기업안전이 기업공시의 부정적 단어 선택에 미치는 영향
Impact of Workplace-related Accidents on the Usage of Negative Words in 10-K Filings

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In this study, we examine the association between corporate workplace safety and narrative disclosure. Specifically, we analyze the negative word usage in 10-K filings depending on the injury/illness rates. Using data from the Occupational Safety and Health Administration (OSHA), we find that firms with higher injury/illness rates are less likely to use negative words in their annual reports. Seeking the underlying reasons, we indeed find a higher usage of negative words in 10-K filings and higher rates of injuries, negatively affecting the firm's future value. Additionally, the tendency to reduce negative words is stronger for firms led by CEOs with higher career concerns. We also find that when firms highly use negative words in their annual reports, it negatively impacts the readability of annual reporting, especially when they are also experiencing a higher number of injuries. Our findings remain robust even after conducting change analysis, propensity score matching, entropy balancing, and various fixed effects. Overall, our results suggest workplace safety practices influence its annual reports, and managers may strategically use their narratives to mitigate adverse impact from injury/illness in their workplace.

Keyword: Firm value, Negative words, Reputation concern, Workplace-related accidents, Workplace safety

Ⅰ. Introduction

Workplace injuries and illnesses can impose significant direct and indirect costs on businesses. Direct costs involve medical expenses, insurance, compensation premiums, and legal proceedings, while indirect costs encompass reduced productivity, additional training, expenses for accident investigations, and diminished employee retention (Kim et al. 2023). Prior studies document the consequences of failure in workplace safety such as lower market value (Cohn and Wardlaw 2016; Albuquerque et al. 2019) and lower reputation or perceptions (Barnea and Rubin 2010; Caskey and Ozel 2017),

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suggesting that violations in workplace safety may lead to value erosion for both investors and managers. Consequently, investors are motivated to monitor workplace safety risks, while managers are incentivized to manage both the risks and the disclosure of workplace safety information.

Investors rely on diverse information sources, including media news, press releases, analyst reports, 10-K filings, and conference calls, to guide their investment decisions. Annual reports, the 10-K filings submitted by publicly traded companies in the United States at the close of each fiscal year, serve as a crucial information channel for investors (Kang et al. 2018).

In this study, we investigate the relation between a firm's workplace accidents and narrative disclosure. Specifically, our analysis focuses on the effect of injury/illness rates on the negative tone of 10-K filings. Huang et al. (2014) argue that managers often use their tone to either enhance understanding or obscure firm fundamentals, and they find that managers use a positive tone to mislead investors. To the extent that workplace safety violations incur substantial costs and lower firm values, we posit that managers attempt to divert attention from workplace accidents to other positive aspects using fewer negative words.

We use a sample of U.S. listed firms from 2002 to 2011. We obtain firm-level injury/illness cases from the Occupational Safety and Health Administration (OSHA) and measure the ratio of negative words in 10-K filings by classifying words with negative tone using Harvard's General Inquiry (GI). We find that firms with higher injury/illness cases use fewer negative words in their annual reports. This suggests that managers strategically choose their language to affect the firm′s value, annual returns, and reputation. Furthermore, we show that these firms experience lower future firm value as the frequency of negative words increases. This implies that managers may partially mitigate the negative impact of poor workplace safety through their language choices in disclosure.

We also examine whether managers' career concerns explain the variation in the effect of workplace safety on language choice. Prior studies find that manager-specific career concerns positively relate to tone in the earnings press release (Arslan-Ayaydin et al. 2020). Consistent with this, we find that the tendency to reduce negative words is stronger for firms led by CEOs with higher career concerns.

We conduct several additional tests to alleviate endogeneity concerns. Firstly, the results remain significant even after conducting propensity score matching and entropy balancing. Secondly, we employ change analysis to explicitly examine the robustness of our results for a change in injury/illness cases and a change in the proportion of negative words.

Additionally, to address the possibility that underlying firm, region, and CEO characteristics may drive our main findings, we re-estimate our main model adding firm, region, and CEO-fixed effects. We continuously find significant results indicating a lower frequency of negative words among firms with safety-related issues.

We extend the literature in a few important ways. First, we add to the accounting research by documenting aspects related to workplace safety and workplace-related accidents. While prior studies investigate the relationship between workplace safety and local newspaper layoffs (Kim et al. 2023), earnings expectations (Caskey and Ozel 2017), and analyst coverage (Bradley et al. 2021), none of these studies have explored the impact of workplace safety on annual reports, particularly in terms of narrative disclosure. Additionally, we examine the consequence of tone management in the presence of higher injuries or illness cases, in terms of firm value. Second, our findings contribute to the literature on narrative disclosure (e.g., Huang et al. 2014; Merkley 2014; Lo et al. 2017; Bonsall and Miller 2017; Campbell et al. 2021) by examining an important determinant of narrative disclosure – workplace safety. Prior studies (Rogers et al. 2011; Huang et al. 2014; Bochkay et al. 2019; D'Augusta and DeAngelis 2020) suggest that several factors, such as financial performance, earnings management, CEOs' career concerns, shareholder litigation risk, accounting conservatism influence languages in disclosure. We provide the first evidence, to the best of our knowledge, on the role of workplace safety in qualitative disclosures.

The remainder of the paper proceeds as follows. Section 2 reviews the literature and develops the hypothesis. Sections 3 and 4 describe the research design and data, respectively. Sections 5 to 6 present the empirical results. Section 7 concludes the paper.

Ⅱ. Literature Review and Hypothesis Development

2.1 Workplace safety and workplace-related accidents

The necessity of workplace safety is emphasized by both industry professionals and researchers due to its significant impact on companies and their workforce (Ali et al. 2009). Workplace injuries and illnesses can result in substantial direct and indirect costs for businesses. Direct costs encompass medical expenses, insurance, compensation premiums, and litigation, while indirect costs include decreased productivity, additional training, accident investigation expenses, and reduced employee retention (Kim et al. 2023).

