial report quality for firms with untrustworthy-looking CFOs.

4.3.2. Will cognitive bias in audit pricing be competed away?

Our main results suggest that auditors' cognitive bias leads them to charge an audit fee premium to firms with untrustworthy-looking CFOs but give an audit fee discount to firms with trustworthy-looking CFOs. The audit pricing inefficiency associated with such bias, driven by CFOs' facial trustworthiness, should in principle be competed away in a competitive market for audit services. Nevertheless, we argue that this inefficiency is unlikely to be competed away, at least in the short run, for the following reasons. First, the cognitive process of facial trustworthiness perceptions generates a *universal* effect across different individuals (Kim and Rosenberg, 1980; Oosterhof and Todorov, 2008). In a similar vein, one can expect that auditors across different audit firms are likely to form similar CFO trustworthiness perceptions, irrespective of client firms' underlying risk profiles. This cognitive bias regarding executive facial features may deter auditors from differentiating clients with differing risk profiles, resulting in universal audit risk evaluations based on client CFOs' appearance. As such, audit pricing inefficiency arising from auditors' cognitive bias (in relation to facial trustworthiness perceptions) cannot be competed away, particularly in initial audit engagements, though it can be mitigated with longer auditor tenure, which leads to auditors relying less on facial trustworthiness perceptions.

Second, each audit firm exhibits different "audit style" in terms of internal working rules, auditing standard implementation, and GAAP enforcement (Francis et al., 2013). Audit firms may also exhibit different abilities to overcome the cognitive bias in relation to facial trustworthiness perceptions, making auditor fixed effects potential omitted variables. Following Francis et al. (2013), we re-estimate our regression models with auditor fixed effects in an effort to capture the incremental effect of each audit firm in adjusting audit pricing inefficiency. The results are reported in Table 8. Compared with the main results in Tables 4 and 6, the coefficients of the facial trustworthiness index and its interactions with auditor tenure are slightly smaller in magnitude after controlling for auditor fixed effects. This suggests that audit pricing inefficiency is at least partially explained by differences in audit firms' abilities to overcome such cognitive bias. After accounting for auditor-specific style by including auditor fixed effects in our regressions, we still find that CFOs' facial trustworthiness and its interaction with auditor tenure are significant and consistent with the directional predictions in H1 and H2. This finding

Table 7
Executives' facial trustworthiness, firms' reporting quality, and securities class action lawsuit.

Variables[a,b]	Sign	*Modified_Jones*[c]	*Dechow_Dechiev*[d]	*McNichols*[e]	*Lawsuit*[f]
		Estimate t-stat.	Estimate t-stat.	Estimate t-stat.	Estimate t-stat.
TRUSTWORTHINESS_CEO	?	0.111 (0.44)	0.006 (0.33)	0.034 (0.82)	−0.011 (−0.90)
TRUSTWORTHINESS_CFO	?	0.332 (1.10)	0.007 (0.76)	−0.032 (−1.02)	−0.013 (−1.16)
N		3719	1461	1454	4411
Adj-R^2		0.217	0.348	0.405	0.213

[a] Variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles.
[b] T-statistics are reported and ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively. Intercept, firm fixed effects, and year fixed effects are controlled but not reported for brevity. Standard errors are clustered at the firm-year level.
[c] Dependent variable is the discretionary accruals estimated based on modified jones model Dechow et al. (1995).
[d] Dependent variable is the discretionary accruals estimated based on Dechow and Dichev (2002).
[e] Dependent variable is the discretionary accruals estimated based on McNichols (2002).
[f] Dependent variable is dummy variable of firms' current year lawsuit that equals to 1 if a security class action lawsuit was recorded by Sandford Law School's Securities Class Action Clearinghouse during the calendar year, and 0 otherwise (Jonathan and Stocken, 2005).

Table 8
Executives' facial trustworthiness and audit fees with auditor fixed effects.

