

Firm-Level Climate Change Exposure and Earnings Quality

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ABSTRACT

This study examines the effect of firm-level climate change exposure on earnings quality. We utilize the climate change exposure measure developed by Sautner et al. (2023), based on a text-based index from earnings call transcripts. Using a large sample of U.S. firms from 2001 to 2024, we find that higher climate change exposure significantly impairs earnings quality, as evidenced by higher absolute values of discretionary accruals and enhanced income smoothing. Further analyses reveal that both aspects of the opportunities and risks from climate change exposure contribute to the negative association between climate change exposure and earnings quality. However, an additional test indicates that the effect of the sentiment aspect of climate change exposure varies directionally depending on whether sentiment is positive or negative.

Keywords: Climate Change Exposure, Earnings Quality, Financial Reporting Quality

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Data availability: All data used in the paper are available from the public/private sources cited in the text.

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1. Introduction

Climate change has been perceived as a serious global issue for humanity. It has also become not only environmental and regulatory concerns, but also a critical financial and strategic risk for firms. Firms may face various challenges, including adapting their operations to physical climate shocks (floods, heat waves, etc.), responding to regulatory changes (carbon taxes, emissions standards, etc.), and seizing new green opportunities (renewables, carbon capture, etc.). (Grover and Kahn 2024; Li and Flammer 2025).

Furthermore, investors and regulators increasingly demand that firms transparently disclose their climate-related information and manage the climate-related risks. As the effects of climate change are significant factors in firms' operations, those effects may influence not only operational performance but also firms' financial reporting behavior. Accordingly, we believe that examining how climate change exposure affects financial reporting practices is an important and interesting research topic. However, the prior literature has focused largely on the effect of climate change or climate-related risks on valuation implications, asset pricing, or disclosure determinants (Barnett 2022; Daniel et al. 2018; Karydas and Xepapadeas 2022; Ilhan et al. 2023), which leaves a gap about the relation between climate change exposure and corporate financial reporting quality. This paper aims to fill that gap by examining how firm-level climate change exposures are associated with the earnings quality of firms.

Climate change exposures have the potential to affect not only corporate activities and financing decisions but also the quality and transparency of financial reporting. Despite all the studies on environmental, social, and governance (ESG) topics (Kim et al. 2012; Vatis et al 2025; Mamatzakis and Tzouvanas 2025), relatively little is known about how firm-level climate change exposure is associated with earnings quality, which is a very critical measure of accounting information's credibility and reliability.

Earnings quality refers to the extent to which earnings reported reflect the true economic performance of a firm. High-quality earnings provide useful information for decision-making, whereas low-quality earnings may indicate opportunistic managerial actions, such as income smoothing or earnings management. (Dechow et al. 2010; Perotti and Wagenhofer 2014). Prior research has examined the association between firm characteristics, such as governance structures, auditor quality, and financial constraints, and earnings quality. The role of firm-level climate change exposure remains an area yet to be explored.

Climate change exposure may affect earnings quality through various channels. First, firms with higher climate risks may face greater uncertainty when forecasting future cash flows, resulting in higher accrual estimation errors. Second, firms exposed to negative climate-related issues or risks may have stronger incentives to manipulate earnings to present a stable image of performance. In contrast, the increasing regulatory and investor pressure on climate risk may constrain the scope for earnings management, thereby increasing transparency in financial reporting and improving earnings quality. The net effect of these opposing forces remains an empirical question.

We use text-based climate change exposure measures developed by Sautner et al. (2023). This measure is based on the frequency of climate-related terms mentioned in earnings conference call transcripts. It captures the extent to which firms are exposed to, or actively engage with, climate-related topics in their communications. Using this metric, we examine whether firms with higher (lower) climate change exposure are more likely to report lower (higher) quality earnings. Furthermore, we explore whether climate change risk, climate change opportunity, and climate change sentiment affect earnings quality.

Using 54,314 firm-year observations from 2001 to 2024 and Ordinary Least Squares (OLS) regressions, we have tested our hypothesis. Our test results consistently demonstrate that higher overall climate change exposure is significantly associated with lower earnings quality. This effect may be driven by the disruption and informational uncertainty that climate change introduces into firms' operations, increasing the scope for estimation errors and managerial opportunism. The decomposition analysis on climate change exposure also shows that both climate change risk and opportunity discussions independently contribute to the impairment of earnings quality.

On the other hand, our detailed sentiment analysis reveals that while general or positive climate language is associated with low earnings quality, the disclosure of negative climate sentiment is significantly associated with higher earnings quality. This indicates that managerial honesty and transparency regarding climate challenges, rather than mere exposure, are the factors that activate the mitigating influence of external monitoring and reporting discipline.

As climate risk has become a financially relevant concern, we believe that a study on its association with accounting quality is timely and urgent. This study contributes to the literature in several ways. First, it offers a new perspective on the nexus of environmental risk and financial reporting by focusing on firm-specific climate change exposure. Second, this study extends current research on earnings quality by examining a future determinant, climate change risk, that can potentially render managerial reporting incentives disparate. Third, the findings have important policy implications since regulators and investors increasingly expect more transparent climate-related disclosures, which are more aligned with the TCFD (Task Force on Climate-related Financial Disclosures) framework.

The remainder of the paper is as follows. Section 2 discusses the link between climate change exposure and earnings quality. Section 3 presents related prior literature and develops research hypotheses. Section 4 presents the research design and data. Section 5 presents the test results and discusses implications. Finally, Section 6 concludes and discusses the limitations of the paper.