The association between workplace safety

and operational performance is positive, as demonstrated in previous studies (Lewchuk 1991; Choo and Grabowski 2018). Workplace injuries and accidents can have a detrimental effect on a company's market value, influencing the perceptions of investors and the public (Caskey and Ozel 2017). Firms with lower rates of workplace injuries and illnesses tend to enjoy positive reputations (Barnea and Rubin 2010). Conversely, the value of a firm may experience a significant decline when injury rates are high (Cohn and Wardlaw 2016). Empirical evidence from Hope et al. (2022) suggests that higher information quality is associated with lower rates of workplace injuries.

The impact of workplace injuries and illnesses on corporate reputations has been explored in previous research. Poor workplace safety can lead to reputational damage (Haga et al. 2022). Albuquerque et al. (2019) highlight that lower corporate social responsibility ratings in the employee safety category can result in reduced valuations. Following major accidents that attract media attention, investors may request disclosures regarding workplace safety (Tait 2010; Coetzee and Van Staden 2011). Institutional investors and bankers take social responsibility disclosures into account in their investment decisions (Longsteeth and Rosenbloom 1973; Spicer 1978). Additionally, higher injury rates are associated with lower job satisfaction (Danna and Griffin 1999; McCaughey et al. 2013). In light of this discussion, firms experiencing higher workplace safety issues and injuries may be more concerned about their reputation (Haga et al. 2022) and endeavor to avoid negative perceptions from both investors and the public. Therefore, workplace safety stands out as one of the most crucial factors for a firm.

2.2 The implications of workplace safety on negative tone

Investors rely on various information sources, including media news, press releases, analyst reports, 10-Ks, and conference calls, to inform their investment decisions. Among various sources, annual reports, particularly the 10-K filings are a crucial information channel for investors (Kang et al. 2018). While quantitative disclosure has been the focus of accounting studies, qualitative disclosure also experiences a surge examination in recent decades given that quantitative information alone may not offer a comprehensive understanding of a company's economic situation (Huang et al. 2014). Many prior studies use language analysis to unveil additional insights from annual reports beyond financial metrics and find variations in managerial decisions on narrative tone (Li 2008; Miller 2010; Loughran and McDonald 2011; Rennekamp 2012; Lopatta et al. 2017). On the one hand, managers manage their tone in narrative disclosure to provide

relevant information in addition to numbers. For example, the narrative tone is associated positively with earnings (Aly et al. 2018) and negatively with bankruptcy risk (Lopatta et al. 2017). In contrast, managers also opportunistically use their tone in narrative discourse. For instance, managers strategically use tone to potentially mislead investors (Huang et al. 2014) and firms use positive expressions selectively to present good results and overshadow adverse information (Bloomfield 2008).

Workplace safety is expected to have an interplay with tone management in a positive way. However, firms facing unfavorable performance may avoid emphasizing negative news such as injuries and accidents of employees. Some firms might disclose less information during periods of losses or lower profits, using ambiguous wording to mask poor performance (Wang et al. 2008).

Injuries and accidents in the workplace can negatively affect firm value, shaping the perceptions of both investors and general public (Caskey and Ozel 2017). Therefore, firms with a higher number of accidents may attempt to control and mitigate these negative perceptions through annual reports. Moreover, findings from psychological research support the existence of a negativity bias, illustrating a prevalent inclination for negative news to attract heightened attention (Rozin and Royzman 2001). Consequently, we predict that firms may endeavor to diminish negative tone and the use of negative words, especially when grappling with concerns related to their reputation. In other words, firms might prioritize maintaining a positive public image and reputation. Consequently, using negative language in annual reports could exacerbate their image, especially if they already face a high frequency of workplace injuries or accidents. Hence, they might be less likely to choose negative language to alleviate any adverse perceptions.

Depending on the jurisdiction, legal or regulatory requirements may dictate the language used in annual reports, particularly concerning disclosures regarding workplace safety and incidents. To sidestep legal implications or regulatory scrutiny, firms may opt for more neutral language.

Lastly, employing negative language in annual reports has the potential to unsettle investors and stakeholders, sparking apprehensions regarding the company's stability and management efficacy. Consequently, firms may opt to adopt a more positive tone to bolster investor confidence and cultivate positive relationships with stakeholders. Based on the aforementioned discussions, we present the first hypothesis as follows:

H1: Firms experiencing a high number of workplace safety issues tend to exhibit a less negative tone compared to firms with fewer accidents.

Prior studies find various adverse aspects of poor workplace safety such as firm value (Cohn and Wardlaw 2016; Amin et al. 2021) and employee satisfaction (Gyekye 2005). Firms may strategically use positive language to shape investor perceptions. Even in the face of negative events, such as workplace accidents, they might emphasize positive aspects or future growth potential, thereby maintaining or increasing their firm value. Building on our first hypothesis that managers may strategically manipulate the tone of disclosures to obfuscate the negative effects of poor workplace safety, we expect that firms with a higher number of workplace accidents but fewer negative descriptions in their reports may experience less significant declines in firm value. We propose the next hypothesis as follows:

H2a: Firm value will decline to a lesser extent in the presence of workplace accidents when the proportion of negative words in annual reports is lower.

It is worth noting that managers with career concerns may opportunistically inflate the tone of corporate disclosures (Bochkay et al. 2019; Arslan-Ayaydin et al. 2020). Under the need to demonstrate their competence, managers are more likely to use positive tones in their conference calls or press releases. Consistent with this notion, prior studies examine and find that tone manipulation is more prevalent among less experienced managers, such as younger CEOs (Arslan-Ayaydin et al. 2020). To the extent that we aim to capture the managerial intention to obfuscate safety risks by using fewer negative words, managers with greater incentives to inflate the disclosure tone would magnify such intentions. This tendency for tone inflation, however, diminishes in more formal, legally binding documents like 10-K filings, where the potential for increased scrutiny and litigation risk encourages a more conservative disclosure tone (Rogers et al. 2011). Supporting this, Bafundi et al. (2022) find that managers with career concerns, particularly those in the early stages of their careers or those perceived as less capable, are likely to use a more restrained tone in their 10-K filings. Given the two opposing findings from prior studies, managers with career concerns may employ an optimistic tone in their annual reports to demonstrate competence and enhance perceived performance, or they may employ a conservative tone in their annual reports when they face higher workplace safety risks. We specify our hypothesis 2b as follows:

H2b: The negative association between workplace safety and the negative words in 10-K filings is more pronounced for CEOs with career concerns.

