

# Board characteristics and negative disclosure tone

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## Abstract

**Purpose** – Negative disclosure tone in 10-K annual reports has economic consequences, yet relatively little is known about how it is generated. Boards of directors play an important governance role with respect to mandatory disclosures and personally sign off on Form 10-K, leading us to expect directors to influence financial reporting narratives. This study investigates whether the negative tone of firms' narrative annual report disclosures is associated with the human and social capital of its board of directors.

**Design/methodology/approach** – Multivariate regression analyses of negative disclosure tone (Loughran and McDonald, 2011) on board members' average age, gender, education, financial expertise and turnover is performed. A host of supplemental tests to corroborate our primary analysis, including using Sarbanes-Oxley's financial expert mandate as an exogenous shock to board composition, impact threshold for a confounding variable, placebo analysis, portfolio tests of more and less negative disclosing firms and portfolio tests of "loud" versus "quiet" boards are conducted.

**Findings** – Evidence that directors' gender, education, financial expertise and board turnover are associated with more negative disclosure tone, while directors' age is associated with less negative disclosure tone is found. The study also looked within the board to differentiate whether these findings are driven by characteristics of inside directors or outside directors serving on the audit committee, or both, as these are the specific groups of directors we would expect to play a role in disclosure. It was found that negative disclosure tone is associated with a lower bid-ask spread, so this study interpreted more negative tone as containing more descriptive information.

**Originality/value** – This study helps decode the "black box" of annual report disclosure tone, which Loughran and McDonald (2011) show has important economic implications. The results help inform stakeholders such as policymakers, executives and capital market participants as to how board member traits are associated with disclosure. The findings are particularly important as this study bears witness to the increasing prominence of gender/diversity mandates (e.g. Israel, Norway, California) and financial expertise mandates (e.g. Sarbanes-Oxley).

**Keywords** Board of directors, Annual report, 10-K, Tone, Narrative disclosure

**Paper type** Research paper

## 1. Introduction

We evaluate the associations between corporate director characteristics and the negativity of disclosure tone in the narratives of mandatory Form 10-K reports. Prior literature on negative disclosure tone indicates that it has a relatively large degree of information content relative to



other types of tone (e.g. [Loughran and McDonald, 2011](#)). We argue that negative tone measures the descriptiveness of firms' narratives.

Narrative disclosures allow firms to place quantitative disclosures in context and provide incremental information. Although earnings and other news releases occur prior to the 10-K, the additional context offered by the annual report is valuable to market participants. Specifically, [Loughran and McDonald \(2011\)](#) show that the tone of annual reports is associated with firms' future financial performance, volatility, fraud allegations and material weaknesses in internal controls, suggesting that there is valuable information in annual reports incremental to that found in earnings announcements. Recent evidence indicates that even automated trading uses linguistic tone [\[1\]](#). Thus, annual report tone has economic consequences, yet how it is generated remains somewhat of a black box.

Large-sample studies on disclosure tone focus primarily on the economic consequences of tone and/or style in financial reports, suggesting that tone and/or style matters and provides additional information in addition to quantitative information [\[2\]](#). In addition, while neoclassical economic theory contends that individuals are interchangeable rational economic agents, behavioral finance research demonstrates that individuals' characteristics matter. This strand of literature tends to focus on the influence of top executives, consistent with upper echelons theory in which executive characteristics affect firm-level decisions [\[3\]](#). In accounting and finance, a closely related concept known as "tone at the top" suggests that managers adopt unique disclosure styles and that managers' disclosure choices interrelate with investor sentiment [\[4\]](#).

The interaction of key individuals with disclosure tone is particularly interesting considering that textual disclosures offer greater discretion than numeric reports ([Tucker, 2015](#)). [Shiller \(2017, p. 968\)](#) highlights the relative lack of research on narratives in economics and finance and implies the relevance of our research question, stating "each narrative originates in the mind of a single individual." Thus, individuals who participate in the writing and editing process likely impart their characteristics on the firm's disclosure.

Corporate boards are emerging as active organizational leaders rather than passive monitors ([Charan et al., 2013](#)). Our study builds upon this literature by investigating the role of corporate boards of directors in preparing the narratives of mandatory 10-K disclosures, which differ from voluntary disclosures insofar as they are audited and required to follow SEC regulations. The board of directors is directly responsible for 10-K filings because SEC regulations require at least a majority of the directors to sign them [\[5\]](#). Typically, corporate executives, general counsel and controllers play a large role in writing annual reports, and some of these individuals (particularly CEOs) serve as inside directors who are directly involved in the writing of the 10-K [\[6\]](#). Likewise, outside directors play an advisory and gatekeeping role ([Agrawal and Chadha, 2005](#)) that includes reviewing multiple drafts of annual reports, making comments and suggesting revisions thereon. In particular, the audit committee is directly involved in this process through their oversight of the financial reporting process, including the preparation of annual reports ([Habib and Bhuiyan, 2016](#)). Beyond any of these direct roles, the board's role in the selection of the firm's officers, auditor and general counsel, for example, conveys an indirect effect of the board on the firm's annual report.

We expect board members' human and social capital to be associated with the negative tone of annual reports. We proxy for human and social capital using directors' average age, percentage of male directors, average education, chief financial officer (CFO) experience and turnover rate. We compute these characteristics for the board as a whole, and separately for inside director(s) and outside directors on the audit committee [\[7\]](#). We measure negative disclosure tone as the ratio of negative words to total words ([Loughran and McDonald, 2011](#)). Our sample consists of SEC registrants between 2003 and 2014 (the period for which we have BoardEx data) with board characteristics from BoardEx and control variables from Compustat, yielding a main sample of 26,551 firm-year observations. We estimate OLS regressions of disclosure tone on board member characteristics, control variables, year fixed effects and industry or firm fixed effects.

First, our main results yield evidence that directors' average age is associated with less negative disclosure tone. Inside directors drive this result; meanwhile, we find no evidence that audit committee members' age is associated with negative tone. Second, we find that male directors are associated with more negative tone. This result is driven primarily by audit committee members. These results suggest that shared perspectives might amplify contextual cues in disclosure language, with implications for policy initiatives aimed at increasing director diversity. Third, we find that board members' knowledge-related human capital is associated with more negative disclosure tone. Specifically, board members' overall education is positively associated with more negative tone, suggesting that highly educated board members might have greater ability and/or confidence to provide descriptive information. This finding appears strongly in inside directors. We also find evidence that audit committee members with CFO experience are associated with incrementally more negative tone when using industry fixed effects, suggesting that directors' knowledge-based human capital relates positively to the firm's use of descriptive language. However, this result vanishes using firm fixed effects, suggesting it may result from a phenomenon wherein firms that tend to produce negative tone also tend to select directors with CFO experience. These results speak to policy initiatives that require director expertise, such as the audit committee financial expert requirement under Sarbanes-Oxley. Fourth, we find that board turnover is associated with more negative tone. This result holds for both inside directors and the audit committee. The evidence is consistent with our expectation that new board members bring new disclosure styles to the board. Altogether, we conclude that director characteristics are associated with negative disclosure tone.

We address the relation between firm performance and turnover in supplemental analysis and find that firm performance does not affect our turnover results. We further subject our main results to a slate of supplemental analyses, including plausibly exogenous board changes during Sarbanes-Oxley Act implementation, impact threshold for a confounding variable (ITCV) analysis, controls for stable boards and portfolio analysis of boards that we expect to produce relatively high and relatively low negative tone. Throughout these analyses, our overall conclusion that directors' human and social capital is associated with negative disclosure tone remains unchanged. Nonetheless, we emphasize that our findings are associations and not necessarily causal relations.

Firms can use disclosure tone for impression management and/or information richness. If impression management is the primary motivation (Garcia Osma and Guillamon-Saorin, 2011), tone should increase information asymmetry (i.e. false information) or have no effect on it (i.e. noise); meanwhile, if information richness is the motivation, tone should reduce information asymmetry. To discern the *average* effect in our sample, we regress future bid-ask spread, a proxy for information asymmetry, on negative tone. We find that negative tone is negatively associated with future bid-ask spread. Hence, we interpret more negative tone as providing *richer information and context, on average*.

Our study contributes to the literature by providing initial evidence of an important role the board of directors plays in advising and monitoring the firm. Our results suggest that board members help shape financial statement narratives, which is meaningful given prior research that reports on the economic consequences of disclosure tone and/or style [8]. This study also contributes to literature on the influence of *managers* (i.e. inside directors) on firms' disclosure choices and style [9], complementing and extending it by examining the role of *the board*. We show that the traits of inside directors (i.e. managers) that relate to disclosure can also manifest in outside directors serving on the audit committee, thus expanding the set of individuals associated with disclosure.

Finally, our study relates to the line of research documenting the effects of board characteristics on firm outcomes in general (e.g. Ahern and Dittmar, 2012; Feng and Johansson, 2019). These studies inform corporate boards, shareholders, search agencies

and other parties looking to elect and retain directors who will benefit the firm across multiple dimensions. Our findings merit consideration in the context of mandates that affect director characteristics, such as gender/diversity mandates (e.g. Israel, Norway, California) or financial expertise mandates (e.g. Sarbanes-Oxley).

## 2. Background and hypothesis development

### 2.1 Corporate disclosure choices and disclosure tone

Early disclosure literature predicts that information problems in capital markets are non-existent (Grossman, 1981; Milgrom, 1981) because, under the classic unraveling result, firms are motivated to disclose all relevant information. These disclosure models generally assume that disclosures are costless and investors know that a firm has information. Verrecchia (1983) and Dye (1985) discard such assumptions in pursuit of a theoretical foundation for research on corporate disclosure. The growing body of empirical research in the area has provided evidence of a wide array of determinants of disclosure choices (Beyer *et al.*, 2010). Firm size is a common determinant of disclosure choices (e.g. Brammer and Pavelin, 2006; Lang and Lundholm, 1993; Miihkinen, 2012). Other documented drivers for disclosure choices include, for example, profitability (e.g. Prencipe, 2004), external financing needs (e.g. Lang and Lundholm, 1993) and risk characteristics such as bankruptcy risk, business risk and systematic risk (Dobler *et al.*, 2011; Jorgensen and Kirschenheiter, 2003; Linsley and Shrivies, 2006; Miihkinen, 2012). There is also evidence of a limited set of corporate governance factors that influence disclosure. For example, Xie *et al.* (2003) conclude that board and audit committee characteristics may constrain managers' propensity to manage earnings. Gul and Leung (2004) suggest that CEO duality is related to lower levels of voluntary corporate disclosures, although this association is moderated by the expertise of the outside directors.