2. Climate Change Exposure and Earnings Quality

(1) Climate Change Exposure and Firms' Decision-making Environment

Climate change may increase uncertainty in firms' decision-making and it is considered as a critical source of risk. Nowadays, firms consider not only traditional financial and operational risks but also climate change related risks such as physical risks (e.g. extreme weather events, supply chain disruptions) and transition risks (e.g. regulatory changes, technological shifts, and evolving consumer preferences). These climate-related factors can affect nearly all aspects of firms' operations, ranging from capital investment decisions to disclosure strategies. (McKinsey & Company 2020; Ilhan et al., 2022)

Firm-level climate change exposure refers to the extent to which a firm's exposures related to opportunity, physical, and regulatory shocks associated with climate change (Sautner et al. 2023). As the firm's operations, assets, or market environment are sensitive to climate-related risks and opportunities, firm-level climate change exposure becomes important for business entities. Particularly, firms in high-risk industries, such as energy, transportation, and manufacturing, may face more volatile cash flows, heightened regulatory scrutiny, and reputational risks. As a result, these risks may influence those firms' financial reporting processes. (European Central Bank 2021; Busch et al. 2022)

From an accounting perspective, climate change exposure may influence managerial incentives for financial reporting through two main channels: informational uncertainty and

strategic disclosure behavior. First, a high level of climate change exposure may increase estimation uncertainty for accrual components such as provisions, asset impairments, and fair value adjustments. This increase in uncertainty may reduce the reliability of accrual estimates, thereby lowering earnings quality. Second, managers of highly climate change-exposed firms may have an incentive to smooth reported earnings in order to project financial stability or downplay environmental risks. (Bi et al. 2024; Imerman et al. 2025; Ben-Abdesslem et al. 2025)

(2) Information Environment and Earnings Quality

Earnings quality has long been studied as a key measure of the reliability and usefulness of reported accounting numbers and overall financial reporting. Theoretically, earnings quality is determined not only by innate factors, stemming from business fundamentals such as operating volatility and asset structure, but also by discretionary factors, arising from managerial choices in financial reporting (Dechow and Dichev, 2002). High earnings quality implies that reported earnings closely reflect underlying economic performance, while low earnings quality suggests potential distortions caused by estimation errors or intentional manipulation.

Climate change exposure may influence the informational environment where which financial reporting takes place. Firms subject to climate-related regulatory pressures or market uncertainty due to climate change may have higher levels of accounting estimation errors, which potentially may lead to lower earnings quality. (Ben-Amar et al. 2022) On the other hand, firms that respond proactively to climate-related challenges and operate under more transparent governance structures may exhibit stronger monitoring and reduced managerial discretion, which may enhance the quality of reported earnings. (Hong et al. 2022) Therefore, the relationship between firm-level climate change exposure and earnings quality is less likely to be unidirectional. Instead, it may vary depending on how firms manage and disclose their climate-related issues. This suggests that the issue represents an interesting topic for empirical research.

Agency theory provides a fundamental theoretical framework for understanding how managers may adjust earnings in response to external pressures. Information asymmetry between managers and shareholders creates opportunities for managerial opportunism (Jensen and Meckling 1976). Under climate-related stress, such opportunistic behavior may lead to earnings management, intended to preserve investor confidence or protect the firm's reputation. Also, if climate change exposure increases earnings volatility, managers can engage in income smoothing in order to signal financial stability. (Gao and Zhang 2015; Shu and Thomas 2019).

On the other hand, firms that are subject to intense monitoring by environmental regulators or climate-focused stakeholders may reduce discretionary reporting, with their intention to mitigate regulatory intervention and reputational damage. (Chen et al. 2022; Hong et al. 2022) This duality suggests that climate change exposure can either enhance or impair earnings quality, depending on the relative dominance of internal managerial incentives over external monitoring.

Firms with higher exposure to climate change can possibly face increased stakeholder pressure to demonstrate environmental accountability. (Flammer et al. 2021) Here, transparent and credible financial reporting may be considered a signaling mechanism for legitimacy and fulfilling the stakeholder expectations. Hence, these firms may prefer to increase the quality of reported earnings by enhancing transparency as a response to climate pressure. (Ismail and Obiedallah 2023) However, when climate risk triggers concerns over possible negative market reactions, managers prefer attempting to conceal bad news by earnings management, which may, in turn, undermine the quality of financial reporting. (Velte 2019)

Another framework to consider the relationship is the risk and information asymmetry model. Climate change exposure can be conceptualized as a form of exogenous uncertainty, which alters the information environment. High uncertainty typically increases the gap between insiders and outsiders in their understanding of firm prospects. Managers, having superior private information, can exploit this gap to manipulate reported performance.

However, climate risk also brings increased external monitoring by regulators, investors, and the media, which can constrain opportunistic behavior. This tension highlights a possible nonlinear relationship. At low to moderate levels of exposure, firms may have both the opportunity and incentive to manage earnings. At very high levels, intensified monitoring may reduce such behavior. (Liu and Han 2025; Li and Flammer 2025)

Combining these perspectives, climate change exposure can influence earnings quality through multiple mechanisms. First, in terms of estimation uncertainty, greater uncertainty in accrual estimation reduces the reliability of reported earnings. Second, climate change exposure may reshape the trade-off between opportunism and transparency in managerial reporting choices. Third, from a monitoring and stakeholder perspective, external scrutiny linked to climate change exposure mitigates or facilitates earnings management, depending on the institutional context.

This integrated view suggests that the relationship between climate change exposure and earnings quality is not straightforward, but is influenced by regulatory and stakeholder channels. While climate change exposure may heighten uncertainty and hence potentially deteriorate earnings quality, it may simultaneously enhance transparency and external monitoring and thereby bring potential improvements. Which effect dominates is inherently an empirical research question.

3. Literature Review and Hypotheses Development

(1) Related Prior Literature Review

The growing literature on corporate responses to climate change demonstrates that firms are increasingly integrating climate-related issues into their strategic and financial decision making. Early research mostly focused on environmental performance and carbon emissions. For instance, Matsumura et al. (2014) found that firms with higher carbon emissions tend to have lower firm valuations, suggesting that markets price carbon risks. Subsequent research expanded beyond emissions to consider broader climate exposure, a firm's sensitivity to both physical and transition risks associated with climate change. (Li and Flammer 2025)

Recent advances in text analysis have enabled researchers to construct firm-level measures of climate exposure. Sautner et al. (2023) developed a climate change exposure index using earnings call announcements of firms, capturing the extent to which the managers discuss climate issues. They found that climate exposure varies substantially across firms and industries and is associated with distinct market reactions. Their findings reinforce that climate change exposure is not uniform but also has an interaction with firm characteristics and market expectations. However, research on the impact of such exposure on the quality of financial reporting remains limited.