Managers often use not only the tone but also the readability of disclosures to obfuscate their deceptions and avoid detection. For example, Lo et al. (2017) find that annual reports become more complex when firms manipulate accruals to meet or exceed benchmarks. Similarly, Humphery-Jenner et al. (2024) document that the readability of annual reports decreases as litigation risk increases. Given that complex information increases the analytical costs for investors, making it more challenging to detect deceptions (Lo et al. 2017), we predict that the readability of annual reports may decline when managers seek to obscure workplace safety issues while also managing the tone of their disclosures.

H2c: The readability of annual reports declines more in the presence of workplace accidents when the proportion of negative words in the reports is lower.

Ⅲ. Research Design

To test the first hypothesis, we estimate the following model:

$$NEG\_TONE = \beta_0 + \beta_1 TCR + \beta_2 SIZE + \beta_3 LEVERAGE + \beta_4 CFO + \beta_5 ROA + \beta_6 LOSS + \beta_7 XRD + \beta_8 CAPEX + \beta_9 FIRMAGE + \beta_{10} MAN\_AB + \beta_{11} CEO\_TENURE + Year\ FE + Ind\ FE + \varepsilon \quad (1)$$

Subscripts for firm i and year t are omitted for brevity. The dependent variable, *NEG_TONE*, represents the ratio of negative words from the Harvard dictionary to the total number of words per 1,000 total words in the 10-K. The main independent variable, *TCR* (Total Case Rate), is calculated by summing deaths, injuries, illnesses resulting in days away from work, job restriction, or transfer, along with other recordable cases. This total is then divided by the number of hours worked by all employees and multiplied by 200,000. The coefficient on *TCR* (β_1) reflects the relationship between workplace safety issues and the portion of negative words in annual reports.

We follow prior studies to include control variables (Huang et al. 2014; Aly et al. 2018; Hussain 2019, etc.). To control for firm-related characteristics, our model includes firm size (*SIZE*), leverage (*LEVERAGE*), cash flow from operations (*CFO*), profitability (*ROA*), loss (*LOSS*), research and development expenses (*XRD*), capital expenditures (*CAPEX*), and firm age (*FIRMAGE*). Additionally, we include CEO-related characteristics, namely CEO tenure (*CEO_TENURE*) and managerial ability (*MAN_AB*). We also control for year and industry-fixed effects. Standard errors are clustered at the firm level. All continuous variables are winsorized at the 1st and 99th percentiles to

mitigate the effect of outliers. Variable definitions are provided in the Appendix.

Ⅳ. Data and Sample Description

We obtain financial data from Compustat and CEO-related data from the ExecuComp database. Workplace injury data are collected from the Occupational Safety and Health Administration (OSHA) as part of the OSHA Data Initiative Program (ODI). While the OSHA data covers injury and illness cases from approximately 80,000 private-sector establishments from 1996 to 2011, we restrict our sample from 2002 to 2011 due to changes in OSHA's recording criteria for injuries and illnesses in 2002. To calculate the negative tone, we use the Harvard General Inquirer (GI), commonly used in the accounting and finance domain (e.g., Tetlock 2007; Tetlock et al. 2008; Li 2010).

〈Table 1〉 presents our sample selection procedure. We begin with workplace safety data from 2002 to 2011. We exclude observations without negative tone data, those within the financial industry, and with missing values in the variables used in the main model. The final sample consists of 2,073 firm-year observations.

Panel A of 〈Table 2〉 presents descriptive statistics for the sample used in the analysis. The mean value of *TCR* is 4.91 percent, suggesting that, on average, an employee has about a 4.91 percent probability of experiencing work-related injuries and illnesses. The average value of *NEG_TONE* is 11.934, indicating that approximately 11.934 words per thousand words in the entire sample are negative. Regarding firm-level characteristics, the mean value of *ROA* is 0.053, and, on average, leverage represents 57.5 percent of total assets. Approximately 15.8 percent of the entire sample incurs a loss in the fiscal year. The mean values of the other control variables are comparable to prior studies.

〈Table 1〉 Sample selection

Workplace safety database	3,736
Less:	
Observations missing negative tone data	-448
Observations of financial firms	-39
Observations are missing necessary control variables, and cases where leverage is higher than total assets.	-1,176
Final sample	2,073

Notes: 〈Table 1〉 summarizes the sample selection procedure for firm - year observations.

〈Table 2〉 Summary statistics

Panel A. Descriptive statistics

Variable	N	Mean	Std.	Min	Q1	Med	Q3	Max
NEG_TONE	2,073	11.934	14.703	0	0	0	22.013	51.829
TCR	2,073	4.905	5.196	0	1.008	3.257	7.172	24.965
SIZE	2,073	8.131	1.590	4.954	6.953	8.012	9.152	12.337
LEVERAGE	2,073	0.575	0.190	0.117	0.455	0.579	0.699	1
CFO	2,073	0.105	0.068	-0.087	0.064	0.103	0.143	0.314
ROA	2,073	0.053	0.078	-0.263	0.024	0.06	0.093	0.254
LOSS	2,073	0.158	0.365	0	0	0	0	1
XRD	2,073	0.025	0.045	0	0	0.006	0.025	0.232
CAPEX	2,073	0.044	0.035	0.005	0.021	0.034	0.056	0.193
FIRMAGE	2,073	2.696	0.314	1.099	2.639	2.773	2.833	2.996
MAN_AB	2,073	-0.017	0.126	-0.208	-0.087	-0.045	0.006	0.511
CEO_TENURE	2,073	5.740	4.150	1	3	5	8	18

Notes: Panel A of 〈Table 2〉 reports the descriptive statistics of the variables used in our main model Equation (1). The summary statistics include the number of observations, mean, median, standard deviation, minimum, maximum, and the percentiles (25% and 75%) distribution of the variables. All the variables are winsorized at the 1st and 99th percentiles. The variable definitions are given in the Appendix.