Variables[a,b]	Sign	Column A[c]		Column B[c]		Column C[c]	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel A: Facial trustworthiness and audit fees with auditor fixed effects (DV = *AUDIT_FEE*)							
TRUSTWORTHINESS_CEO	−	0.003	0.26			0.003	0.29
TRUSTWORTHINESS_CFO	−			−0.029***	−2.80	−0.028***	−2.71
N		4411		4411		4411	
Adj-R^2		0.956		0.956		0.956	
Variables[a,b]	Sign	Column A[c]		Column B[c]		Column C[c]	
		Estimate	t-stat.	Estimate	t-stat.	Estimate	t-stat.
Panel B: Auditor tenure, facial trustworthiness and audit fees with auditor fixed effects (DV = *AUDIT_FEE*)							
TRUSTWORTHINESS_CEO	−	0.007	0.34			0.008	0.39
*TRUSTWORTHINESS_CEO*AUTENURE*	+	0.000	−0.26			−0.000	−0.33
TRUSTWORTHINESS_CFO	−			−0.065***	−3.75	−0.064***	−3.67
*TRUSTWORTHINESS_CFO*AUTENURE*	+			0.002***	2.79	0.002***	2.74
N		4411		4411		4411	
Adj-R^2		0.956		0.956		0.956	

[a] Variables are defined in Appendix C.
[b] All continuous variables are winsorized at the 1st and 99th percentiles.
[c] T-statistics are reported and ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively. Intercept, control variables, firm fixed effects, year fixed effects, auditor fixed effects, CEOs' age-group fixed effects, and/or CFOs' age-group fixed effects are controlled but not reported for brevity. Standard errors are clustered at the auditor-year level.

suggests that the audit pricing inefficiency associated with auditors' cognitive bias (in relation to facial trustworthiness) is unlikely to be competed away in the audit market, at least in the short run.

4.3.3. Internally promoted CFOs versus externally hired CFOs

Graham et al. (2016) find that when firms *externally* hire CEOs, the board of directors tends to judge CEO competence based on facial features due to high information asymmetries and uncertainties about the candidate's true abilities. In this case, facial appearance is likely to be an important factor for firms to identify candidates who can satisfy their needs for the executive position. To the extent that our facial trustworthiness measure is correlated with firm fundamentals such as firm performance and risk factors, our main findings on the role of facial trustworthiness in audit pricing could be open to the alternative explanation that firms' fundamental characteristics, rather than executives' facial trustworthiness, are considered by auditors when making audit fee decisions.

To eliminate this alternative explanation, we follow Graham et al. (2016) by manually checking CFOs' work experience using their biographic information provided by BoardEx and distinguishing internally promoted CFOs from externally hired CFOs.[25] There are two reasons to differentiate between internally promoted and externally hired CFOs. First, while executives' facial appearance is an important influencer when the board appoints an external CFO (Graham et al., 2016), executives' facial traits are less likely to influence the appointment of *internally* promoted CFOs who have established performance records within the firm (Graham et al., 2016). Therefore, CFOs' facial trustworthiness is less likely to be correlated with a firm's fundamental characteristics and potential risk factors for firms with internally promoted CFOs than for those with externally hired CFOs. Second, by retesting our hypotheses using the two subsamples of firms with externally hired and internally promoted CFOs, we can test the validity of the alternative explanation that auditors price firms' fundamental characteristics rather than CFOs' facial trustworthiness in audit fee decisions. If our main results on the negative impact of facial trustworthiness on audit fee do not hold for the subsample of firms with internally promoted CFOs, it would suggest that auditors are reacting to firm fundamentals, thus supporting the alternative explanation. By contrast, if our main results are robust for internally promoted CFOs, it would suggest that auditors are reacting to CFOs' facial trustworthiness, as the promotion of internally selected CFOs is less likely to be influenced by their facial trustworthiness. Table 9 Panel A reports the empirical results. As shown in Panel A, our results are robust for *both* internally promoted and externally hired CFOs. This finding helps to rule out the above-mentioned alternative explanation, suggesting that the negative association observed between CFOs' facial trustworthiness and audit fee is unlikely to be driven by auditors' reactions to fundamental firm characteristics.

4.3.4. Discounts in initial audit engagements

Auditors tend to "low-ball" the audit fee by offering discounts in initial audit engagements (Ettredge and Greenberg, 1990; Simon and Francis, 1988). The initial audit engagement discount amounts to 24% of total audit fee and may last for

[25] We define a CFO as internally promoted if they held a position other than CFO since joining the firm. We define a CFO as externally hired if they are directly appointed as CFO on joining the firm. We drop observations if the CFO's work experience is missing in BoardEx. In total, we identify 520 internally promoted CFOs and 433 externally hired CFOs within the full CFO sample of 1360.