Previous studies have investigated how environmental and sustainability factors are associated with earnings quality and accounting conservatism. There is evidence from some sources that companies with superior Environmental, Social, and Governance (ESG) performance have superior earnings quality.

Another stream of research investigates how environmental uncertainty affects conservatism in accounting. Conservatism, which requires recognizing losses more promptly than gains, is particularly critical to firms exposed to climate-related risks that could impair asset values. Li et al. (1997) found that firms subject to higher environmental risk are more likely to adopt

conservative accounting policies. In a similar way, Hossain and Adams (2013) argued that climate-sensitive firms may be more conditionally conservative, potentially as a precautionary response to anticipated asset impairments. This suggests that climate change exposure may enhance certain aspects of financial reporting quality, particularly the timeliness of loss recognition.

However, the relationship between environmental factors and earnings quality is not always positive. When uncertainty increases estimation error, accrual-based earnings quality may deteriorate. In some cases, firms may use environmental reporting as a window dressing mechanism to divert attention from poor financial performance. Choi et al. (2013) found that firms with poor environmental performance, despite extensive sustainability reporting, sometimes exhibit lower earnings quality. This suggests that the mere act of disclosing environmental information does not guarantee improved quality of financial reporting. Rather, managerial incentives and external oversight serve as critical determinants.

Overall, the prior literature provides two contrasting perspectives. One emphasizes the ethical and transparency effects that improve earning quality, and the other highlights the opportunistic use of environmental reporting to manage perceptions. Both are relevant to understanding how climate change exposure may affect earnings quality.

A well-established body of research links firm-level risk and uncertainty to earnings quality. Rajgopal and Venkatachalam (2011) demonstrated that firms with greater exposure to macroeconomic uncertainty exhibit lower earnings persistence and predictability. Similarly, Francis et al. (2005) also showed that higher business risk and operating volatility lead to lower accrual reliability.

Climate change exposure may represent a unique type of uncertainty that combines physical and policy-related components. Because it affects future cash flow expectations and asset valuation, it can bring noise into accrual estimation processes. The connection is similar to industry-specific shocks, such as the oil price volatility or geopolitical risk, which distort accruals and deteriorate earnings quality. Therefore, insights from the broader uncertainty literature can be extended to the context of climate risk.

In summary, prior literature provides partial information about the relation between environmental factors and financial reporting, but several gaps remain. Firstly, most prior literature employs aggregated ESG or CSR scores, making it difficult to isolate the unique impacts of climate change exposure. Secondly, even within the same industry, firms have considerably different perceptions of climate-related risks, and the ways they manage those risks also vary. Therefore, it is necessary to consider firm-level climate exposure. Third, while previous research has explored how climate change exposure affects the valuation of firms, its impact on the reliability of reported earnings has received little attention. By bridging these gaps, this study seeks to advance understanding of how firm-level climate change exposure influences earnings quality.

(2) Hypothesis Development

As discussed in the previous sections, climate change exposure introduces both operational uncertainty and strategic pressures into firms' decision-making. Firms with higher climate change exposure should operate amidst volatile regulatory landscapes, unpredictable shifts in demand, and physical disruptions. Such complexity may increase the difficulty in forecasting future cash flows and thus directly affect the reliability of accrual estimates. Following Dechow and Dichev (2002), we believe that accrual quality would deteriorate when cash flow realizations are uncertain or difficult to estimate. Therefore, a firm's exposure to climate-related risks could naturally reduce the precision of accounting accruals and, consequently, earnings quality.

Beyond the mechanical effect of uncertainty, managerial incentives also play an important role. When firms face financial pressure from climate risk, such as cost increases, stranded assets, or reduced investor confidence, managers may have greater motivation to manipulate earnings to present an image of stability. This ‘performance impression management’ perspective is consistent with prior findings that firms under adverse conditions often engage in income smoothing (Graham et al., 2005).

However, climate change exposure also brings increased stakeholder attention. Institutional investors, regulators, and the public may focus more on how firms respond to climate change. Such attention may constrain opportunistic reporting and promote transparency. Therefore, while uncertainty may generate an environment of reporting low earnings quality, external monitoring and legitimacy pressures may counteract that effect. The net outcome depends on which force dominates.

Given these competing forces, the relationship between climate change exposure and earnings quality remains unclear. Climate change exposure may impair earnings quality through heightened uncertainty in cash flow realizations, while increased stakeholder scrutiny could strengthen reporting discipline. Because these opposing mechanisms may offset or dominate one another in different settings, the expected association cannot be stated a priori in a directional form. Accordingly, we state the hypothesis in its nondirectional, null form as follows:

H₁: Climate change exposure is not associated with earnings quality.

This hypothesis allows empirical analysis to detect either a positive or a negative relationship without imposing directionality in advance. Along with this hypothesis test, we also examine the association between climate change-related opportunities, risks, and sentiments and earnings quality.

4. Data and Research Methodology

(1) Research Model

To test our hypothesis, the following model is estimated:

$$EQ_{i,t} = \beta_0 + \beta_1 CCE_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} + \beta_5 GROWTH_{i,t} + \beta_6 LOSS_{i,t} + \beta_7 BIG4_{i,t} + \beta_8 Age_{i,t} + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \epsilon_{i,j,t}$$

where $EQ_{i,t}$ represents the earnings quality measure (discretionary accruals and income smoothing). The coefficient of interest is β_1 , which captures the association between climate change exposure and earnings quality.

(2) Measurement of Earnings Quality

Earnings quality (EQ) is a complex construct. Following prior research (Dechow et al. 2010), we use two complementary proxies to capture different aspects of EQ: Discretionary accruals and income smoothing.