Panel B. High versus low TCR sample

Variables	*HIGH_TCR*=0			*HIGH_TCR*=1			Difference	
	N	Mean	Std	N	Mean	Std	Diff.	*t*-value
NEG_TONE	1,039	12.621	0.464	1,034	11.243	0.448	1.378**	2.14
SIZE	1,039	8.238	0.050	1,034	8.024	0.049	0.214***	3.06
LEVERAGE	1,039	0.565	0.006	1,034	0.585	0.006	-0.020**	-2.36
CFO	1,039	0.107	0.002	1,034	0.104	0.002	0.003	1.03
ROA	1,039	0.055	0.002	1,034	0.051	0.002	0.004	1.26
LOSS	1,039	0.154	0.011	1,034	0.162	0.011	-0.008	-0.53
XRD	1,039	0.035	0.002	1,034	0.015	0.001	0.020***	10.25
CAPEX	1,039	0.042	0.001	1,034	0.046	0.001	-0.004**	-2.00
FIRMAGE	1,039	2.680	0.011	1,034	2.712	0.009	-0.032**	-2.29
MAN_AB	1,039	-0.013	0.004	1,034	-0.021	0.004	0.008	1.37
CEO_TENURE	1,039	5.680	0.127	1,034	5.800	0.131	-0.120	-0.66

Notes: Panel B of 〈Table 2〉 compares summary statistics of the variables across the firms with a high number of workplace-related accidents and firms with a low number of workplace-related accidents subsamples. *, **, *** denote significance levels of 10 percent, 5 percent, and 1 percent, respectively.

In Panel B of 〈Table 2〉, we compare a subsample of firms with a higher number of workplace accidents to those with a lower number. Firms with a high number of workplace accidents are less likely to use negative words (*NEG_TONE*),[1] have smaller size (*SIZE*), higher leverage (*LEVERAGE*), lower R&D expenditure (*XRD*), and higher capital expenses (*CAPEX*) compared to firms with a low number of workplace-related accidents. These differences between the two subsamples are statistically significant.

Ⅴ. Main Results

5.1 Workplace safety issues and negative tone

〈Table 3〉 presents the results of estimating Equation (1), which examines the relation between workplace safety and the usage of negative words in disclosure. The coefficient on *TCR* is negative and significant at the 5 percent level (coefficient = -0.141, *t*-stat = -2.05). It suggests that firms with poor workplace safety (i.e., higher injury/illness cases) tend to use fewer negative words in their annual reports than firms with lower injury/illness cases. These findings suggest that firms, concerned about workplace safety, strategically minimize the use of negative language in their annual reports to mitigate the impact of adverse news and perceptions among investors.

5.2 Effect on future firm value

To corroborate our main findings on managers' strategic choice of negative wording in the presence of safety-related risk, we further examine how this tactic mitigates negative market perceptions associated with safety risks by analyzing the future firm value.[2] While managers' language provides crucial information of future financial performance (Mayew and Venkatachalam 2012; Aly et al. 2018; Kang et al. 2018, etc.), it also reflects their strategic decisions to inflate the tone of words to mislead investors (Huang et al. 2014). Prior studies find that workplace safety concerns are negatively associated with firm value (Cohn and Wardlaw 2016; Amin et al. 2021) and employee satisfaction (Gyekye 2005). If managers reduce negative language in their annual reports to hide negative aspects of poor workplace safety, firms with more workplace accidents but fewer negative words may experience

1) The mean value of negative words in annual reports is slightly lower than for firms with accidents (*TCR*=1, 11.877) than firms with a zero-accident rate (*TCR*=0, 12.249). This suggests that firms with workplace accidents are less likely to use negative words in their annual reports.
2) To examine the role of narratives in investors' perceptions, we use market-based valuation (i.e., Tobin's Q).

〈Table 3〉 The effect of workplace-related accidents on the negative tone

	Dependent variable = *NEG_TONE* (1)
TCR	-0.141** (-2.05)
SIZE	-0.746*** (-2.79)
LEVERAGE	1.841 (0.80)
CFO	-5.933 (-0.84)
ROA	-13.023* (-1.80)
LOSS	0.589 (0.44)
XRD	2.845 (0.27)
CAPEX	-5.121 (-0.42)
FIRMAGE	-2.077 (-1.63)
MAN_AB	3.538 (1.18)
CEO_TENURE	-0.088 (-0.92)
Intercept	37.155*** (3.38)
Observations	2,073
Year FE	Yes
Ind FE	Yes
Cluster	Firm
Adjusted R^2	0.019

Notes: 〈Table 3〉 reports the main results using Equation (1). This table presents the relationship between workplace safety and negative tone. T-statistics in parentheses are estimated with robust standard errors clustered by firm. Also, we include year and industry-fixed effects. All the variables are defined in the Appendix.

attenuated declines in firm value. To investigate whether and how workplace safety and negative words are related to a firm's future value as in H2a, we estimate the following regression equation:

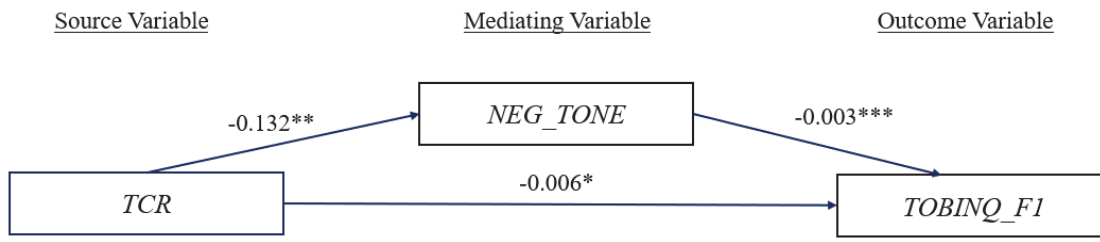
$$TOBINQ\_F1 = \beta_0 + \beta_1 TCR + \beta_2 NEG\_TONE + \beta_{3-14} Controls + Year\ FE + Ind\ FE + \varepsilon \quad (2A)$$

$$NEG\_TONE = \beta_0 + \alpha_1 TCR + \beta_{2-13} Controls + Year\ FE + Ind\ FE + \varepsilon \quad (2B)$$

We measure a firm's future value using the one-year-ahead Tobin's Q ratio. Consistent with prior studies (Yung and Chen 2018; Lai et al. 2020; Brochet et al. 2021), we control for various firm-related characteristics, including firm size (*SIZE*), leverage (*LEVERAGE*), cash flow from operations (*CFO*), firm performance (*ROA*, *LOSS*), capital expenditure (*CAPEX*), firm age (*FIRMAGE*), sales growth (*SALES_GROW*), book-to-market ratio (*BOOK_MAR*), and SG&A expenses (*XSGA*). Additionally, we control for CEO-related variables such as managerial ability (*MAN_AB*) and CEO tenure (*CEO_TENURE*).