Table 9
Hypothesis testing for internally promoted CFOs and sample excluding initial audit engagements.

Variables[a,b]	Sign	*Internally promoted* CFOs[c]		*Externally hired* CFOs[c]	
		Estimate t-stat.	Estimate t-stat.	Estimate t-stat.	Estimate t-stat.
Panel A: Hypothesis testing for *Internally promoted* CFOs vs. *Externally hired* CFOs (DV = *AUDIT_FEE*)					
TRUSTWORTHINESS_CFO	−	−0.029* (−1.67)	−0.074** (−2.04)	−0.023** (−3.22)	−0.109*** (−3.94)
*TRUSTWORTHINESS_CFO*AUTENURE*	+		0.003* (1.72)		0.007*** (3.46)
N		2037	2037	1604	1604
Adj-R^2		0.971	0.971	0.964	0.964
Variables[a,b]	Sign	*Sample excluding the audit engagements of initial year*[c]		*Sample excluding the audit engagements of initial three years*[c]	
		Estimate t-stat.	Estimate t-stat.	Estimate t-stat.	Estimate t-stat.
Panel B: Hypothesis testing using the sample excluding initial audit engagements (DV = *AUDIT_FEE*)					
TRUSTWORTHINESS_CFO	−	−0.030*** (−2.77)	−0.080*** (−4.17)	−0.029*** (−2.92)	−0.078*** (−5.06)
*TRUSTWORTHINESS_CFO*AUTENURE*	+		0.003*** (3.15)		0.003*** (3.79)
N		4296	4296	4078	4078
Adj-R^2		0.960	0.960	0.962	0.962

[a] Variables are defined in Appendix C.
[b] All continuous variables are winsorized at the 1st and 99th percentiles.
[c] T-statistics are reported and ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively. Intercept, control variables, intercept, firm fixed effects, year fixed effects, and CFOs' age-group fixed effects are controlled but not reported for brevity. Standard errors are clustered at the auditor-year level.

approximately two more years at diminishing rates, before then disappearing (Simon and Francis, 1988). This first-time audit fee discount may be a special manifestation of our main findings in that auditors tend to charge lower fees for their initial audit engagement with firms that have trustworthy-looking CFOs. Thus, we explore whether the effects of CFO's facial trustworthiness on audit fee still hold after the initial discount period. Specifically, we follow Abbott et al. (2017) to exclude the observations with auditor tenure being equal to 0 (first-year audit engagements) and retest our hypotheses. In addition, since Simon and Francis (1988) suggest that the fee may be discounted for up to three years after an auditor is engaged, we also exclude observations with auditor tenure being equal to or smaller than 2 (first-three-year audit engagements) and retest our hypotheses.

As shown in Table 9 Panel B, the results are robust even when using the reduced sample excluding audit engagements that may have a discounted fee for the initial year or initial three years. The results in Table 9 Panel B suggest that the impact of CFO's facial trustworthiness on audit fee exists throughout the entire audit period, including the discount in initial audit engagements.

4.3.5. Sensitivity tests

We perform a series of sensitivity tests to check the robustness of our findings. First, as we extract executives' pictures from Google Images over a 14-year sample period, our results may suffer from survival bias. This is because executives who were terminated during the early period of our sample are less likely to have their pictures on Google Images when we collected executives' pictures, and are, thus, less likely to be included in the sample. Therefore, we focus on a subsample containing only the most recent five-year observations in our sample and retest our hypotheses. By focusing on the years closer to picture collection, we may partly alleviate executives' survival bias in Google Images. Second, in their study of the impacts of societal trust on audit fee, Jha and Chen (2014) find that firms located in U.S. counties with higher social capital pay a lower audit fee. Therefore, we control for the potential impact of county-level social capital, as defined by Rupasingha et al. (2006), on audit fee and rerun our regressions. Third, our final sample size is significantly reduced by limited corporate governance data in the RiskMetrics database. To relax this data constraint, we drop three governance-related controls (*BD_SIZE*, *BD_IND*, and *AC_SIZE*) from our regression models and retest our hypotheses using an enlarged sample. Fourth, our computer programming algorithm adopts deep machine-learning technology to understand how human beings view a face. A natural concern here is that eyebrow positions may be obscured for people with eyeglasses, especially when the edges of eyeglasses overlap eyebrows. To rule out the possibility that our results are influenced by associated measurement errors, we exclude the pictures of CFOs with eyeglasses from our sample and retest our hypotheses.