Economic consequences of disclosure and disclosure tone are clearly identified in prior research. Brown and Tucker (2011) study the informativeness of firms' management discussion and analysis (MD&A) disclosures within Form 10-K and find that changes in disclosures are positively related to economic changes. However, they also find that despite the increasing trend in MD&A length over time, the degree to which MD&A changes from year to year is decreasing, indicative of a decline in the usefulness of MD&A. Choi (2020) finds an association between spin-off prospectus MD&A tone and long-term returns.

Loughran and McDonald (2011) conclude that MD&A does not provide superior information compared to 10-K reports taken in their entirety. Their analyses of 10-Ks provide evidence that negativity as measured by the Harvard Psychological Dictionary is not associated with 10-K filing returns, but they create a new dictionary that is able to detect such a relation. They also develop five additional dictionaries (positive, uncertain, litigious, strong modal and weak modal) and provide evidence that these lists can gauge disclosure tone [10].

Despite many meaningful studies on disclosure tone, research on the influence of corporate leadership on tone is limited. Tucker (2015) states that managers have greater influence over disclosure tone than over numeric reporting. Davis *et al.* (2015) find that manager optimism is associated with the tone of earnings conference calls. Patelli and Pedrini (2015) suggest that both boards of directors and chief executive officers determine disclosure tone. They argue that the tone of the CEO letters is one fundamental way for directors to enact leadership. They also provide empirical evidence that aggressive financial reporting is positively associated with language that is resolute, complex and not engaging. Bozzolan *et al.* (2015) report that Fiat Group managers use disclosure tone strategically to implement different disclosure styles to communicate with various stakeholders (i.e. local press, international press and financial analysts) at different levels of salience and optimism. Thus, existing literature implies that management and directors help set disclosure tone.

However, to our knowledge, no study has yet conducted a detailed analysis of the role of the board of directors in setting disclosure tone. We pursue this research question in the context of certain board characteristics, which we discuss in greater detail below.

### *2.2 Board member experiential human capital and risk aversion*

The social psychology literature indicates that individuals' characteristics influence their language choices. For example, [Sanford \(1942\)](#), [Pennebaker and King \(1999\)](#), [Fast and Funder \(2008\)](#) and [Hirsh and Peterson \(2009\)](#) find that personality traits are expressed in language. [Mehl et al. \(2006\)](#) link gender to language. Thus, we expect linguistic style to relate to director traits.

Prior literature argues that risk aversion increases with age ([Vroom and Pahl, 1971](#)). Older individuals are also, on average, less tolerant of uncertainty ([Jost et al., 2003](#)). Honesty and humility increase dramatically with age ([Ashton and Lee, 2016](#)). Older managers are considered more sensible and prudent, whereas younger and more inexperienced managers are prone to take greater risks ([Menkhoff et al., 2006](#)). Further, the experience gained by older directors could be helpful in advisory and monitoring capacities.

We expect that older board members' risk aversion and prudence could result in more moderate tone in which negative descriptions are rarer. However, their honesty and humility could alternatively lead to more truthful disclosure. Whether age affects disclosure tone is uncertain for several reasons. Intellectual curiosity and information processing ability decline with age ([Roberts et al., 2006](#)), contributing to an increase in conservatism; however, older individuals use experience to effectively overcome their slower information-processing ability. Older board members who are close to retirement may be prone to moral hazard problems; for example, they might have already established status and lack motivation to affect the firm's disclosure choices. Similarly, there is evidence that managerial turnover is more performance-sensitive for younger managers ([Chevalier and Ellison, 1996](#)), suggesting the reduced threat of termination and perhaps lower motivation for older board members. These competing predictions lead us to a non-directional hypothesis:

*H1. Board member age is associated with negative disclosure tone.*

### *2.3 Board member social capital (gender)*

In general, corporate boards are disproportionately comprised of male directors. Corporate boards are slowly becoming more gender diverse ([Hyland and Marcellino, 2001](#)), as females made up less than 5% of directors in 1984 ([Bilimoria and Piderit, 1994](#)) but comprise nearly 9% of directors in our sample. The board's gender composition has the potential to affect board decisions (e.g. [Ye et al., 2019](#)), and we evaluate its association with negative annual report tone.

While psychological studies have disproven many perceived cognitive differences between the sexes (e.g. [Spelke, 2005](#)), differences may arise through situational or experiential means. For instance, [Barber and Odean \(2001\)](#) suggest that men are generally more overconfident than women in a financial context, which perhaps contributes to the lower risk ([Faccio et al., 2016](#)) and acquisitiveness ([Huang and Kisgen, 2013](#)) observed in firms with female CEOs. However, male director overconfidence might not always produce more descriptive tone. Instead, it may reduce disclosure of negative events, leading to less negative tone.

Specific to the director context, [Bilimoria and Piderit \(1994\)](#) indicate that female directors experience bias that could limit their input. [Ahern and Dittmar \(2012\)](#) note that female board members tend to be younger and less experienced, which could limit their voice in the firm

relative to older, more experienced male directors. These studies imply that female board members might not materially affect disclosure tone. Notwithstanding, female directors bring a range of perspectives, experiences and skillsets to the board (Mallin and Michelon, 2011), reducing groupthink. Lacking a clear directional prediction, we form a nondirectional hypothesis:

*H2. Male gender is associated with negative disclosure tone.*

#### *2.4 Board members' knowledge-based human capital*

The competence of the board is a function of directors' knowledge of the firm, their general managerial capability and human capital (Boyatzis *et al.*, 2002). Board members' knowledge-based human capital could positively affect negative disclosure tone for two main reasons. First, board member knowledge is a source of competitive advantage (Khanna *et al.*, 2014). Martikainen *et al.* (2015) demonstrate that the breadth of risk disclosure coverage is negatively associated with directors' human capital, suggesting more focused risk discussions consistent with superior judgment. To the extent that managers and fellow directors recognize these advantages, directors with significant knowledge will be more influential as their peers value their input. Second, education is associated with stronger writing skills throughout one's adult life (Kaufman *et al.*, 2009). We expect that the competence and writing skills associated with knowledge-based human capital might manifest in the form of richer language, i.e. more negative tone. This association could occur either through direct involvement in actual writing or through the reviewing of multiple drafts and provision of feedback.

However, since specific areas of expertise typically vary dramatically within a board, human capital would cause less descriptive language when individual directors fail to communicate their respective expertise to the rest of the board. Further, directors' individual areas of expertise may have little to do with the items disclosed in annual reports. We would not expect to find a relation if knowledge causes overanalysis, leading to weaker language. Further, if part of the competitive advantage attributable to human capital is in protecting trade secrets, disclosures may instead be more opaque and therefore less tonal in the presence of directors with significant human capital. Our prediction is nondirectional:

*H3. Board members' knowledge-based human capital is associated with negative disclosure tone.*

#### *2.5 Board member turnover*

Board member turnover is likely to affect disclosure tone because, following turnover, new directors are likely to join the board of directors. Their fresh perspectives and new experience should change the human capital balance in boards and alter the collective makeup of the board. For instance, Hambrick *et al.* (1993) show that executives' tenure in the organization is positively related to commitment to the status quo, suggesting that board member tenure would be associated with less negative disclosure tone. Therefore, we expect that the addition of outsiders will also prompt a reevaluation of boilerplate disclosures (Brown and Tucker, 2011), making disclosures more negative. This leads to our fourth hypothesis:

*H4. Board member turnover is associated with more negative disclosure tone.*

Despite our expectation, it is not assured that board turnover is associated with negative disclosure tone in all firms. New board members' contributions may be discounted relative to those of established, trusted directors. New board members also lack familiarity with their firm and thus may produce more boilerplate (i.e. less descriptive) disclosures.



### 3. Research design

#### 3.1 Disclosure tone in large sample studies

As described in [Li \(2010b\)](#), two main streams for analyzing disclosure tone in large sample studies prevail. The first approach builds on the existing literature in linguistics and psychology. In this approach, a researcher uses a manually created dictionary that (s)he predicts to be associated with a particular disclosure sentiment such as negativity. Dictionaries refer to predefined word lists. The appearance of these words in financial reports is then automatically analyzed. This approach has been used in many studies (e.g. [Larcker and Zakolyukina, 2012](#); [Loughran and McDonald, 2011](#); [Pennebaker et al., 2007](#); [Tetlock, 2007](#); [Twedt and Rees, 2012](#)). Predefined word lists are replicable and their effects have been scientifically demonstrated. Yet context is important to consider, as words relevant to financial disclosures may have different meanings or importance in other contexts. [Loughran and McDonald \(2011\)](#) show in a large sample of 10-Ks that almost three-fourths of the words identified as negative by Harvard Dictionary are irrelevant in a financial context, leading them to develop alternative word lists that better capture tone in financial texts. We follow [Loughran and McDonald \(2011\)](#) and use their financial-text-specific tone measure for negativity [11].