〈Table 4〉 Path analysis of indirect effects of negative tone on firm value

Direct path	
p〔TCR, TOBINQ_F1〕	-0.006* (-1.74)
Mediated path	
Ⅰ. p〔TCR, NEG_TONE〕	-0.132** (-1.97)
Ⅱ. p〔NEG_TONE, TOBINQ_F1〕	-0.003*** (-2.60)
Observations	2,062



Notes: 〈Table 4〉 and 〈Figure 1〉 present the results from the mediation test, which examines the indirect impact of negative tone on the correlation between TCR and firm value. All specifications are estimated with robust standard errors clustered by firm. Also, we include year and industry-fixed effects. All the variables are defined in the Appendix.

〈Figure 1〉 Path analysis of indirect effects of negative tone on firm value

Our focus is on the product of path coefficient $\beta_2 \times \alpha_1$, which represent the magnitude of the indirect path from workplace accidents to future firm value mediated through the negative words in annual reports. We present this result in 〈Table 4〉 and 〈Figure 1〉. While the direct path from workplace accidents to future firm value has a significant negative impact (-0.006), the indirect path coefficient $\beta_2 \times \alpha_1$ is positive (0.0004). This positive product indicates that, although workplace accidents directly lower future firm value, the fewer negative words in annual reports have a positive indirect effect on future firm value. Put differently, it suggests that reducing the negative expressions in annual reports could help mitigate the decline in firm value associated with safety risks. Firms may strategically use positive language to shape investor perceptions. Even in the face of negative events, such as workplace accidents, they might emphasize positive aspects or future growth potential, thereby maintaining or increasing their firm value.

5.3 The effect of CEO's career concerns

Our primary findings support that managers use the tone of disclosure to highlight positive aspects of their firm, particularly in the presence of workplace accidents. In this subsection, we further examine the potential influence of the CEO's career concerns on the intentions of managers. To test H2b related to CEO career concerns, we employ the following Equation (3):

$$NEG\_TONE = \beta_0 + \beta_1 TCR + \beta_2 CAREER + \beta_3 TCR*CAREER + \beta_{4-13} Controls + Year\ FE + Ind\ FE + \varepsilon \quad (3)$$

where we omit industry and year subscripts for brevity. Gibbons and Murphy (1992) emphasize that career concerns become more prominent as managers approach retirement, as the potential benefits from influencing the market′s perception of their abilities increase. Additionally, compared to their older counterparts, younger CEOs exhibit a higher propensity to enter into new lines of business and discontinue existing ones (Li et al. 2017). We introduce the *YOUNG_CEO* dummy variable, which equals 1 if the CEO is below 50 years old and 0 otherwise (Li et al. 2017). Yuan et al. (2017) have observed that CEOs experience fewer concerns when they also hold the position of chairperson. Consequently, we anticipate that our results will be less pronounced when CEOs also serve as chairpersons of the board. We create a new dummy variable, *NONCHAIRMAN*, which equals 1 if the CEO is not the chairman of the board of directors and 0 if the CEO is the chairman of the board of directors. *EARLY_YEARS* indicator for the first two years of the CEO′s tenure (Ali and Zhang 2015). The control variables

are the same as those used in Equation (1) and standard errors are clustered at a firm level. Both Columns (1)-(2) in 〈Table 5〉 report significantly negative coefficients on *TCR * CAREER* (coefficient = -0.726, *t*-stat = -1.78 in Column (1); coefficient = -0.423, *t*-stat = -2.64 in Column (2)). These results suggest that when firms have greater workplace safety issues, and when managers have a higher level of career concerns, managers tend to decrease the use of negative words in annual reports.

However, the interaction of *EARLY_TENURE* and *TCR* is positive and significant (coefficient = 0.315, *t*-stat = 2.16 in Column (3)). Previous studies suggest that incoming CEOs

〈Table 5〉 CEO's effect on negative tone

VARIABLES	Dependent variable = *NEG_TONE*		
	(1)	(2)	(3)
TCR	-0.195*	0.209	-0.226***
	(-1.89)	(1.41)	(-2.87)
YOUNG_CEO	0.644		
	(0.27)		
*YOUNG_CEO*TCR*	-0.726*		
	(-1.78)		
NONCHAIRMAN		2.886**	
		(2.26)	
*NONCHAIRMAN*TCR*		-0.423***	
		(-2.64)	
EARLY_TENURE			-2.766**
			(-2.17)
*EARLY_TENURE*TCR*			0.315**
			(2.16)
Intercept	22.091**	34.157***	39.398***
	(2.14)	(3.13)	(3.52)
Controls	Included	Included	Included
Observations	938	2,073	2,073
Year FE	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes
Cluster	Firm	Firm	Firm
Adjusted R^2	0.037	0.021	0.021

Notes: 〈Table 5〉 presents the moderating effects of CEO's career concerns on the relationship between workplace safety and the usage of negative words. T-statistics in parentheses are estimated with robust standard errors clustered by firm. Also, we include year and industry-fixed effects. All the variables are defined in the Appendix.