Table 10 tabulates the results of these robustness tests. As shown in Panels A to C of Table 10, our main inferences remain unaltered in all these sensitivity checks. Specifically, our results are robust to controlling for survival bias and social trust (Panel A), using an alternative enlarged sample (Panel B),[26] and using a reduced sample after removing executives with eyeglasses (Panel C).

[26] Consistent with our main findings, we do not find any evidence that CEO's facial trustworthiness plays a role in determining audit fee in the enlarged sample excluding corporate governance control variables. The results are not tabulated for brevity.

Table 10
Additional analyses.

Variables[a,b]	Sign	*Corrections of survival bias*[c]		*Controlling for social capital*[c]	
		Estimate t-stat.	Estimate t-stat.	Estimate t-stat.	Estimate t-stat.
Panel A: Additional analyses correcting survival bias and controlling for social capital (DV = *AUDIT_FEE*)					
TRUSTWORTHINESS_CFO	−	−0.030* (−1.86)	−0.046*** (−4.57)	−0.025** (−3.43)	−0.056*** (−3.33)
*TRUSTWORTHINESS_CFO*AUTENURE*	+		0.002*** (8.35)		0.002* (2.12)
SOCIAL_CAPITAL	?			−0.044 (−1.19)	−0.045* (−2.19)
N		2228	2228	1507	1507
Adj-R^2		0.981	0.981	0.953	0.954

Variables[a,b]	Sign	*Controls without corporate governance variables*[c]	
		Estimate t-stat.	Estimate t-stat.
Panel B: Additional analyses using an enlarged sample (DV = *AUDIT_FEE*)			
TRUSTWORTHINESS_CFO	−	−0.017** (−2.02)	−0.050*** (−3.69)
*TRUSTWORTHINESS_CFO*AUTENURE*	+		0.003*** (3.13)
N		5059	5059
Adj-R^2		0.975	0.975

Variables[a,b]	Sign	*CFOs without eyeglasses* [c]			
		Estimate (t-stat.)	Estimate (t-stat.)	Estimate (t-stat.)	Estimate (t-stat.)
Panel C: Additional analyses using a reduced sample excluding CFOs with eyeglasses (DV = *AUDIT_FEE*)					
TRUSTWORTHINESS_CFO	−	−0.041*** (−3.03)	−0.103*** (−4.94)		
*TRUSTWORTHINESS_CFO*AUTENURE*	+		0.004*** (4.14)		
$EYEBROW_{rstd}$*_CFO*	−			−0.026*** (−3.20)	−0.043*** (−3.43)
$EYEBROW_{rstd}$*_CFO*AUTENURE*	+				0.001* (1.91)
N		3473	3473	3473	3473
Adj-R^2		0.958	0.958	0.958	0.958

[a] *SOCIAL_CAPITAL* is county-level social capital defined following Rupasingha et al. (2006). $EYEBROW_{rstd}$*_CFO* is the standardized value of reversed value of *EYEBROW* for CFOs. Variables are defined in Appendix C.
[b] All continuous variables are winsorized at the 1st and 99th percentiles.
[c] T-statistics are reported and ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels, respectively. Intercept, control variables, intercept, firm fixed effects, year fixed effects, and CFOs' age-group fixed effects are controlled but not reported for brevity. Standard errors are clustered at the auditor-year level.

5. Conclusion

By using machine learning-based facial-feature-point detection techniques, which are well-developed in the field of computer science (Dalal and Triggs, 2005; Kazemi and Sullivan, 2014; Sagonas et al., 2013), we construct a novel database of executives' facial trustworthiness for U.S. listed companies and investigate whether and how auditors incorporate the facial trustworthiness of client firm executives into their audit pricing decisions. Our results suggest that auditors tend to charge an audit fee premium to firms with untrustworthy-looking CFOs, although the impact of CFOs' facial trustworthiness on audit fee is weakened as auditor tenure increases. To our knowledge, our study is the first to provide large-sample, systematic evidence on the correlation of CFOs' facial trustworthiness with audit fees.

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Appendix A. Supplementary data

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