The second approach employs statistical methods to let the data determine which words are relevant. This method originated in computer science but it has been used to analyze the tone of business texts ([Antweiler and Frank, 2004](#); [Cecchini et al., 2010](#); [Goel et al., 2010](#); [Humphreys et al., 2011](#); [Li, 2010a](#)). Data-generated word lists may permit higher coverage; however, they can be criticized for a failure to specifically address different areas of disclosure tone, and it can be unclear what their word lists capture. Sometimes both predefined word lists and data-generated word lists are used in parallel ([Goel et al., 2010](#); [Humphreys et al., 2011](#)). Since we are interested in identifying relations between specific board characteristics and specific aspects of tone, we employ the first approach and use [Loughran and McDonald's \(2011\)](#) financial-text-specific tone measures.

#### 3.2 Measuring negative disclosure tone

We proxy for the descriptiveness of disclosure tone using a measure of negative tone in firms' annual 10-K reports computed by [Loughran and McDonald \(2011\)](#). The [Loughran and McDonald \(2011\)](#) dictionary of negative words contains a list of words and word combinations that normally signify negativity in a financial context (see [Equation 1](#)). We focus on negative tone because it has a relatively large degree of information content relative to other types of tone ([Loughran and McDonald, 2011](#)) [12]. Negative tone is equal to the number of specific tonal words in an annual filing divided by the number of total words in that filing, which we use as our dependent variable:

$$\text{Negative\_tone} = \text{ratio of negative words to total words in the firm's annual report} \\ (\text{e.g. loss, bankruptcy, indebtedness, felony, misstated, discontinued, expire, unable}). \quad (1)$$

We multiply negative tone by 10,000 to improve readability of the tables.

#### 3.3 Independent variables

We compute board characteristics from BoardEx data both at the aggregate level and separated into inside directors and the audit committee. Outside directors are board members who are not employees of the company. Inside directors are full-time employees of the company who are on its board. The CEO is often the only inside director. With respect to our

variables, we add the suffix *Inside* to describe inside (“executive”) directors, and the suffix *ACOM* to describe outside directors on the audit committee.

We use age (*Age*) to proxy for risk aversion and experience following Vroom and Pahl (1971) and Menkhoff *et al.* (2006). *Age\_Inside* and *Age\_ACOM* measure the average age of inside directors and the audit committee, respectively. We use the percentage of males (*Gender*) to measure gender. *Gender\_Inside* and *Gender\_ACOM* measure the percentage of males on the board in each group. We use educational attainment (*Edu*) to proxy for human capital following Boyatzis *et al.* (2002), Kaufman *et al.* (2009) and Khanna *et al.* (2014), among others. *Edu\_Inside* and *Edu\_ACOM* measure the average number of educational qualifications (i.e. degrees held) in each board member group. *CFO\_Exp\_ACOM* captures an audit committee member’s functional experience in a CFO or similar role (i.e. typically at a different firm). We measure overall director turnover using *Turnover* to capture the turnover rate of the board in the preceding fiscal year, and separately at both director levels (*Turnover\_Inside*, *Turnover\_ACOM*).

The control variables consist of firm fundamentals that we expect to capture differences in firms’ disclosure choices according to previous disclosure literature. Recognizing that many performance, risk and governance attributes determine negative disclosure tone, we include a large vector of control variables [13]. *Size* is the natural logarithm of the firm’s total assets. Larger firm size is consistently linked in more intensive corporate disclosures (e.g. Lang and Lundholm, 1993; Brammer and Pavelin, 2006). One potential reason is that large firms are more vulnerable to political costs, increasing demand for disclosure (Watts and Zimmerman, 1978). *ROA* measures firm profitability as return on assets. Prior evidence on the impact of profitability on disclosures is mixed (Leuz, 2000; Miihkinen, 2012; Prencipe, 2004; Troberg *et al.*, 2010).

We also include more specific control variables for firm risk. *StdevROA* is the five-year standard deviation of return on assets, which captures variation in firms’ business risk. *Leverage* measures the firm’s financial leverage and bankruptcy risk as the ratio of long-term debt to total assets. *Loss* is a binary variable indicating negative net income in the 10-K filing year, helping to account for non-linearity in firm performance. *BTM* is the book-to-market ratio, which measures growth prospects. It is the ratio of total book value of common equity to year-end market capitalization.

Governance controls include variables that potentially impact disclosure choices and negative tone. The incumbent auditor plays a role in guiding and supervising annual reports. Auditor expertise and reputational risk are positively associated with audit firm size (e.g. Craswell *et al.*, 1995), so we include a control for auditor size, *Big\_N*. *Big\_N* is a dummy variable equal to 1 if a firm is audited by a Big N auditor, and zero otherwise. *Board\_Size* contains the total number of board members in the corporate board. *Outside\_ratio* is the ratio of outside board members to total number of board members in the corporate board. *StdevBoard\_Age* is the standard deviation of the age of the reigning board members. *Firm\_Age* captures the firm life cycle as measured by the age of the firm. Finally, we add information risk controls. *Earnings\_quality* is the absolute value of performance-adjusted discretionary accruals (Dechow *et al.*, 1995), and *Spread* is the 12-month average bid-ask spread preceding the end of the fiscal year. All variables represent fiscal year-end values except turnover-based measures, which we compute using the starting and finishing percentages of board members at the beginning of the fiscal year. Complete variable definitions are provided in the Appendix.

### 3.4 Regression model

We test our hypotheses using ordinary least squares regression analysis [14]. The dependent variable is *Negative\_tone*. We include four blocks of independent variables as



explanatory variables. The first block is board characteristics, pursuant to our hypotheses. The second through fourth blocks are control variables for firm fundamentals, risk and governance as described in [Section 3.3](#).

The main tests in the paper involve estimation of the following multivariate regression for negative tone in disclosure.  $\beta$  represent the regression parameters to be estimated,  $e$  represents the regression residual, subscripts  $i$  and  $t$  refer to the firm and year, respectively:

$$\begin{aligned} \text{Negative\_Tone}_{it} = & \beta_0 + \sum_c \beta_c \text{board characteristics}_{it} + \sum_f \beta_f \text{firm fundamentals}_{it} \\ & + \sum_g \beta_g \text{governance controls}_{it} + \sum_r \beta_r \text{information risk}_{it} + e_{it} \quad (2) \end{aligned}$$

We include year fixed effects in the model to capture the impact of macroeconomic and regulatory factors that may cause systematic time series variation in firms' negative disclosure tone. We include industry fixed effects to control for disclosure trends and effects caused by the different operating environments of various industries. We compute regression coefficients using heteroscedasticity-corrected standard errors clustered by firm and year. Alternatively, we substitute firm fixed effects in place of industry fixed effects [\[15\]](#). We believe that this is one way to improve identification and strive toward exogeneity in our setting because we can isolate stationary firm characteristics, and thus examine only deviations from those mean values. Finally, we winsorize the continuous variables at the 1% and 99% levels in the main tests to reduce the influence of outliers on our results.

## 4. Data, sample and descriptive statistics

### 4.1 Data and sample selection

We analyze the board characteristics and tone of SEC registrants' 10-Ks from years 2003 through 2014. [Table 1](#) shows our sample selection process. We retrieve data on board characteristics from *BoardEx*. The database contains biographical information on most board members and senior executives in North America. We merge the board characteristics relevant for this study with BoardEx CIK-code file (file A), leaving 73,103 observations. We obtain values for negative tone from Bill McDonald's website, which contains data for firms' 1994–2014 annual reports (10-K and 10-K405). Merging the initial file with Compustat annual data yields 65,142 observations (file B).

Next, we merge file A with file B using CIK codes, producing 47,377 observations. We exclude fiscal year 2002 as a pre-SOX year and omit financial institutions (SIC 6000–6999) as in prior literature, leaving 35,324 observations [\[16\]](#). We also exclude 1,653 observations from utility companies, whose regulated environments may produce different disclosure ([Bodnaruk et al., 2015](#); [Ertugrul et al., 2017](#)). We exclude amended 10-Ks, 10 K-SBs and firm-years whose 10-K filings include fewer than 2000 words in line with previous studies (e.g. [Loughran and McDonald, 2011](#); [Law and Mills, 2015](#)). Our board-level sample consists of 26,551 observations. When we compute measures for inside directors and audit committee members separately, we have incomplete data for some of these observations, yielding a within-board sample of 23,546 observations.

### 4.2 Descriptive statistics

[Table 2](#) provides descriptive statistics for our variables. The mean value of *Negative\_tone* is 174.492. This value corresponds to percentage of negative tonal content multiplied by 10,000; in other words, about 1.74% of the words in firms' annual reports contain negative tone as specified in the [Loughran and MacDonald \(2011\)](#) dictionary. There is meaningful variation

Sample selection criteria	Lost observations	Remaining observations
<i>Phase 1 (file A)</i>		
BoardEx data for years 1999–2014		80,335
Merging BoardEx data with BoardEx CIK-code file = file A	7,232	73,103
<i>Phase 2 (file B)</i>		
Compustat annual data for years 2002–2014		145,021
Negativity measures for the SEC annual filings (10-K and 10-K405) for fiscal year end dates 2002–2014	39,940	105,681
Negativity measures for 10-K filings after removal of late filings	7	105,674
Merging Compustat annual data with tone data = file B	40,532	65,142
<i>Phase 3 (final sample)</i>		
Merging file A with file B		47,377
Exclusions of fiscal year 2002	1,795	45,582
Exclusion of financial institutions (sic 6)	10,258	35,324
Exclusion of utility firms (sic 4900–4999)	1,653	33,671
Exclusion of firm-years whose 10-K filing includes less than 2000 words	4	33,667
Exclusion of firm-years that do not have existing board size in the database	58	33,609
Exclusion of firm-years that have executive directors in the audit committee	337	33,272
Lost observations because of missing values for other independent variables (board level)	6,709	26,551
Lost observations because of missing values for other independent variables (within-board levels)	5,880	23,546

**Note(s):** This table reports our sample selection process. Our final sample consists of 26,551 observations at the board level and 23,546 observations at the within-board level

**Table 1.**  
Sample selection

in the tone of the reports as the maximum value of *Negative\_tone* is 281.322 (2.8%) whereas the minimum value is 52.308 (0.5%). The minimum *Negative\_tone* indicates that the least negative disclosure in our sample still averaged more than 5 negative words in every 1,000 words of text (in practical terms, 1,000 words is approximately 2 pages of single-spaced text). Therefore, negative disclosure tone is present in meaningful amounts throughout our sample.