〈Table 6〉 Readability

	Dependent variable = *FOG* (1)
HIGH_TCR	-0.836** (-2.08)
NEG_TONE	0.050*** (4.42)
*HIGH_TCR*NEG_TONE*	0.028* (1.68)
SIZE	0.161* (1.79)
LEVERAGE	0.202 (0.31)
ROA	-0.396 (-0.20)
LOSS	-0.479 (-1.30)
CAPEX	-2.994 (-0.77)
LOG_OC	0.256 (0.94)
MAN_AB	0.844 (0.83)
CEO_TENURE	0.006 (0.22)
CEO_COMP	-0.038 (-1.26)
DUALITY	-0.142 (-0.55)
CEO_OWNER	0.016 (0.91)
Intercept	16.513*** (9.65)
Observations	1,034
Year FE	Yes
Ind FE	Yes
Cluster	Firm
Adjusted R^2	0.075

Notes: 〈Table 6〉 reports the effects of workplace safety and the usage of negative words on readability. T-statistics in parentheses are estimated with robust standard errors clustered by firm. Also, we include year and industry-fixed effects. All the variables are defined in the Appendix.

may implement earnings baths to lower performance targets and reserve earnings for future periods. This strategy is commonly utilized because any poor performance in the first year, often a partial year, is typically attributed to the previous CEO, thus having minimal impact on the new CEO's reputation (Hensel and Schöndube 2022). We predict that big-bath accounting is the reason why early-tenure CEOs are more likely to use negative words in their annual reports, even when the firm suffers from a high number of workplace accidents.

5.4 Effect on readability

To test H2c related to readability of annual reports, we employ the following Equation (4):

$$\begin{aligned} FOG = {} & \beta_0 + \beta_1 HIGH\_TCR + \beta_2 NEG\_TONE \\ & + \beta_3 HIGH\_TCR*NEG\_TONE + \beta_4 SIZE \\ & + \beta_5 LEVERAGE + \beta_6 ROA + \beta_7 LOSS \\ & + \beta_8 CAPEX + \beta_9 LOG\_OC \\ & + \beta_{10} MAN\_AB + \beta_{11} CEO\_TENURE \\ & + \beta_{12} CEO\_COMP + \beta_{13} DUALITY \\ & + \beta_{14} CEO\_OWNER + Year\ FE \\ & + Ind\ FE + \varepsilon \end{aligned} \quad (4)$$

The dependent variable is the *FOG* index (*FOG*), which measures text complexity based on syllables per word and words per sentence. *HIGH_TCR* is an indicator for higher workplace accidents, equal to 1 if a firm's *TCR* is above the median value. Following prior studies (Li 2008; Ertugrul et al. 2017; Dyer et al. 2017), we control for firm and CEO-related characteristics, as well as year- and industry-fixed effects. The standard errors are clustered at a firm level. The coefficient of interest is β_3, capturing the relationship between negative words in 10-K filings and safety risk and readability.

〈Table 6〉 reports the results of Equation (4). The interaction between the use of negative words (*NEG_TONE*) and workplace-related accidents (*HIGH_TCR*) is positive and significant at the 10 percent level (coefficient = 0.028, *t*-stat = 1.68). These results suggest that firms with safety risks and fewer negative words in their 10-K tend to provide less readable reports. This implies an intention to obscure work safety issues by making the reports less negative and more difficult to understand.

Ⅵ. Additional Tests

6.1 Propensity score matching

Our findings could potentially be influenced by the endogenous characteristics of firms as potential determinants of *TCR*. To address this issue, we perform a propensity score matching analysis. Firstly, we construct a model to de-

termine the probability of a firm experiencing a high number of accidents using the following logit model:

$$Pr(HIGH\_TCR=1) = \beta_0 + \beta_{1-10} Controls + Year\ FE + Ind\ FE + \varepsilon. \quad (5)$$

For the variable "*Controls*," we include the full set of control variables used in Equation (1). We then match observations with a high number of accidents (the "Treat" group) to those with a low number of accidents (the "Control" group) based on propensity scores. We do this using one-to-one matching without replacement.

Panel A of ⟨Table 7⟩ presents the results of estimating Equation (5). The matching procedure enables the matching of 743 observations of firms with high accidents with an equal number of observations of low accidents.

Panels B and C tabulate the differences in means of variables between the two subgroups. Before matching, there are significant variations in means between the treatment and control groups. However, post-matching, these differences diminish and lose statistical significance, suggesting the success of the matching procedure.

Panel D in ⟨Table 7⟩ presents the results of estimating Equation (1) utilizing the matched sample. In column 1, the coefficient on *HIGH_TCR* is notably negative and statistically significant at the 1 percent level (coefficient = -2.059, *t*-stat = -2.63). This suggests that firms with a high frequency of workplace accidents are less inclined to use negative language compared to those with a lower incidence of workplace accidents.

6.2 Entropy balancing

Even after implementing entropy balancing, the coefficient on *HIGH_TCR* remains negative and significant at the 1 percent level in ⟨Table 8⟩ (coefficient = -2.051, *t*-stat = -2.74). This indicates that firms with a high number of workplace accidents still exhibit a tendency to use less negative language compared to those with a lower number of workplace accidents.

6.3 Change analysis

Given the stability of a firm's culture and strategic orientation over a short period (Lai et al. 2020), we perform a change analysis to alleviate the concern for endogeneity and draw a causal link between workplace-related accidents and negative words in disclosures. We regress the change in negative words in disclosure (*ΔNEG_TONE*) from year *t-1* to year *t* on changes in total case rates (*ΔTCR*) and continuous variables from year *t-1* to year *t* in Equation (1). In ⟨Table 9⟩, consistent with the main findings, the coefficient on *ΔTCR* is negative and significant at the 1 percent level (coefficient = -0.278, *t*-stat =

〈Table 7〉 Propensity score matching

Panel A. The first stage of the propensity score matching

	Dependent variable= *HIGH_TCR* (1)
SIZE	-0.097***
	(-3.77)
LEVERAGE	0.185
	(0.96)
CFO	0.142
	(0.22)
ROA	0.073
	(0.11)
LOSS	0.100
	(0.84)
XRD	-5.307***
	(-5.10)
CAPEX	-0.780
	(-0.70)
FIRMAGE	0.228**
	(2.22)
MAN_AB	0.577*
	(1.86)
CEO_TENURE	0.001
	(0.13)
Intercept	-5.098***
	(-7.65)
Observations	2,073
Year FE	Yes
Ind FE	Yes
Cluster	Firm
Pseudo R^2	0.104

Panel B. Before matching

	HIGH_TCR	*LOW_TCR*	Diff.	*t*-stat
SIZE	8.024	8.238	-0.214***	-3.06
LEVERAGE	0.585	0.565	0.020**	2.36
CFO	0.104	0.107	-0.003	-1.03
ROA	0.051	0.055	-0.004	-1.26
LOSS	0.162	0.154	0.008	0.53
XRD	0.015	0.035	-0.020***	-10.25
CAPEX	0.046	0.042	0.004**	2.00
FIRMAGE	2.712	2.680	0.032**	2.29
MAN_AB	-0.021	-0.013	-0.008	-1.37
CEO_TENURE	5.800	5.680	0.120	0.66