(a) Discretionary Accruals

Discretionary Accruals is measured using the Jones (1991) model modified by Dechow et al. (1995). Total accruals are regressed against changes in revenue (adjusted for receivables) and

property, plant, and equipment (PPE) for the industry-year. The residuals of this regression are discretionary accruals (DA), a standard proxy for earnings management. The absolute value of discretionary accruals, $|DA|$, is used as the primary earnings quality measure (with higher values implying higher earnings management and lower earnings quality).

$$TA_{i,t}/A_{i,t-1} = \alpha_1(1/A_{i,t-1}) + \beta_1(\Delta REV_{i,t} - \Delta AR_{i,t})/A_{i,t-1} + \beta_2(PPE_{i,t}/A_{i,t-1}) + \epsilon_{i,t}$$

where

$TA_{i,t}$ = total accruals for a firm i at year t ;

$\Delta REV_{i,t}$ = change in net revenues in year t from year $t-1$;

$\Delta AR_{i,t}$ = change in net receivables;

$PPE_{i,t}$ = gross property, plant, and equipment; and

$A_{i,t-1}$ is lagged total assets.

In addition, we estimate the discretionary accruals from the Jones (1991) model (i.e., without the receivable adjustment) and use the absolute value of these discretionary accruals as a complementary measure of earnings quality.

(b) Income Smoothing

Income smoothing captures the extent to which firms use accruals to reduce the volatility of reported earnings relative to operating cash flows. Following Tucker and Zarowin (2006), we construct the income smoothing ranking (IS) as another primary measure of earnings quality.

Tucker and Zarowin (2006) estimate non-discretionary accruals using the Jones Model modified by Kothari et al. (2005) with return on assets as an additional control variable.

$$Accruals_t = a(1/Assets_{t-1}) + b\Delta Sales_t + cPPE_t + dROA_t + \mu_t$$

where $Assets$ is total assets; $Accruals$ is defined as net income minus operating cashflow, deflated by lagged total Assets; $\Delta Sales$ is change in sales scaled by lagged total assets; PPE is gross property, plant and equipment scaled by total assets; ROA, return on assets, is net income over lagged total assets.

The predicted value from this regression is non-discretionary accruals ($NDAP$). The discretionary accruals (DAP) are then:

$$DAP_{i,t} = Accruals_{i,t} - NDAP_{i,t}$$

The pre-discretionary Income (PDI), i.e., unmanaged income, is defined as net income (NI) minus discretionary accruals (DAP).

$$PDI_{i,t} = NI_{i,t} - DAP_{i,t}$$

Note that as DAP is assets-scaled, NI should also be assets-scaled here. The degree of income smoothing is measured using the correlation between the changes in discretionary accruals ($\Delta DAP_{i,t}$) and changes in pre-discretionary income ($\Delta PDI_{i,t}$).

$$IS_{i,t} = Corr(\Delta DAP_{i,t}, \Delta PDI_{i,t})$$

Tucker and Zarowin (2006) compute this correlation using the current year's and past four years' observations and convert them into reverse fractional rankings by two-digit industry SIC code for each year. Thus, the IS measure ranges from 0 to 1 by industry-year, with the highest income smoothers (more negative correlations) having higher rankings, and lower income smoothers (less negative correlations) having lower rankings. The higher income smoothing indicates lower earnings quality.

(3) Measurement of Climate Change Exposure

Climate Change Exposure, *CCE*, measures firm-specific exposures to climate change shocks by counting bigrams relating to technological opportunity, regulatory intervention, or physical threats mentioned in quarterly earnings call transcripts (Sautner et al. 2023). The higher value in Climate Change Exposure, *CCE*, the more exposure to climate change shocks. In this paper, we primarily use Climate Change Exposure data from Sautner et al. (2023).

$$CCE_{i,t} = (1/B_{i,t}) \sum_1^{B_{i,t}} (1[b \in C])$$

Where i is a firm i and t is a quarter. b (bigram) = 0, 1, 2, 3... $B_{i,t}$. C is the bigrams related to all topics (e.g., technological opportunity, regulatory intervention, and physical threats).

In addition, we also test the effects of firm-level exposure to climate change related opportunities and risks on earning quality. Climate Change Opportunity, *CC_OPPE*, is measured as the relative frequency of climate-related statements that frame climate change as a potential source of value creation or competitive advantage. These statements typically refer to innovation, new products, efficiency gains, growth in green markets, or strategic positioning arisen from climate-related regulation or technological change. According to Sautner et al. (2023), the opportunity measure is constructed as the number of opportunity related climate keywords scaled by the total number of words in the transcript.

Climate Change Risk, *CC_RISK*, is measured analogously, capturing the relative frequency of climate-related statements that emphasize potential adverse effects of climate change on the firm. The keywords related to climate risk include regulatory costs, transition risks, physical risks, compliance burdens, stranded assets, or uncertainty related to climate policy and environmental regulation. (Sautner et al. 2023). Taken together, these measures capture the extent to which managers perceive climate change as either a threat or an opportunity for the firm, based on their own language in corporate communications.

We also analyze the impact of the climate change sentiment variable, *CC_SENT*, as measured by Sautner et al. (2023), on earnings quality. The sentiment variable captures the tone of firms' climate change-related discussions in conference calls by quantifying the relative intensity of positive and negative climate-related language. Positive Climate Sentiment, *SENT_POS*, captures optimistic or favorable language used in conjunction with climate-related discussions. This includes words indicating confidence, enthusiasm, or constructive engagement with climate issues. The measure is calculated as the frequency of positive sentiment words appearing near climate-related terms, scaled by total words or total climate-related content. Negative Climate Sentiment, *SENT_NEG*, reflects pessimistic or unfavorable language associated with climate-related discussions. This includes expressions of concern, uncertainty, or downside risk. The negative sentiment measure is constructed analogously to the positive sentiment measure.

By separating sentiment from opportunity and risk content, Sautner et al. (2023) distinguish what managers talk about (opportunity vs. risk) from how they talk about it (positive vs. negative tone). These measures jointly provide a nuanced characterization of firms' climate change exposure and managerial perceptions. Opportunity and risk variables capture the economic framing of climate change, while positive and negative sentiment variables capture the emotional or attitudinal tone with which climate issues are discussed.