The mean age of inside directors is 55.2 years. Minimum and maximum ages are 37 years and 74 years, respectively. Audit committee members tend to be slightly older with a mean age of over 60 years. Minimum and maximum ages are 44 years and 74.5 years, respectively.

As expected, male directors are prevalent in our sample. We report the following mean values for *Gender*, *Gender\_Inside* and *Gender\_ACOM*: 0.820, 0.961 and 0.836, respectively, meaning that on average, over 80% of directors are male regardless of board level. However, there is variability as can be seen from the minimum value of *Gender* at 0.286.

The mean of *Edu* is 2.197, meaning that the average director has approximately two educational qualifications. In real-world terms, one might think of this as having undergraduate and master's degrees. Further, 18.3% of audit committee members have CFO experience.

The overall turnover rate (*Turnover*) is 17.6% in our sample and is zero for over a quarter of the sample. The means for *Turnover\_Inside* and *Turnover\_ACOM* are 0.174 and 0.240, respectively, indicating that the aggregate change of insiders (audit committee) is about 17.4% (24.0) during the fiscal year. This suggests that, on average, the audit

**Table 2.**  
Descriptive statistics

(Board level, $n = 26,551$ )		$n$	Mean	Median	Upper quartile (75%)	Lower quartile (25%)	Standard deviation	Maximum	Minimum
	<i>Negative_tone</i>	26,551	174.492	172.964	199.156	147.738	38.226	281.322	52.308
	<i>Age</i>	26,551	59.591	59.833	62.800	56.500	4.820	71.333	44.500
	<i>Gender</i>	26,551	0.820	0.857	1.000	0.727	0.159	1.000	0.286
	<i>Edu</i>	26,551	2.197	2.167	2.444	2.000	0.410	3.333	1.000
	<i>CFQ_Exp_ACOM</i>	26,551	0.183	0.200	0.333	0.000	0.204	0.667	0.000
	<i>Turnover</i>	26,551	0.176	0.111	0.250	0.000	0.235	1.467	0.000
	<i>Size</i>	26,551	6.151	6.113	7.507	4.702	1.987	11.629	-0.019
	<i>ROA</i>	26,551	0.011	0.069	0.125	-0.008	0.266	0.427	-6.500
	<i>SidevROA</i>	26,551	0.092	0.045	0.092	0.023	0.263	7.407	0.001
	<i>Leverage</i>	26,551	0.170	0.105	0.268	0.000	0.209	1.352	0.000
	<i>Loss</i>	26,551	0.337	0.000	1.000	0.000	0.473	1.000	0.000
	<i>BTM</i>	26,551	0.519	0.429	0.707	0.240	0.753	5.307	-11.680
	<i>Big_N</i>	26,551	0.739	1.000	1.000	1.000	0.427	1.000	0.000
	<i>Board_Size</i>	26,551	8.068	8.000	9.000	7.000	2.171	17.000	2.000
	<i>Outside_ratio</i>	26,551	0.815	0.857	0.889	0.769	0.096	1.000	0.333
	<i>SidevBoard_Age</i>	26,551	8.216	7.937	9.935	6.285	2.786	16.276	2.121
	<i>Firm_Age</i>	26,551	20.887	16.000	27.000	10.000	14.718	64.000	2.000
	<i>Earnings_quality</i>	26,551	0.957	0.414	0.994	0.176	1.819	24.373	0.006
	<i>Spread</i>	26,551	0.705	0.210	0.679	0.094	1.230	7.307	-0.002
	<i>SOX</i>	26,551	0.063	0.000	0.000	0.000	0.242	1.000	0.000
(Within-board level, $n = 23,546$ )									
	<i>Negative_tone</i>	23,546	175.057	173.440	199.647	148.232	38.208	281.322	52.308
	<i>Age_Inside</i>	23,546	55.199	55.000	60.000	50.000	7.256	74.000	37.000
	<i>Age_ACOM</i>	23,546	60.684	61.000	64.500	57.000	5.658	74.500	44.000
	<i>Gender_Inside</i>	23,546	0.961	1.000	1.000	1.000	0.172	1.000	0.000
	<i>Gender_ACOM</i>	23,546	0.836	1.000	1.000	0.667	0.202	1.000	0.250
	<i>Edu_Inside</i>	23,546	2.015	2.000	2.500	1.500	0.815	5.000	1.000

(Within-board level, $n = 23,546$ )		Mean	Median	Upper quartile (75%)	Lower quartile (25%)	Standard deviation	Maximum	Minimum
$n$								
<i>Edu_ACOM</i>	23,546	2.267	2.250	2.667	2.000	0.538	3.750	1.000
<i>CFO_Exp_ACOM</i>	23,546	0.185	0.200	0.333	0.000	0.204	0.667	0.000
<i>Turnover_Inside</i>	23,546	0.174	0.000	0.000	0.000	0.481	2.000	0.000
<i>Turnover_ACOM</i>	23,546	0.240	0.000	0.333	0.000	0.368	2.000	0.000
<i>Size</i>	23,546	6.251	6.218	7.608	4.808	1.998	11.629	-0.019
<i>ROA</i>	23,546	0.011	0.070	0.125	-0.006	0.270	0.427	-6.500
<i>StdevROA</i>	23,546	0.092	0.044	0.092	0.022	0.266	7.407	0.001
<i>Leverage</i>	23,546	0.171	0.110	0.268	0.000	0.209	1.352	0.000
<i>Loss</i>	23,546	0.333	0.000	1.000	0.000	0.471	1.000	0.000
<i>BTM</i>	23,546	0.503	0.421	0.690	0.235	0.731	5.307	-11.680
<i>Big_N</i>	23,546	0.778	1.000	1.000	1.000	0.416	1.000	0.000
<i>Board_Size</i>	23,546	8.177	8.000	9.000	7.000	2.173	17.000	3.000
<i>Outside_ratio</i>	23,546	0.812	0.846	0.875	0.750	0.094	1.000	0.333
<i>StdevBoard_Age</i>	23,546	8.199	7.933	9.850	6.348	2.679	16.276	2.121
<i>Firm_Age</i>	23,546	20.987	16.000	27.000	10.000	14.898	64.000	2.000
<i>Earnings_quality</i>	23,546	0.952	0.415	0.995	0.176	1.793	24.373	0.006
<i>Spread</i>	23,546	0.651	0.195	0.597	0.089	1.173	7.307	-0.002
<i>SOX</i>	23,546	0.065	0.000	0.000	0.000	0.246	1.000	0.000

**Note(s):** This table reports descriptive statistics for the negative tone and board characteristics at the aggregate level and within the board. Variables are defined in the [Appendix](#)

Table 2.

committee experiences more turnover than inside directors. Naturally, since there are typically only one or two inside directors on the board, their turnover is less frequent than outside directors.

In terms of control variables, the distributions of most variables are approximately symmetrically distributed as the mean and median values are close to each other. However, the means and medians of *ROA*, *StdevROA*, *Leverage* and *Firm\_Age* differ meaningfully, indicative of profitable, risky, older firms causing some skewness. About a third of our observations are loss years, and in supplemental analysis, we explore the relation between tone and board characteristics separately under profit and loss conditions (Schleicher and Walker, 2010).

## 5. Empirical results

### 5.1 Univariate analyses

We present a correlation matrix of the variables in Table 3. At the aggregate level, *Age* is negatively and significantly correlated with negative tone. *Gender*, *Edu* *CFO\_Exp\_ACOM* and *Turnover* are positively and significantly correlated with negative tone. The correlation coefficients between negative tone and the test variables suggest that tone varies with board characteristics.

### 5.2 Multivariate analyses

Table 4 reports regression results from OLS regressions of annual report negative tone on board characteristics and control variables. Column 1 presents results using industry and year fixed effects, while column 2 presents results using firm and year fixed effects. In column 1, *Age* is negatively and statistically significantly associated with negative tone, suggesting that older directors use less descriptive language consistent with H1. However, we find no relation using firm fixed effects in column 2. Meanwhile, *Gender* and *Edu* yield positive associations with negative tone in either fixed effects structure consistent with H2 and H3 respectively. This suggests that boards with more male directors use more descriptive language, consistent with shared perspectives amplifying tone. The positive coefficient estimates on *Edu* suggest that more educated directors write more descriptively. Likewise, the positive coefficient estimate on *CFO\_Exp\_ACOM* in column 1 regressions suggests that audit committee members with CFO experience use more negative tonal language consistent with H3; however, we fail to find such a relation using firm fixed effects. We find that *Turnover* is positively related to negative tone, consistent with incoming directors making more negative descriptions even after controlling for firm performance. This result is consistent with H4. Overall, the results suggest that board member characteristics are associated with negative disclosure tone in mandatory annual reports.

Table 5 reports the OLS regression results for inside director and audit committee members separately. *Age\_Inside* is negatively and significantly associated with negative tone, consistent with H1 wherein older executives' risk aversion prompts them to recommend less descriptive language. However, we find no such association in the audit committee (*Age\_ACOM*). Audit committee male gender (*Gender\_ACOM*) is positively associated with negative tone, consistent with H2. This result suggests that more like-minded audit committee members think similarly and agree on descriptive language, yielding more negative tone. Inside director education (*Edu\_Inside*) is positively and significantly associated with negative tone, consistent with H3 wherein human capital leads to more descriptive disclosure. We likewise observe a positive and significant relation for audit committee education (*Edu\_ACOM*) in column 1, but no such relation in column 2 using firm fixed effects.