〈Table 7〉 Propensity score matching (continue)

Panel C. After matching

	HIGH_TCR	*LOW_TCR*	Diff.	*t*-stat
SIZE	8.060	8.067	-0.007	-0.09
LEVERAGE	0.578	0.579	-0.001	-0.09
CFO	0.102	0.103	-0.001	-0.39
ROA	0.052	0.054	-0.002	-0.46
LOSS	0.149	0.155	-0.006	-0.29
XRD	0.019	0.021	-0.002	-1.07
CAPEX	0.040	0.042	-0.002	-0.61
FIRMAGE	2.703	2.705	-0.002	-0.11
MAN_AB	-0.028	-0.030	0.002	0.42
CEO_TENURE	5.775	5.728	0.047	0.22

Panel D. Results with the matched sample

	Dependent variable = *NEG_TONE*
	(1)
HIGH_TCR	-2.059***
	(-2.63)
SIZE	-0.842***
	(-2.68)
LEVERAGE	1.166
	(0.46)
CFO	-10.508
	(-1.26)
ROA	-16.268*
	(-1.87)
LOSS	0.552
	(0.34)
XRD	3.256
	(0.22)
CAPEX	-5.372
	(-0.35)
FIRMAGE	-0.882
	(-0.58)
MAN_AB	3.105
	(0.75)
CEO_TENURE	-0.107
	(-0.98)
Intercept	27.348***
	(2.74)
Observations	1,486
Year FE	Yes
Ind FE	Yes
Cluster	Firm
Adjusted R^2	0.016

Notes: 〈Table 7〉 reports the results of the propensity score matching (PSM) analysis. Panel A presents the logistic regression results for the relationship between firms with a high number of accident cases and the control variables using Equation (5). Panel B and Panel C present the results for the difference in means of the treatment and control groups, along with the corresponding t-statistics before and after the matching. Panel D exhibits the impact of workplace safety on negative tone using propensity score matching (PSM) analysis. T-statistics (or Z-statistics) in parentheses are estimated with robust standard errors clustered by firm. Also, we include year and industry-fixed effects. All the variables are defined in the Appendix.

〈Table 8〉 Entropy balancing

	Dependent variable = *NEG_TONE* (1)
HIGH_TCR	-2.051*** (-2.74)
SIZE	-0.822*** (-2.87)
LEVERAGE	1.793 (0.78)
CFO	-5.033 (-0.66)
ROA	-17.498** (-2.20)
LOSS	0.468 (0.34)
XRD	3.595 (0.30)
CAPEX	-4.956 (-0.38)
FIRMAGE	-2.167 (-1.63)
MAN_AB	3.251 (1.02)
CEO_TENURE	-0.039 (-0.38)
Intercept	41.053*** (3.47)
Observations	2,073
Year FE	Yes
Ind FE	Yes
Cluster	Firm
Adjusted R^2	0.029

Notes: 〈Table 8〉 reports the results of entropy balancing. T-statistics in parentheses are estimated with robust standard errors clustered by firm. Also, we include year and industry-fixed effects. All the variables are defined in the Appendix.

〈Table 9〉 Change regression

	Dependent variable = *ΔNEG_TONE* (1)
ΔTCR	-0.278*** (-3.02)
ΔSIZE	-3.806 (-1.09)
ΔLEVERAGE	-2.229 (-0.43)
ΔCFO	4.813 (0.40)
ΔROA	-12.726 (-0.91)
ΔLOSS	-0.729 (-0.33)
ΔXRD	93.561 (1.41)
ΔCAPEX	-11.016 (-0.36)
ΔFIRMAGE	32.034* (1.67)
ΔMAN_AB	4.080 (0.68)
ΔCEO_TENURE	-0.276 (-1.16)
Intercept	19.562*** (3.21)
Observations	1,234
Year FE	Yes
Ind FE	Yes
Cluster	Firm
Adjusted R^2	-0.009

Notes: 〈Table 9〉 presents the result of change regression. T-statistics in parentheses are estimated with robust standard errors clustered by firm. Also, we include year and industry-fixed effects. All the variables are defined in the Appendix.

〈Table 10〉 Fixed effects

	Dependent variable = *NEG_TONE*			
	(1)	(2)	(3)	(4)
TCR	-0.215**	-0.181**	-0.380***	-0.385***
	(-2.30)	(-2.44)	(-2.60)	(-2.63)
SIZE	-4.628**	-1.414***	-4.046	-4.244
	(-1.99)	(-4.05)	(-0.84)	(-0.86)
LEVERAGE	3.203	4.364	2.056	2.601
	(0.74)	(1.59)	(0.27)	(0.33)
CFO	5.438	3.372	-11.138	-9.680
	(0.48)	(0.42)	(-0.57)	(-0.48)
ROA	-9.730	-8.783	5.824	6.727
	(-0.88)	(-1.06)	(0.25)	(0.28)
LOSS	-0.650	-0.142	1.052	1.172
	(-0.31)	(-0.10)	(0.30)	(0.33)
XRD	37.451	-1.292	152.747	146.304
	(0.65)	(-0.10)	(1.62)	(1.53)
CAPEX	-7.982	-20.803	36.617	36.364
	(-0.34)	(-1.48)	(0.83)	(0.82)
FIRMAGE	13.854	-1.857	70.392***	68.447***
	(0.96)	(-1.09)	(3.14)	(3.06)
MAN_AB	7.919	1.988	10.719	9.850
	(1.57)	(0.54)	(1.46)	(1.33)
CEO_TENURE	-0.159	-0.104	-1.993	-1.979
	(-0.71)	(-0.92)	(-0.40)	(-0.40)
Intercept	6.834	49.708***	-148.186**	-176.483*
	(0.17)	(2.68)	(-2.24)	(-1.80)
Observations	2,073	2,019	948	934
Year FE	Yes	Yes	Yes	Yes
Ind FE	No	Yes	Yes	Yes
Firm FE	Yes	No	No	No
CEO FE	No	No	Yes	Yes
County FE	No	Yes	No	Yes
Cluster	Firm	Firm	Firm	Firm
Adjusted R^2	0.128	0.051	0.140	0.137

Notes: 〈Table 10〉 presents the result of fixed effects. T-statistics in parentheses are estimated with robust standard errors clustered by firm. All the variables are defined in the Appendix.