(4) Control Variables

Consistent with prior literature on earnings quality (e.g., Francis et al., 2005; Cohen and Zarowin, 2010), we include several control variables to account for firm characteristics that may influence earnings quality. *SIZE* is measured as the natural logarithm of total assets and is expected to be positively associated with earnings quality, as larger firms typically face greater monitoring. *LEV*, defined as total interest-bearing debt divided by total assets, is anticipated to exhibit a negative relation with earnings quality due to higher pressure associated with debt obligations. *ROA* (operating income before tax scaled by total assets) is expected to be positively related to earnings quality, reflecting stronger firm performance. *GROWTH*, measured as the book-to-market ratio, does not have a clear directional prediction, given mixed evidence in prior studies. *LOSS* is an indicator variable equal to one when a firm reports negative net income, and it is expected to be negatively associated with earnings quality. *BIG4* equals one if the firm is audited by a Big 4 auditor and zero otherwise and is expected to be positively associated with earnings quality due to higher audit quality. *AGE* is the firm age measured as natural log of the number of years since the firm has been listed. Finally, we include industry and year fixed effects to control for unobserved heterogeneity across industries and time.

(5) Sample Selection and Data Sources

We use a firm-year dataset of publicly listed U.S. firms from 2001 to 2024. The sample period begins in 2001 to ensure the availability of firm-level climate exposure data and consistent financial reporting variables. The initial sample includes 303,265 firm-year observations covered by Compustat. We exclude financial institutions (SIC 6000-6999) and utilities (SIC 4900-4999) due to their unique regulatory environments and accounting structures. We also exclude firm-year observations if sales or total assets are less than \$1 million. For the measure of firm-level climate change exposure, we use the text-based Climate Change Exposure Index, *CCE*, developed by Sautner et al. (2023). All other financial data come from Compustat. After requiring all necessary variables, the final sample comprises 54,314 firm-year observations. Appendix B describes detailed sample selection procedures.

5. Results and Discussion

(1) Descriptive Statistics and Correlation between Variables

Table 1 presents descriptive statistics for the variables used in the analyses. The sample consists of 54,134 firm-year observations. Earnings quality is measured using three proxies: absolute discretionary accruals based on the Jones model (*ABS_DA*), absolute discretionary accruals based on the modified Jones model (*ABS_DAM*), and income smoothing (*IS*), where higher values indicate lower earnings quality.

Table 1 Descriptive Statistics

	N	Mean	SD	Q1	Median	Q3
<i>CCE</i>	54134	0.0009	0.0017	0.0001	0.0003	0.0008
<i>CC_RISK</i>	54134	0.0000	0.0001	0.0000	0.0000	0.0000
<i>CC_OPPE</i>	54134	0.0003	0.0007	0.0000	0.0000	0.0002
<i>CC_SENT</i>	54134	0.0002	0.0006	0.0000	0.0000	0.0002
<i>SENT_POS</i>	54134	0.0004	0.0008	0.0000	0.0001	0.0004
<i>SENT_NEG</i>	54134	-0.0002	0.0004	-0.0002	0.0000	0.0000
<i>ABS_DA</i>	54134	0.4213	0.9908	0.0325	0.0952	0.3250
<i>ABS_DAM</i>	54134	0.4288	1.0035	0.0330	0.0965	0.3329
<i>IS</i>	54134	0.5402	0.2806	0.3043	0.5534	0.7831
<i>SIZE</i>	54134	7.0909	2.0518	5.7077	7.0986	8.5038
<i>LEV</i>	54134	0.2592	0.2409	0.0640	0.2242	0.3785

<i>ROA</i>	54134	0.0831	0.1821	0.0540	0.1120	0.1664
<i>GROWTH</i>	54134	0.5209	0.9299	0.2236	0.4207	0.7214
<i>LOSS</i>	54134	0.3166	0.4651	0.0000	0.0000	1.0000
<i>BIG4</i>	54134	0.8229	0.3817	1.0000	1.0000	1.0000
<i>AGE</i>	54134	12.3398	6.7349	8.7300	8.7300	15.0000

Table 1 presents descriptive statistics for the variables used in our study. The sample comprises the variables used in our regression analyses. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% and 99% levels.

The mean values of *ABS_DA* and *ABS_DAM* are 0.4213 and 0.4288, respectively, with similar distributions across quartiles, suggesting consistency across the two accrual-based earnings quality measures. Both measures exhibit large standard deviations, 0.9908 and 1.0035, respectively, and large disparities between the mean and the median, 0.0952 and 0.0965, respectively. This suggests a wide dispersion in accrual quality across the sample, with some firm-year observations showing a substantial degree of earnings management. The mean of the income smoothing measure (*IS*) is 0.5402, with a median of 0.5534, indicating a more centralized distribution compared to the accrual-based measures.

The mean of the overall climate change exposure index (*CCE*), from Sautner et al. (2023), is 0.0009, with a standard deviation of 0.0017. The large difference between the mean and the median (0.0003) suggests that the distribution is highly right-skewed, indicating that while most firms have low climate exposure, a small number of firms have significantly higher exposure.

Climate change risk measure (*CC_RISK*) has a mean of 0.0000, which is close to zero, while the opportunity component (*CC_OPPE*) has a mean of 0.0003. The lower mean for *CC_RISK* suggests that specific climate risks are discussed less frequently than general climate-related opportunities (*CC_OPPE*). The mean of positive sentiment (*SENT_POS*, 0.0004) is greater than the mean of negative sentiment (*SENT_NEG*, -0.0002). The mean of overall sentiment (*CC_SENT*) is 0.0002. This indicates that, on average, managerial communication regarding climate change in earnings calls leans slightly towards a positive or opportunistic tone, consistent with impression management incentives.