Table 3.  
Correlation matrix

Board level: $n = 26,551$																				
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1. <i>Negative_tone</i>	<u>-0.08</u>	0.17	0.14	0.11	0.10	-0.02	-0.15	0.06	-0.05	0.25	0.00	0.07	-0.05	0.11	-0.02	-0.10	-0.01	-0.05	-0.06	
2. <i>Age</i>		<u>-0.07</u>	0.09	-0.11	-0.22	0.16	0.09	-0.08	0.00	-0.14	0.05	0.07	-0.12	0.04	-0.08	0.32	0.00	-0.05	-0.07	
3. <i>Gender</i>			0.12	0.07	0.02	-0.04	-0.15	0.08	-0.01	0.14	-0.05	0.05	-0.08	0.11	0.03	-0.18	0.00	-0.04	-0.03	
4. <i>Edu</i>				0.04	0.02	0.03	-0.14	0.05	-0.01	0.09	-0.05	0.08	0.08	0.10	-0.08	0.03	-0.02	-0.06	0.00	
5. <i>CFO_Exp_ACOM</i>					0.05	0.04	-0.01	0.01	0.01	0.03	0.00	0.06	0.04	0.14	-0.05	-0.06	-0.01	-0.06	-0.07	
6. <i>Turnover</i>						<u>-0.06</u>	-0.09	0.06	0.01	0.13	-0.02	-0.03	-0.03	0.05	0.03	-0.06	0.01	0.06	0.03	
7. <i>Size</i>							0.43	-0.24	0.31	-0.38	-0.05	0.51	0.63	0.27	-0.17	0.38	0.00	-0.57	0.08	
8. <i>ROA</i>								<u>-0.38</u>	0.05	-0.56	0.03	0.17	0.19	0.03	-0.08	0.19	-0.05	-0.27	0.08	
9. <i>SideROA</i>									<u>-0.07</u>	0.18	-0.05	-0.13	0.19	-0.07	0.05	-0.14	0.07	0.10	-0.02	
10. <i>Leverage</i>										0.03	-0.20	0.16	0.19	0.09	-0.01	0.03	0.06	-0.12	0.01	
11. <i>Loss</i>											0.05	-0.16	-0.20	-0.01	0.08	-0.22	0.03	0.29	0.08	
12. <i>BTM</i>												-0.10	-0.09	-0.03	0.00	0.03	-0.01	0.15	-0.04	
13. <i>Big_N</i>													0.35	0.24	-0.10	0.08	-0.01	-0.45	0.12	
14. <i>Board_Size</i>														0.32	-0.05	0.36	0.01	0.32	0.07	
15. <i>Outside_ratio</i>															-0.12	0.15	0.00	0.17	-0.04	
16. <i>SideBoard_Age</i>																-0.12	0.02	0.12	-0.02	
17. <i>Firm_Age</i>																	0.00	-0.09	0.00	
18. <i>Earnings_quality</i>																		0.03	0.05	
19. <i>Spread</i>																			-0.06	
20. <i>SOX</i>																				
Within-board level: $n = 23,546$																				
	2a	2b	3a	3b	4a	4b	5	6a	6b											
1. <i>Negative_tone</i>	<u>-0.12</u>	-0.04	0.02	0.10	0.07	0.07	0.11	0.09	0.07											
2a. <i>Age_Inside</i>		<u>-0.26</u>	0.04	-0.06	0.05	0.03	-0.07	-0.10	-0.06											
2b. <i>Age_ACOM</i>			0.04	0.05	0.03	0.03	-0.14	-0.05	-0.17											
3a. <i>Gender_Inside</i>				0.04	-0.01	0.00	-0.01	-0.02	-0.02											
3b. <i>Gender_ACOM</i>					0.06	0.02	0.04	0.03	0.00											
4a. <i>Edu_Inside</i>						0.09	0.00	0.02	0.00											
4b. <i>Edu_ACOM</i>							0.03	0.02	0.00											
5. <i>CFO_Exp_ACOM</i>								0.02	0.02											
6a. <i>Turnover_Inside</i>								0.02	0.02											
6b. <i>Turnover_ACOM</i>									<u>0.15</u>											

**Note(s):** This table reports Pearson correlation coefficients for the negative tone, test variables and controls. Variables are defined in the [Appendix](#). Correlation coefficients are italicized underline when significant at 1% or lower; *italicized* when significant at 5% or lower and underlined when significant at 10% or lower. The number of observations is 26,551 or 23,546 in all pairwise correlations



Column	(1) Negative_tone	(2) Negative_tone
<i>Age</i>	−0.517*** (−5.28)	−0.0805 (−1.09)
<i>Gender</i>	17.720*** (5.96)	8.269*** (3.71)
<i>Edu</i>	7.164*** (6.51)	2.395*** (2.86)
<i>CFO_Exp_ACOM</i>	7.585*** (3.66)	−1.370 (−0.98)
<i>Turnover</i>	10.210*** (6.87)	4.735*** (6.90)
<i>Size</i>	2.060*** (4.65)	−0.976** (−2.28)
<i>ROA</i>	−4.095** (−2.30)	−5.390*** (−4.30)
<i>StdevROA</i>	1.487 (1.180)	−0.258 (−0.27)
<i>Leverage</i>	−12.650*** (−5.75)	5.365*** (3.72)
<i>Loss</i>	19.05*** (17.96)	8.977*** (19.37)
<i>BTM</i>	−0.329 (−0.67)	0.445 (1.58)
<i>Big_N</i>	5.109*** (3.16)	0.561 (0.64)
<i>Board_Size</i>	−1.279*** (−5.07)	−0.184 (−1.13)
<i>Outside_ratio</i>	21.060*** (4.46)	10.03*** (3.35)
<i>StdevBoard_Age</i>	−0.248 (−1.62)	0.0823 (0.85)
<i>Firm_Age</i>	−0.155 (−4.05)	— —
<i>Earnings_quality</i>	−0.742** (−2.55)	−0.119 (−1.28)
<i>Spread</i>	−2.714*** (−5.80)	−0.241 (−1.07)
Intercept	152.200*** (19.97)	161.0*** (25.92)
Year FE	YES	YES
Industry FE	YES	NO
Firm FE	NO	YES
Observations	26,551	26,178
Adj.R-squared	0.182	0.671
F-value	42.850	40.24

**Table 4.**  
Board characteristics  
and the negative tone  
of annual reports:  
board level  
examination

**Note(s):** This table reports OLS regression results for the determinants of negative tone in firms’ annual reports. In the first regression, year and industry fixed effects are included (not reported) and standard errors are clustered by firm and year. In the second regression, year and firm fixed effects are included. All variables are winsorized at the 1% and 99% level. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels respectively. The dependent variable is multiplied by 10,000 for presentation. In the firm fixed effects regression we exclude *Firm\_Age* because of collinearity and drop 373 singleton observations. Variables are defined in the [Appendix](#)

Column	(1) Negative_tone	(2) Negative_tone
<i>Age_Inside</i>	−0.429*** (−5.96)	−0.0930** (−2.18)
<i>Age_ACOM</i>	−0.0158 (−0.19)	−0.0592 (−1.06)
<i>Gender_Inside</i>	4.406* (1.82)	2.522 (1.59)
<i>Gender_ACOM</i>	9.200*** (4.00)	4.712*** (3.30)
<i>Edu_Inside</i>	1.771*** (3.25)	0.831** (2.13)
<i>Edu_ACOM</i>	2.669*** (3.12)	0.782 (1.44)
<i>CFO_Exp_ACOM</i>	7.404*** (3.44)	−0.834 (−0.56)
<i>Turnover_Inside</i>	3.920*** (7.35)	1.843*** (5.48)
<i>Turnover_ACOM</i>	4.905*** (6.80)	1.844*** (4.10)
<i>Size</i>	2.142*** (4.51)	−1.580*** (−3.47)
<i>ROA</i>	−4.766** (−2.63)	−3.867*** (−2.94)
<i>StdevROA</i>	0.973 (0.73)	−2.109** (−2.00)
<i>Leverage</i>	−12.37*** (−5.56)	5.557*** (3.65)
<i>Loss</i>	19.26*** (16.31)	9.066*** (18.40)
<i>BTM</i>	−0.476 (−0.91)	0.611** (2.02)
<i>Big_N</i>	5.763*** (3.31)	−0.293 (−0.30)
<i>Board_Size</i>	−1.404*** (−4.99)	−0.336* (−1.92)
<i>Outside_ratio</i>	21.09*** (3.96)	8.515** (2.46)
<i>StdevBoard_Age</i>	−0.364* (−2.06)	0.133 (1.19)
<i>Firm_Age</i>	−0.190*** (−4.70)	— —
<i>Earnings_quality</i>	−0.774** (−2.61)	−0.115 (−1.15)
<i>Spread</i>	−2.940*** (−5.29)	−0.279 (−1.11)
Intercept	156.9*** (18.53)	174.4*** (27.99)
Year FE	YES	YES
Industry FE	YES	NO
Firm FE	NO	YES
Observations	23,546	23,142
Adjusted <i>R</i> -squared	0.179	0.679
<i>F</i> -value	37.740	29.62

**Note(s):** This table reports OLS regression results for the determinants of negative tone in firms' annual reports. Analyses are performed at inside director and audit committee member levels. In the first column, year and industry fixed effects are included (not reported) and standard errors are clustered by firm and year. In the second column, year and firm fixed effects are included. All variables are winsorized at the 1% and 99% level. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively. The dependent variables are multiplied by 10,000 for presentation. Variables are defined in the [Appendix](#)

**Table 5.**  
Board characteristics  
and the negative tone  
of annual reports:  
within-board  
examination

The association between audit committee CFO experience (*CFO\_Exp\_ACOM*) and negative tone is positive and significant in column 1, suggesting that audit committee members use CFO experience to write more descriptive narrative disclosures. This result is again consistent with H3. However, we find no such evidence in column 2 using firm fixed effects. Inside director (*Turnover\_inside*) and audit committee turnover (*Turnover\_ACOM*) are positively and significantly associated with negative tone, consistent with H4 and the interpretation that new directors bring their own disclosure choices and style to shape disclosures. The findings on turnover suggest that new board members emphasize negativity, which could help build credibility early in their tenure and shift blame for recent underperformance to former managers and/or directors.