-3.02), suggesting that as the number of injury /illness cases increases, the usage of negative words in 10-K filings decreases.

6.4 Firm-, region- and CEO-fixed effects

To further mitigate concerns that our main findings may be attributable to differences in unobservable firm characteristics and CEO traits, we include firm, county, and CEO-fixed effects along with year and industry-fixed effects. 〈Table 10〉 shows that the variables of interest (*TCR*) remain statistically significant in all columns, confirming the robustness of our main findings to unobservable factors within the firms, region, and CEOs, respectively.

6.5 Alternative definitions of workplace accidents

In our study, our main independent variable *TCR* represents the ratio of the sum of deaths, injuries, illnesses resulting in leave from work, job restrictions, transfers, and other recordable cases, divided by the total number of hours worked by all employees in a specific establishment-year, then multiplied by 200,000. In this section, we use alternative measures

〈Table 11〉 Alternative definitions of workplace-related accidents

	Dependent variable = *NEG_TONE*		
	(1)	(2)	(3)
NUMCASES_EMP	-13.883* (-1.93)		
INJURY_EMP		-14.596* (-1.93)	
CAWAY_EMP			-2.653 (-0.17)
Intercept	37.184*** (3.39)	37.205*** (3.37)	36.546*** (3.29)
Controls	Included	Included	Included
Observations	2,073	2,073	2,073
Year FE	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes
Cluster	Firm	Firm	Firm
Adjusted R^2	0.019	0.019	0.017

Notes: 〈Table 11〉 presents the result of the alternative definitions of workplace-related accidents. T-statistics in parentheses are estimated with robust standard errors clustered by firm. All the variables are defined in the Appendix.

of workplace safety. *NUMCASES_EMP* is the number of cases involving days away from work, job transfers, or restrictions, and other recordable cases, divided by the total number of employees. *INJURY_EMP* is the ratio of injuries to the total number of employees. *CAWAY_EMP* is the ratio of cases with days away from work to total number of employees. The coefficients of alternative measurements are generally negative and significant except for *CAWAY_EMP*, consistent with our main results.

Ⅶ. Conclusion

In this study, we investigate the relationship between a firm's workplace safety and narrative disclosure. Specifically, our analysis focuses on the influence of injury/illness rates on the usage of negative words in 10-K filings. Using a sample of U.S.-listed firms from 2002 to 2011, we find that firms with higher injury/illness cases use fewer negative words in their annual reports, suggesting that managers strategically choose language in their disclosures, impacting the firm's value, and reputation. This result remains consistent when employing changes in specification, and incorporating firm, region and CEO fixed effects, as well as propensity score matching and entropy balancing. We further show that firms reporting higher injury/illness cases exhibit lower firm value in the following year as the frequency of negative words in the current-year disclosure increases. It implies that managers can partially alleviate the negative impact of poor workplace safety through language choice in disclosure.

We contribute to accounting research by documenting aspects related to workplace safety. While prior studies have investigated the relationship between workplace safety and local newspaper layoffs (Kim et al. 2023), earnings expectations (Caskey and Ozel 2017), and analyst coverage (Bradley et al. 2021), none of these studies have explored the impact of workplace safety on annual reports, particularly in terms of narrative disclosure.

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〈Appendix〉 Variable definitions

Variables	Definition
Main variables	
NEG_TONE	The negative tone ratio is calculated by the ratio of negative words from the Harvard dictionary to the total number of words per 1,000 total words in the 10-K filings.
TCR	The sum of deaths and all injuries and illnesses that result in leave from work, job restriction, or transfer, and other recordable cases divided by the number of hours worked by all employees in a given establishment-year, then multiplied by 200 000.
HIGH_TCR	One if *TCR* is above the median value of its industry (SIC 2-digit), zero otherwise.
Control variables	
SIZE	The natural logarithm of total assets.
LEVERAGE	The ratio of total leverage to total assets.
CFO	The ratio of operating cash flows to total assets.
ROA	The ratio of operating income to total assets.
LOSS	One if the firm reports a loss (i.e., net income is below zero), and zero otherwise.
XRD	The ratio of research and development expense to total assets.
CAPEX	The ratio of capital expenditure to total assets.
FIRMAGE	The natural logarithm of the number of years since the firm was first included in Compustat.
MAN_AB	The measure of the managerial ability developed in Demerjian et al. (2012). *Database*: Peter Demerjian's website, https://peterdemerjian.weebly.com/managerialability.html
CEO_TENURE	CEO's tenure.
Other variables	
TOBINQ_F1	One year ahead Tobin's Q ratio.
SALES_GROW	The change in sales compared to the previous year.
BOOK_MAR	The book-to-market ratio is determined by dividing the book value of equity by the market value of equity.
XSGA	The ratio of SG&A expenditure to total assets.
YOUNG_CEO	One if the CEO's age is below 50 years old, and zero otherwise.
NONCHAIRMAN	One if the CEO is a non-chairman of the board of directors, and zero otherwise.
EARLY_TENURE	An indicator variable that equals one for the first two years of the firms' CEO, and zero otherwise.
FOG	The Fog index, created by Robert Gunning, is a widely recognized and straightforward formula used to measure readability. Database: Li's website, http://webuser.bus.umich.edu/feng/
LOG_OC	The natural logarithm of the operating cycle.
CEO_COMP	The natural logarithm of the CEO's compensation.
DUALITY	One if the CEO is the chairman of the board of directors, and zero otherwise.
CEO_OWNER	CEO's ownership.
NUMCASES_EMP	The sum of cases involving days away from work, job transfers or restrictions, and other recordable cases is divided by the total number of employees.
INJURY_EMP	The number of injury cases during the year divided by the total number of employees.
CAWAY_EMP	The number of cases involving days away from work is divided by the total number of employees.