Regarding firm characteristics, the average firm size (*SIZE*), measured as the log of total assets, is 7.0909, and the mean leverage ratio (*LEV*) is 0.2592. The sample firms report an average return on assets (*ROA*) of 0.0831, while approximately 31.66% of the observations

Table 2 Correlation matrix among all selected variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) <i>CCE</i>																
(2) <i>CC_RISK</i>	0.54***															
(3) <i>SENT_POS</i>	0.86***	0.45***														
(4) <i>SENT_NEG</i>	-0.76***	-0.52***	-0.65***													
(5) <i>CC_SENT</i>	0.68***	0.29***	0.91***	-0.30***												
(6) <i>CC_OPPE</i>	0.87***	0.46***	0.75***	-0.63***	0.61***											
(7) <i>ABS_DA</i>	-0.01***	0.00	-0.01***	0.00	-0.02***	-0.02***										
(8) <i>ABS_DAM</i>	-0.01***	-0.00	-0.02***	0.00	-0.02***	-0.02***	0.93***									
(9) <i>IS</i>	0.02***	0.02***	0.02***	-0.02***	0.02***	0.01***	0.04***	0.03***								
(10) <i>SIZE</i>	0.05***	0.05***	0.05***	-0.03***	0.05***	0.03***	-0.09***	-0.09***	0.25***							
(11) <i>LEV</i>	-0.01***	-0.01	-0.01**	0.00	-0.01***	-0.01***	-0.00	-0.01	-0.04***	0.20***						
(12) <i>ROA</i>	-0.03***	-0.01***	-0.02***	0.03***	-0.01***	-0.04***	-0.11***	-0.12***	0.23***	0.41***	-0.05***					
(13) <i>LOSS</i>	0.01	0.00	-0.00	-0.02***	-0.01***	0.02***	0.08***	0.08***	-0.27***	-0.36***	0.12***	-0.58***				
(14) <i>BIG4</i>	-0.03***	-0.01**	-0.02***	0.03***	-0.01***	-0.03***	-0.04***	-0.03***	0.11***	0.46***	0.07***	0.19***	-0.17***			
(15) <i>GROWTH</i>	0.05***	0.03***	0.03***	-0.05***	0.01***	0.03***	-0.03***	-0.03***	0.04***	-0.00	-0.25***	-0.00	0.04***	-0.04***		
(16) <i>AGE</i>	0.05***	0.03***	0.06***	-0.04***	0.05***	0.06***	-0.00	-0.00	0.06***	0.10***	0.02***	0.06***	-0.05***	-0.04***	0.01	

The asterisks *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively

correspond to loss firms. A large proportion of the sample firms (82.29%) are audited by Big 4 auditors, and the average firm age (*AGE*) is 12.34 years. All continuous variables are winsorized at the 1st and 99th percentiles to mitigate the influence of extreme observations.

Table 2 displays the Pearson correlation matrix for the variables. The correlation analysis confirms strong relationships among all the climate change exposure variables. *CCE* is highly correlated with *CC_RISK*, *CC_OPPE* and *CC_SENT*. *CCE* is strongly correlated with *SENT_POS* and negatively correlated with *SENT_NEG*. This high intercorrelation justifies the approach of testing these related variables in separate regression models (Tables 3, 4, and 5) to avoid multicollinearity issues in the main tests. Crucially, the bivariate correlations between *CCE* and the earnings quality measures are statistically significant. *CCE* exhibits a negative correlation with both *ABS_DA* (-0.01) and *ABS_DAM* (-0.01), but a positive correlation with *IS* (0.02). This conflicting signal highlights the necessity of using multivariate regression analysis to control for confounding firm characteristics. As expected, firm size (*SIZE*) is negatively correlated with *ABS_DA* and *ABS_DAM*, and *BIG4* is also negatively correlated with these discretionary accrual measures, consistent with the monitoring role of large auditors and scale.

(2) Regression Results

Table 3 reports regression results examining the association between firms' climate change exposure (*CCE*), measured by Sautner et al. (2023), and earnings quality. Earnings quality is proxied by absolute discretionary accruals based on the Jones model (*ABS_DA*), absolute discretionary accruals based on the modified Jones model (*ABS_DAM*), and income smoothing (*IS*), where higher values indicate lower earnings quality. All specifications include year and industry fixed effects, and standard errors are clustered at the firm level.

The primary coefficient of interest is β for *CCE*. A positive and significant coefficient on *CCE* implies that greater climate change exposure is associated with lower earnings quality. In Column (1), the coefficient, β , on *CCE* is 13.449 and is highly significant ($p < 0.01$). This result indicates that firms with higher climate change exposure report significantly higher levels of discretionary accruals (*ABS DA*), a direct measure of accrual-based earnings management. Column (2) provides further confirmation, showing that the *CCE* coefficient ($\beta = 15.967$) is also highly significant ($p < 0.01$). The increase in magnitude of *ABS_DA* suggests the association holds robustly even when employing an alternative measure of discretionary accruals (*ABS_DAM*). In Column (3), the coefficient, β , on *CCE* is 6.029 and is highly significant ($p < 0.01$). This finding suggests that firms with greater climate exposure are also more likely to engage in income smoothing activities, which is a common form of opportunistic earnings management used to portray stable performance. Taken together, the results across all three measures provide consistent evidence that climate change exposure is negatively associated with earnings quality.

Collectively, the findings from Table 3 reject our hypothesis H_1 (that firm-level climate change exposure is not associated with earnings quality) and provide strong evidence that firm-level climate change exposure significantly impairs earnings quality. This supports the theoretical channel where the effects of informational uncertainty and managerial opportunism dominate the external monitoring channel.