5.3 Supplemental tests

We conduct a variety of supplemental tests to ensure that our results are not sensitive to certain research choices.

5.3.1 *Additional control variables.* Since it is not possible to observe and/or control for every omitted confounding variable, we conduct Impact Threshold of a Confounding Variable (ITCV) analysis to give the reader an idea of how such variables would or would not affect our findings (Frank, 2000) [17]. ITCV analysis can provide evidence on the internal and external validity of the results. In our case, we are most concerned with internal validity, while external validity is strong in our large, multi-year, multi-industry sample [18]. ITCV internal validity tests estimate how strongly the omitted (confounding) variable must correlate with the treatment (independent) variable to invalidate the documented relation between the treatment variable and the dependent (outcome) variable.

Table 6 reports the results of the ITCV analysis. The ITCV-index is the lowest product of the partial correlation between the outcome variable and the confounding variable and the partial correlation between the treatment variable and the confounding variable that would make the coefficient on the treatment variable statistically insignificant at the 5% level. The impact of the confounding variable is maximized if its mutual correlation between the treatment and outcome variable is equal. Thus, the threshold correlation (Th\_corr) is the square root of the absolute value of ITCV-index, which facilitates interpretation of ITCV analysis by providing the minimum correlation necessary between the confounding variable and both the outcome and treatment variables for the relation between the treatment variable and outcome variable to become statistically insignificant at the 5% level. For example, if *Age* is the treatment variable, the correlation between the confounding variable and the outcome

Outcome variable	Treatment variable	ITCV-index	Th_corr	Existing correlation (Table 2)
<i>Negative_tone</i>	<i>Age</i>	−0.042	0.204	−0.083
	<i>Gender</i>	0.075	0.273	0.169
	<i>Edu</i>	0.081	0.284	0.136
	<i>CFO_ACOM</i>	0.049	0.22	0.114
	<i>Turnover</i>	0.07	0.264	0.097
	Average		0.249	0.120

**Note(s):** This table reports the ITCV-index values and threshold correlations (Th\_corr) for the examined board characteristic at the board level. ITCV-index is the lowest product of the partial correlation between the outcome variable and the confounding variable and the partial correlation between the treatment variable and the confounding variable that would make the coefficient estimate on the treatment variable statistically insignificant at the 5% level. Th\_corr is the square root of the absolute value of ITCV-index, which gives the minimum correlations necessary between the confounding variable and both the outcome and treatment variables for the relation between the treatment variable and outcome variable to become statistically insignificant. In the computation of the average values, we use the absolute values of the correlations

**Table 6.**  
Impact threshold of a  
confounding variable

variable *and* the correlation between the confounding variable and the treatment variable would *both* need to be higher than 0.204 to invalidate our inferences on negative tone [19].

We observe the lowest threshold correlation (0.204) for the treatment variable *Age* and the highest value for *Edu* (0.284). Thus, using *Age* as the treatment variable, the correlation between it and the confounding variable must be higher than 0.204 to invalidate the documented negative relation between *Age* and *Negative\_tone*. Comparing this value to the correlation between *Age* and *Negative\_tone* from Table 3 (−0.08), the omitted variable would need to have almost three times as high of a correlation with the outcome variable than the existing treatment variable has. Using *Edu* as the treatment variable, the correlation between the outcome variable and the confounding variable must be higher than 0.284. The existing correlation between *Edu* and *Negative\_tone* from Table 3 is 0.136, indicating that a confounding variable would need to have almost twice as large of a correlation to invalidate our result.

The average threshold correlation across all variables is 0.249, while the average correlation coefficient between the treatment and outcome variables is 0.120, meaning that for our average-strength result to become statistically insignificant, an omitted correlated variable would have to have approximately 2.08 times stronger correlation with the outcome variable than the existing treatment variable has, and it must also have at least this strong of a correlation with the treatment variable. Given the modest correlations even among closely related board characteristics, it seems extremely unlikely that our results would be significantly affected by confounding variables [20]. We conclude that the ITCV analysis greatly mitigates omitted correlated variable bias concerns.

**5.3.2 Alternate estimation and endogeneity.** In the main tests, we present OLS estimates for ease of interpretability. In untabulated results, we subject our data to a generalized linear model (GLM) with a logit link and the binomial family to estimate our model with fewer assumptions, given the restricted range of our dependent variable (i.e. mechanically it is restricted to [0,1]) and the possibility that it is not normally distributed. Using this specification, we continue to find significant associations between board characteristics and negative disclosure tone.

In our next test, we use the passage and implementation of the Sarbanes-Oxley Act of 2002 (SOX) as an exogenous shock to board membership. SOX mandated a majority of independent directors and required a financial expert on audit committees. Thus, SOX prompted changes to some firms' boards. Specifically, having financial experts (many of whom likely have MBA degrees) join boards leads us to predict that directors' mean education level and CFO experience will increase because of the financial expert mandate. We make no predictions for how SOX would affect age or gender because these characteristics do not seem linked to the SOX mandates.

We explore how changes in board characteristics around SOX relate to annual report tone by interacting an indicator variable, *SOX*, set equal to 1 for the SOX implementation period (7/30/2002-11/15/2004) and 0 otherwise, with changes in our director characteristics variables (denoted with the prefix *ch\_*) [21]. We present the results of this analysis in Table 7. The SOX implementation period was a time of lower negative tone on average for firms whose levels of education and CFO experience did not change, as the coefficient estimate on *SOX* is negative and statistically significant. However, we find that increases in directors' education (*SOX\*ch\_Edu*) and CFO experience (*SOX\*ch\_CFO\_Exp\_ACOM*) occurring during SOX implementation are associated with more negative tone. This evidence is compelling given that increases in education (e.g. MBA degrees) and CFO experience were likely during the SOX implementation period because of its financial expertise requirement on the audit committee. That is, SOX required plausibly exogenous director changes that directly relate to the significant difference-in-difference coefficient estimates we detect. These results suggest that SOX's regulation of the board of directors led to more descriptive annual report tone.

	<i>Negative_tone</i>
<i>ch_Age</i>	−0.101 (−0.56)***
<i>ch_Gender</i>	−7.473 (−3.03)*
<i>ch_Edu</i>	−2.742* (−1.89)
<i>ch_CFO_Exp_ACOM</i>	0.784 (0.38)***
<i>SOX</i>	−8.903 (−3.98)
<i>SOX*ch_Age</i>	0.642 (1.14)
<i>SOX*ch_Gender</i>	13.990 (1.02)**
<i>SOX*ch_Edu</i>	4.381 (2.57)***
<i>SOX*ch_CFO_Exp_ACO</i>	21.85 (5.49)***
Intercept	140.3 (27.21)
Controls	Yes
Industry Fixed Effects	Yes
Observations	28,425
Adj. <i>R</i> <sup>2</sup>	0.139

**Note(s):** This table reports OLS regression results for the determinants of negative tone in firms' annual reports based on changes in board characteristics (*change variables contain the prefix ch\_*) that occurred during the implementation of the Sarbanes-Oxley Act of 2002 (SOX). Control variables and industry fixed effects are included (not reported) and standard errors are clustered by firm and year. All variables are winsorized at the 1% and 99% level. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels respectively. The dependent variables are multiplied by 10,000 for presentation. Variables are defined in the [Appendix](#)

**Table 7.**  
OLS regression results  
using changes around  
Sarbanes-Oxley

Finally, we recognize that some boards remain stable for several consecutive years. Differences between these boards and boards with turnover may have differential impacts on the negativity of disclosure tone. Therefore, we add an indicator variable *Stable\_Board* to identify boards that stay unchanged for three consecutive years. The results on *Stable\_Board* presented in [Table 8](#) indicate that if the board stays unchanged for three consecutive years, it tends to use less negative tone. In other words, in total, changes in board membership seem to increase the descriptive content of disclosures. This result supports our conclusions for *Turnover* in the main tests.

*5.3.3 Portfolios based on two-way board characteristics.* Next, we conduct portfolio analyses to observe total industry-year adjusted negative tone for firm-years in the highest or lowest tercile of specific board characteristics. The statistics reported in [Table 9](#) show that for *Age*, the lowest tercile observations have the highest median industry-year adjusted negative tone scores, whereas for *Gender*, *Edu* and *Turnover* the highest negative tone is in the top tercile. These findings provide confirmatory evidence for the main findings. Next, when we compare the middle tercile to the highest tercile, the results are robust, consistent with the interpretation that the associations that we are capturing are monotonic.

We also compare portfolios of combinations of those board characteristics that should generate the most negative tone-rich disclosures with those that should provide the least negative tone. Therefore, we form portfolios by using those board characteristic terciles that should generate most negative tone (observations in the lowest tercile of *Age* and highest

## Boards and disclosure tone

	<i>Negative_tone</i>
<i>Age</i>	−0.465*** (−4.31)
<i>Gender</i>	17.600*** (5.57)
<i>Edu</i>	7.163*** (6.10)
<i>CFO_Exp_ACOM</i>	8.049*** (3.66)
<i>Turnover</i>	9.372*** (6.04)
<i>Stable_Board</i>	−3.882*** (−3.97)
Intercept	153.500*** (18.06)
Controls	Yes
Industry and Year FE	Yes
Observations	23,235
Adj. $R^2$	0.176
$F$ -statistic	34.820

**Note(s):** This table reports OLS regression results for the determinants of negative tone in firms' annual reports after controlling for firm years in which boards remained totally unchanged for three consecutive years (*Stable\_Board*). Year and industry fixed effects are included (not reported) and standard errors are clustered by firm and year. All variables are winsorized at the 1% and 99% level. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels respectively. The dependent variable is multiplied by 10,000 for presentation. Variables are defined in the [Appendix](#)

**Table 8.**  
OLS regression results  
with stable boards

	Nobs (low/high)	Mean: lowest tercile	Mean: highest tercile	$t$ -value	Unequal variance
<i>Age</i>	11,045/10,972	1.036	0.986	16.231	YES
<i>Gender</i>	11,734/10,907	0.974	1.036	−20.747	YES
<i>Edu</i>	13,484/10,637	0.982	1.039	−19.437	YES
<i>Turnover</i>	12,940/9,568	0.982	1.037	−18.209	NO

  

	Nobs (middle/high)	Mean: middle tercile	Mean: highest tercile	$t$ -value	Unequal variance
<i>Age</i>	11,115/10,972	1.010	0.986	7.961	YES
<i>Gender</i>	10,498/10,907	1.026	1.036	−3.194	YES
<i>Edu</i>	9,018/10,637	1.021	1.039	−5.600	YES
<i>Turnover</i>	7,510/9,568	1.020	1.037	−4.841	NO

**Note(s):** This table describes the results of portfolio tests comparing differences in the mean negative tone scores of main board characteristics. Negative tone scores are industry-year median adjusted, computed by dividing the firm's yearly negative tone score by the median yearly negative tone score of the firm's one digit SIC industry.  $T$ -value describes the statistical significance of the  $t$ -test and the Unequal variance column tells whether the  $t$ -test was conducted by assuming unequal or equal variances

**Table 9.**  
Portfolio tests for  
negativity

tercile of *Gender*, *Edu* and *Turnover*) and least negative tone (observations in the highest tercile of *Age* and lowest tercile of *Gender*, *Edu* and *Turnover*), and name these "loud" and "quiet" respectively. We present these portfolios in [Table 10](#). The loud portfolio has 420 observations, and the quiet portfolio has 1,100 observations [22]. We present negative tone



**Table 10.**  
Portfolio tests for loud  
versus quiet boards

	Nobs (loud/quiet)	Mean: loud	Mean: quiet	t-value	Unequal variance
<i>Negative_tone</i>	420/1,100	1.104	0.898	17.451	NO

  

	Nobs (loud/ quiet)	Sample mean (Nobs = 26,551)	Mean: loud	Mean: quiet	t-value	Unequal variance
<i>Size</i>	417/1,096	6.150	4.818	5.209	-3.424	YES
<i>ROA</i>	417/1,096	0.011	-0.263	-0.014	-6.791	NO
<i>StdevROA</i>	407/1,085	0.092	0.255	0.129	3.145	YES
<i>Leverage</i>	416/1,093	0.170	0.170	0.147	1.579	YES
<i>Loss</i>	420/1,100	0.337	0.686	0.257	16.783	NO
<i>BTM</i>	410/1,090	0.519	0.369	0.642	-4.975	NO
<i>Big_N</i>	420/1,100	0.759	0.690	0.528	5.779	NO
<i>Board_Size</i>	420/1,100	8.068	7.148	7.124	0.209	YES
<i>Outside_ratio</i>	419/1,085	0.815	0.809	0.761	7.676	YES
<i>StdevBoard_Age</i>	420/1,050	8.217	8.831	8.124	4.007	YES
<i>Firm_Age</i>	420/1,100	20.888	10.690	25.283	-25.148	YES
<i>Earnings_quality</i>	398/1,060	0.958	1.338	1.143	1.152	YES
<i>Spread</i>	376/989	0.704	0.913	1.102	-2.338	YES

**Note(s):** This table describes the results of the portfolio tests after forming groups of “loud” boards and “quiet” boards that we expect to produce the most and least negative tone, respectively. The loud (quiet) board portfolio includes firm-years that are in the lowest (highest) tercile in terms of *Age* and in the highest (lowest) tercile in terms of *Gender*, *Edu*, and *Turnover*. We compare the means of loud and quiet board firms on the negative tone variable, and secondarily on control variables

and control variable means for these portfolios. The loud portfolio has significantly higher mean values of negative tone. Comparison of the mean values of the control variables helps identify differences between companies governed by loud versus quiet boards. Accordingly, firms under the supervision of loud boards are less profitable, more risky and have lower growth prospects. They are also more likely to be audited by Big N auditors, have more outside members on the board, have higher board member standard deviation of age, are younger firms and have lower information asymmetry as measured by the bid-ask spread. These statistics suggest that loud board firms have more complex and changing operating environments, which underscores the need for high-quality governance and disclosure.

*5.3.4 Financial distress and the financial crisis.* Our findings on turnover may be at least partly attributed to financial distress because board turnover is likely higher in distressed firms, and financial distress is likely to increase the use of negative language. Financial distress could also affect the way other board characteristics relate to negative disclosure tone; for example, the risk aversion signaled by age could result in more or less disclosure tone during financial distress. In addition to controlling for financial performance in our main test, we examine this possibility further using negative earnings as a proxy for financial distress. We interact our director characteristics with *Loss* and present the results in [Table 11](#).

The inferences we gather from our primary results continue to hold for profitable firms (i.e. the main effects of *Age*, *Gender*, *Edu*, *CFO\_Exp\_ACOM* and *Turnover* are all consistent with [Table 4](#)). Perhaps surprisingly, we only detect one instance where loss firms appear to differ meaningfully. The negative and statistically significant coefficient estimate on *Edu\*Loss* suggests that more educated boards are associated with less negative disclosure tone during financial distress. We fail to detect any other significant interaction terms. Altogether, this test helps identify how board characteristics relate to disclosure tone under poor earnings performance. It also mitigates the concern that certain board committee characteristics, in particular turnover, may be capturing poor financial performance.

	Negative_tone	Boards and disclosure tone
<i>Age</i>	−0.527*** (−4.58)	
<i>Age*Loss</i>	0.0281 (0.18)	
<i>Gender</i>	18.190*** (5.30)	
<i>Gender*Loss</i>	−1.990 (0.51)	
<i>Edu</i>	8.735*** (6.40)	
<i>Edu*Loss</i>	−4.251** (−2.50)	
<i>CFO_Exp_ACOM</i>	7.148** (2.74)	
<i>CFO_Exp_ACOM*Loss</i>	1.113 (0.35)	
<i>Turnover</i>	11.680*** (5.06)	
<i>Turnover*Loss</i>	−3.220 (−1.28)	
<i>Loss</i>	28.680*** (2.59)	
Controls	Yes	
Industry and Year FE	Yes	
Observations	26,551	
Adj. $R^2$	0.182	
$F$ -statistic	36.19	

**Note(s):** This table reports OLS regression results for the determinants of negative tone in firms' annual reports interacted with a binary variable equal to 1 for firm-years with negative earnings (*Loss*), and 0 otherwise. Control variables and year and industry fixed effects are included (not reported) and standard errors are clustered by firm and year. All variables are winsorized at the 1% and 99% level. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels respectively. The dependent variable is multiplied by 10,000 for presentation. Variables are defined in the [Appendix](#)

**Table 11.**  
Earnings performance  
analysis

Next, we consider the effects of the 2008–2009 financial crisis with the expectation that the financial crisis increased negativity in narrative disclosures [23]. Thus, we consider whether board risk aversion and experience (as measured by directors' average age) moderate board members' use of negative tone around the financial crisis. We compute a new binary variable, *Crisis*, set equal to one if the annual reports are for 2008 or 2009; that is, released after the collapse of the stock markets, and zero otherwise. We first run the main regression by adding the *Crisis* indicator to the regression and find that it is positive and statistically significant [24].

Since one might expect the financial crisis to have the greatest influence on firms with relatively risk-averse directors, and risk aversion increases with age (Vroom and Pahl, 1971), we interact *Crisis* with *Age*. The results (untabulated) provide evidence that the interaction variable *Crisis\*Age* is positive and significant ( $t$ -value 2.28) whereas *Crisis* is not statistically significant, suggesting that older boards were less reluctant to use negative tone in mandatory annual filings during the financial crisis than during other times.

**5.3.5 Nonlinear independent variables.** We consider the possibility that our independent variables of interest have nonlinear relations with negative disclosure tone. Specifically, we consider whether squared terms will improve our estimation of negative disclosure tone. For example, it is possible that negative disclosure tone is decreasing in age to a certain point, but

for boards with a very high average age, this relation weakens, strengthens, or even reverses. We include squared terms for each of our independent variables of interest and re-estimate the analyses presented in column 1 of [Tables 4 and 5](#). Then we run Wald tests to determine whether the squared terms improve model fit. We find statistically insignificant Wald tests, with test statistics of 2.14 and 1.86 respectively, indicating that inclusion of the squared terms does not meaningfully improve our model fit and that these squared terms can be dropped from the regression without any significant loss of predictive ability. We therefore omit the squared terms from our models.

*5.3.6 Variance inflation factor test.* Our next supplemental test uses a variance inflation factor test to determine whether the correlations between the independent variables unduly inflate the standard errors in our multivariate analyses. In untabulated results, these tests indicate that multicollinearity is not a concern. For most of the covariates, the VIFs are between 1 and 2 and the highest VIF occurs on *Size* at the board level (3.42).

## 6. Summary and conclusions

Corporate boards of directors play important advisory and gatekeeping roles and sign off on annual reports, leading us to expect them to influence the negativity of disclosure tone in mandatory annual filings. We examine the role of the board of directors in shaping the richness of firms' narrative descriptions in their 10-K reports. Specifically, we consider negative 10-K disclosure tone, which has been documented to provide a large degree of information content relative to other types of tone. We investigate whether board member risk aversion and experience, male gender, human capital and turnover are associated with the descriptiveness of firms' narratives as measured by negative tone.

We sample 26,551 10-K reports filed by SEC registrants and measure the negative tone used therein. We proxy for directors' experiential human capital and risk aversion using director age; social capital using male gender; knowledge-based human capital using educational attainment and CFO experience; and human capital in the form of turnover using 1-year director turnover rates.