Control variables perform as expected: *SIZE* is negatively associated with accrual-based management, while *LEV* is positively associated with lower accrual quality, consistent with debt pressure increasing earnings management incentives. *LOSS* is strongly negatively associated with *IS*, which is typical for loss firms. The indicator for Big 4 auditors (*BIG4*) is negatively and

Table 3 CCE Regression

	(1)	(2)	(3)
	<i>ABS DA</i>	<i>ABS DAM</i>	<i>IS</i>
<i>CCE</i>	13.449*** (4.951)	15.967*** (5.425)	6.029*** (4.098)
<i>SIZE</i>	-0.018*** (-7.404)	-0.020*** (-7.755)	0.029*** (17.445)
<i>LEV</i>	0.077*** (3.392)	0.069*** (2.970)	-0.030*** (-2.814)
<i>ROA</i>	0.034 (0.930)	0.060 (1.585)	0.124*** (9.173)
<i>GROWTH</i>	-0.000 (-0.046)	-0.002 (-0.526)	0.014*** (7.314)
<i>LOSS</i>	0.007 (0.652)	0.006 (0.524)	-0.107*** (-23.361)
<i>BIG4</i>	-0.024** (-2.101)	-0.022* (-1.823)	-0.013** (-2.007)
<i>AGE</i>	0.000 (0.464)	0.000 (0.680)	0.002*** (4.203)
<i>Intercept</i>	0.536*** (6.902)	0.381*** (9.375)	0.341*** (14.705)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Obs.	54134	54134	54134
Adj. R ²	0.216	0.233	0.137

All variables are defined in Appendix A. All continuous variables are winsorized at the 1% and 99% levels. The asterisks *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, based on two-tailed tests. t-statistics are reported in parentheses. The estimated robust standard errors are clustered at the firm level.

significantly related to all three earnings quality measures, consistent with higher earnings quality among Big 4 audited firms. Overall, the results in Table 3 document a statistically significant association between *CCE* and multiple earnings quality proxies after controlling for firm characteristics and fixed effects.

Table 4 CC RISK and CC OPPE Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>ABS DA</i>		<i>ABS DAM</i>		<i>IS</i>	
<i>CC_RISK</i>	162.934*** (3.083)		148.985*** (2.792)		68.979*** (3.358)	
<i>CC_OPPE</i>		16.894*** (3.298)		21.400*** (3.988)		11.475*** (3.606)
<i>SIZE</i>	-0.018*** (-7.389)	-0.017*** (-7.317)	-0.020*** (-7.712)	-0.020*** (-7.668)	0.029*** (17.455)	0.029*** (17.453)
<i>LEV</i>	0.077*** (3.379)	0.076*** (3.365)	0.069*** (2.942)	0.069*** (2.940)	-0.030*** (-2.824)	-0.030*** (-2.823)
<i>ROA</i>	0.030 (0.843)	0.032 (0.879)	0.056 (1.475)	0.058 (1.534)	0.122*** (9.050)	0.124*** (9.150)
<i>GROWTH</i>	-0.000 (-0.010)	-0.000 (-0.026)	-0.002 (-0.480)	-0.002 (-0.502)	0.015*** (7.369)	0.014*** (7.324)
<i>LOSS</i>	0.006 (0.591)	0.006 (0.606)	0.005 (0.449)	0.005 (0.470)	-0.107*** (-23.383)	-0.107*** (-23.392)
<i>BIG4</i>	-0.024** (-2.170)	-0.024** (-2.173)	-0.023* (-1.915)	-0.023* (-1.902)	-0.014** (-2.064)	-0.014** (-2.048)
<i>AGE</i>	0.000 (0.500)	0.000 (0.505)	0.000 (0.727)	0.000 (0.721)	0.002*** (4.223)	0.002*** (4.218)
<i>Intercept</i>	0.540*** (6.959)	0.540*** (6.965)	0.386*** (9.513)	0.387*** (9.528)	0.343*** (14.783)	0.343*** (14.795)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	54134	54134	54134	54134	54134	54134
Adj. R ²	0.215	0.215	0.233	0.233	0.136	0.137

All variables are defined in Appendix A. All continuous variables are winsorized at the 1% and 99% levels. The asterisks *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, based on two-tailed tests. t-statistics are reported in parentheses. The estimated robust standard errors are clustered at the firm level.

Table 4 presents results investigating whether the negative effect on earnings quality is driven primarily by risk or opportunity discussions, by testing the decomposed variables of *CC_RISK* and *CC_OPPE* separately. The results show that both components contribute to the deterioration of earnings quality. *CC_RISK* is positively and significantly associated with *ABS_DA* ($\beta = 162.934$, $p < 0.01$) and *ABS_DAM* ($\beta = 148.985$, $p < 0.01$), and *IS* ($\beta = 68.979$, $p < 0.01$). This confirms that the explicit acknowledgment of climate threats is linked to increased earnings management.

CC_OPPE (opportunities) is also positively and significantly associated with *ABS_DA* ($\beta = 16.894$, $p < 0.01$) and *ABS_DAM* ($\beta = 21.4$, $p < 0.01$), and *IS* ($\beta = 11.475$, $p < 0.01$). The finding that both risk and opportunity discussions impair earnings quality is noteworthy. It suggests that the dominant factor is the inherent complexity and uncertainty associated with material climate-related issues, whether it involves estimating the value of potential new ventures (*CC_OPPE*) or forecasting contingent liabilities and asset impairments (*CC_RISK*). This increased estimation

difficulty provides greater scope for managerial discretion and lower accrual precision, leading to lower earnings quality.

Table 5 examines the effect of managerial sentiment on earnings quality using the decomposed sentiment variables, overall climate sentiment index (*CC_SENT*), positive sentiment (*SENT_POS*), and negative sentiment (*SENT_NEG*). The results reveal a nuanced role for managerial language. This analysis is crucial for identifying whether the observed impairment in earnings quality is driven by the mere quantity of climate discussion or the tone and underlying incentives conveyed by management. The results reveal a clear and contrasting pattern based on the sentiment expressed.

The *CC_SENT* is positively and significantly associated with all three proxies for low earnings quality. The coefficient, β , is 21.936 ($p < 0.01$) on *ABS_DA* and 27.429 ($p < 0.01$) on *ABS_DAM*. It is also significantly positive on *IS* ($\beta = 8.527$, $p < 0.01$). The positive tone component shows an even stronger link to earnings management. *SENT_POS* is highly significant and positive across all model, with $\beta = 27.706$ ($p < 0.01$) on *ABS_DA*, $\beta = 30.981$ ($p < 0.01$) on *ABS_DAM*, and $\beta = 9.946$ ($p < 0.01$) on *IS*.