To summarize our results, we find that inside directors' age is associated with less negative tone. These results are consistent with older executives' risk aversion and experience prompting relatively guarded language in annual reports. We document that male gender is associated with more negative tone, suggesting that boards which lack different perspectives produce more descriptive disclosure. We find that directors' educational attainment is associated with more negative tone, consistent with highly competent board members writing richly. We find that board turnover is associated with more negative tone, consistent with new board members bringing fresh voices to corporate disclosure. Our results suggest that directors' human and social capital are associated with the descriptiveness of narrative disclosure as measured by the negative tone of mandatory 10-K filings.

Our inferences are limited by the fact that we are not able to identify casual effects; however, the robustness of our overall conclusions to a slate of additional analyses and several supplemental tests including placebo tests, ITCV and a difference-in-differences test around SOX lend confidence to our inferences. Nonetheless, we emphasize that we find evidence of associations and not necessarily causal effects.

This paper contributes to the literature on disclosure tone by providing initial evidence of an important role the board of directors plays in advising and monitoring the firm. Previous literature has focused on the economic consequences of disclosure tone and/or style (e.g. [Loughran and McDonald, 2011](#); [Tetlock, 2007](#); [Yang, 2012](#); [Choi, 2020](#)) or the role of management behind firms' disclosure choices/style ([Bamber et al., 2010](#); [Bertrand and Schoar, 2003](#); [Ge et al., 2011](#); [Davis et al., 2015](#)). However, the board's association with tonal aspects of disclosure has been largely overlooked. We add to the literature by providing evidence of

associations between board characteristics and the negative tone of 10-K annual reports. Further, while recent research concludes that the negative tone in 10-K reports contains economically important information (Loughran and McDonald, 2011), our study is one of the first to identify specific factors that appear to determine such negative tone.

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## Notes

1. Groß-Klußmann and Hautsch (2011), Riordan *et al.* (2013).
2. Tetlock (2007), Cecchini *et al.* (2010), Loughran and McDonald (2011), Yang (2012), Blau *et al.* (2015).
3. Hambrick and Mason (1984), Hambrick (2007).
4. Bamber *et al.* (2010), Ge *et al.* (2011), Brown *et al.* (2012).
5. See SEC General Instructions for Form 10-K, Paragraph D(2) (a). Similar requirements apply in certain other countries, e.g. Sec. 30(3) (c) of the Companies Act 71 of 2008 in South Africa.
6. Inside (outside) directors are also known as executive (non-executive) directors.
7. We exclude outside directors not serving on the audit committee because we do not expect them to play a large role in the preparation of annual reports. Including these directors does not materially affect our inferences.
8. Tetlock (2007), Loughran and McDonald (2011), Yang (2012).
9. Bertrand and Schoar (2003), Bamber *et al.* (2010), Ge *et al.* (2011), Davis *et al.* (2015).
10. Disclosure tone can be used as a proxy for several developments in the firms' operating environment. Law and Mills (2015) use Loughran and McDonald's dictionary for negative words and show that financially constrained firms (as measured by the ratio of negative words in the annual reports) pursue more aggressive tax planning strategies.
11. We thank Bill McDonald for making the dictionary for negative tone available via his website: <http://www3.nd.edu/~mcdonald>
12. It is possible that firms use negative tone to provide descriptive information or to provide misinformation. While this distinction is not the focus of our study and is more deeply explored in other research (e.g. Loughran and MacDonald, 2011), in untabulated analysis we find that higher levels of negative tone are negatively associated with 12-month average future bid-ask spread. This result suggests that investors use negative disclosure tone to resolve information asymmetry,

implying that negative tone provides greater information and context. This test corroborates our interpretation of negative tone as a measure of descriptive content. Meanwhile, we control for the bid-ask spread in our main analyses.

13. One could, of course, add more control variables to the model. Our impact threshold for a confounding variable analysis considers the potential impact of additional variables. See [Section V](#).
14. Alternatively, we employ a generalized linear model to allow estimation with fewer assumptions than OLS (see [Section 5.3.2](#)). We present the OLS results for ease of interpretation.
15. We omit firm age from the firm fixed effects regressions to mitigate collinearity. The results regarding board characteristics are not influenced by this decision.
16. We retain fiscal year 2002 in the sample in the early phases of merging to ensure that we do not lose observations whose Compustat datadates are in 2002 but relate to fiscal year 2003.
17. We thank Ken Frank for providing guidance on conducting ITCV analysis on his website <https://msu.edu/~kenfrank/research.htm>
18. In untabulated analysis, we run ITCV external validity checks and generally find that our results have high external validity. For example, it would require 81.1% of our sample to be replaced with a group of observations having zero correlation between the treatment (*Age*) and outcome (*Negative\_tone*) variable to invalidate our observed relation between *Age* and *Negative\_tone*.
19. One of the correlations would have to be negative because the sign of the relation between the treatment and outcome variable is negative.
20. For example, the correlation between *Age* and *Turnover* is the highest absolute correlation among board characteristics, yet is only  $-0.22$ . For comparison, the threshold correlation on *Age* (*Turnover*) is 0.204 (0.264).
21. We omit *ch\_Turnover* from this model because it would result in additional lost observations preceding the *SOX* era.
22. We exclude *CFO\_Exp\_ACOM* from this analysis because its inclusion would greatly reduce our "loud" portfolio size.
23. For fiscal year 2007 annual reports ( $n = 3,080$ ), the mean value of *Negative\_tone* was 169.08. For fiscal year 2008 annual reports ( $n = 3,146$ ), the mean value of *Negative\_tone* was 175.94 and for fiscal year 2009 annual reports ( $n = 2,993$ ), the mean value of *Negative\_tone* was 176.62.
24. In this model there are three fiscal years included in the sample: fiscal year 2007 is the baseline year and fiscal years 2008 and 2009 capture the post-crisis years. We omit year fixed effects because of collinearity with *Post\_crisis*. Standard errors are clustered by year and industry.

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Variable	Description
<i>Dependent variable</i>	
<i>Negative_tone</i>	The proportion of negative words to total words in the firm's annual report. It follows the wordlist for negative tone as specified at Bill McDonald's website and used in <a href="#">Loughran and McDonald (2011)</a>
<i>Independent variables</i>	
<b>Test variables</b>	
<i>Age</i>	Average age of the board of directors
<i>Age_Inside</i>	Average age of the executive directors
<i>Age_ACOM</i>	Average age of the audit committee
<i>Gender</i>	Ratio of male directors to the total number of board members
<i>Gender_Inside</i>	Ratio of male executive directors to the total number of executive directors
<i>Gender_ACOM</i>	Ratio of male audit committee members to the number of audit committee members
<i>Edu</i>	Total educational qualifications divided by the total number of board members
<i>Edu_Inside</i>	Total educational qualifications held by executive directors divided by the number of executive directors
<i>Edu_ACOM</i>	Total educational qualifications held by the audit committee divided by the number of board members on the audit committee
<i>CFO_Exp_ACOM</i>	Number of audit committee members with CFO experience divided by the size of the audit committee
<i>Turnover</i>	The turnover ratio of the directors on the board for the given firm. It is the sum of <i>finishing_percent</i> and <i>starting_percent</i> for directors. <i>Finishing_percent</i> is the number of directors that have left a role within the last year as a proportion of total number of directors in the same year. <i>Starting_percent</i> is the number of directors that have started within the fiscal year to total number of directors in the same year
<i>Turnover_Inside</i>	The turnover ratio of the executive directors on the board for the given firm. It is the sum of <i>finishing_percent</i> and <i>starting_percent</i> for executive directors. <i>Finishing_percent</i> is the number of executive directors that have left a role within the last year as a proportion of total number of executive directors in the same year. <i>Starting_percent</i> is the number of executive directors that have started within the fiscal year to total number of executive directors in the same year
<i>Turnover_ACOM</i>	The turnover ratio of the audit committee members is the sum of <i>starting_percent</i> and <i>finishing_percent</i> . <i>Finishing_percent</i> is the ratio of resigned committee members to the size of the committee. <i>Starting_percent</i> is the ratio of new audit committee members to the size of the committee
<b>Control variables</b>	
<i>Size</i>	The natural logarithm of total assets
<i>ROA</i>	Return on assets, computed as earnings before interest and taxes scaled by the mean of lagged and current total assets if available. If total assets values are missing, it is scaled by lagged assets if available and after that leading asset values are used if needed
<i>StdevROA</i>	The standard deviation of the return on assets ratio of the firm as measured from five years (t, t-4). Five observations are used if available, with a minimum of three observations required
<i>Leverage</i>	The ratio of long-term debt to total assets
<i>Loss</i>	Binary variable set equal to 1 if a firm reported negative net income in the 10-K filing year, and 0 otherwise
<i>BTM</i>	The ratio of total common equity to year-end market capitalization
<i>Big_N</i>	Binary variable set equal to 1 if a firm is audited by a Big N auditor, and 0 otherwise
<i>Board_Size</i>	Total number of board members
<i>Outside_ratio</i>	The ratio of outside directors to total number of board members
<i>StdevBoard_Age</i>	Standard deviation of the age of board members
<i>Firm_Age</i>	The age of the firm as computed from COMPUSTAT first fiscal year
<i>Earnings_quality</i>	Absolute value of the performance-adjusted discretionary accruals ( <a href="#">Dechow et al., 1995</a> )
<i>Spread</i>	12-month average bid-ask spread preceding the end of the fiscal year as computed from the monthly data. Bid-ask spread is calculated as follows: $((\text{ask price} - \text{bid price}) / ((\text{ask price} + \text{bid price}) / 2)) * 100$
<i>SOX</i>	Binary variable set equal to 1 if the COMPUSTAT datadate of the firm occurs during the implementation period of Sarbanes-Oxley (7/30/2002-11/15/2004), and 0 otherwise

**Table A1.**  
Variable definitions