This finding suggests that managers who use more frequent or more positive language concerning climate change are associated with higher levels of earnings management. This is consistent with the hypothesis that managers utilize positive climate talk as a form of ‘greenwashing’ or impression management to divert stakeholder attention from underlying financial volatility or opportunistic accrual choices.

Columns (3), (6), and (9) introduce somewhat interesting results. The negative sentiment component exhibits a highly significant negative coefficient across all three low earnings quality measures, with $\beta = -69.293$ ($p < 0.01$) on *ABS_DA*, $\beta = -68.119$ ($p < 0.01$) on *ABS_DAM*, and $\beta = -24.019$ ($p < 0.01$) on *IS*.

Since *ABS_DA*, *ABS_DAM*, and *IS* are proxies for poor earnings quality, a negative coefficient implies that a higher degree of negative climate sentiment is associated with a higher level of earnings quality (i.e., less accrual-based earnings management and income smoothing). This result provides some evidence in line with the transparency and external monitoring channel story. When managers openly and honestly acknowledge the difficulties, risks, and challenges posed by climate change, this transparency likely subjects them to increased scrutiny from investors, analysts, and regulators. As the decision to disclose adverse information may act as a constraint on subsequent opportunistic financial reporting behavior, it may force managers to adopt more conservative and reliable accounting practices.

The decomposition analysis in Table 5 highlights a critical distinction. It is not the volume of climate discussion that matters for earnings quality, but the tone and frankness of the words. This outcome strongly suggests that when managers openly acknowledge and discuss climate-related difficulties and risks, this increased transparency activates the external monitoring and transparency channel, constraining opportunistic reporting and leading to more reliable financial numbers and higher earnings quality.

Table 5 CC Sentiment Regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	<i>ABS DA</i>			<i>ABS DAM</i>			<i>IS</i>		
<i>CC_SENT</i>	21.936*** (3.558)			27.429*** (4.306)			8.527*** (2.697)		
<i>SENT_POS</i>		27.706*** (5.316)			30.981*** (5.755)			9.946*** (3.679)	
<i>SENT_NEG</i>			-69.293*** (-5.365)			-68.119*** (-5.108)			-24.019*** (-4.193)
<i>SIZE</i>	-0.018*** (-7.333)	-0.018*** (-7.404)	-0.018*** (-7.346)	-0.020*** (-7.692)	-0.020*** (-7.752)	-0.020*** (-7.674)	0.029*** (17.467)	0.029*** (17.444)	0.029*** (17.500)
<i>LEV</i>	0.077*** (3.401)	0.078*** (3.424)	0.076*** (3.337)	0.070*** (2.984)	0.070*** (3.001)	0.068*** (2.907)	-0.030*** (-2.804)	-0.030*** (-2.796)	-0.030*** (-2.865)
<i>ROA</i>	0.030 (0.846)	0.032 (0.894)	0.032 (0.896)	0.057 (1.494)	0.058 (1.539)	0.058 (1.528)	0.122*** (9.043)	0.123*** (9.090)	0.123*** (9.101)
<i>GROWTH</i>	0.000 (0.028)	-0.000 (-0.003)	-0.001 (-0.118)	-0.002 (-0.428)	-0.002 (-0.471)	-0.003 (-0.595)	0.015*** (7.400)	0.015*** (7.365)	0.014*** (7.266)
<i>LOSS</i>	0.007 (0.638)	0.007 (0.656)	0.006 (0.586)	0.005 (0.510)	0.006 (0.523)	0.005 (0.444)	-0.107*** (-23.332)	-0.107*** (-23.348)	-0.107*** (-23.416)
<i>BIG4</i>	-0.025** (-2.214)	-0.024** (-2.164)	-0.024** (-2.127)	-0.024* (-1.952)	-0.023* (-1.899)	-0.022* (-1.870)	-0.014** (-2.098)	-0.014** (-2.066)	-0.014** (-2.045)
<i>AGE</i>	0.000 (0.533)	0.000 (0.482)	0.000 (0.410)	0.000 (0.755)	0.000 (0.703)	0.000 (0.644)	0.002*** (4.240)	0.002*** (4.217)	0.002*** (4.189)
<i>Intercept</i>	0.541*** (6.969)	0.538*** (6.936)	0.535*** (6.895)	0.387*** (9.541)	0.384*** (9.459)	0.381*** (9.369)	0.343*** (14.812)	0.342*** (14.765)	0.341*** (14.715)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	54134	54134	54134	54134	54134	54134	54134	54134	54134
Adj. R ²	0.215	0.216	0.216	0.233	0.233	0.233	0.136	0.137	0.137

All variables are defined in Appendix A. All continuous variables are winsorized at the 1% and 99% levels. The asterisks *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, based on two-tailed tests. t-statistics are reported in parentheses. The estimated robust standard errors are clustered at the firm level.

6. Conclusion

This study examines the association between firm-level climate change exposures, measured by a prior study using a text-based index derived from earnings call transcripts, and earnings quality. Our research fills a critical gap by providing empirical evidence on how the granular, firm-specific measure of climate change exposure impacts the financial reporting quality. Our empirical findings are robust across multiple earnings quality measures.

Our primary results consistently demonstrate that higher overall climate change exposure is significantly associated with lower earnings quality, as indicated by higher discretionary accruals and increased income smoothing. This effect may be driven by the disruption and informational uncertainty that climate change introduces into firms' operations, increasing the scope for estimation errors and managerial opportunism.

Further analyses show that both climate risk and opportunity discussions independently contribute to the impairment of earnings quality. This supports the mechanism that the inherent complexity and uncertainty surrounding all material climate-related issues, regardless of their positive or negative framing, reduces the precision of accounting estimates.

Our detailed sentiment analysis provides more nuanced findings. While general or positive climate language is associated with low earnings quality, the disclosure of negative climate sentiment is significantly associated with higher earnings quality. This may indicate that managerial honesty and transparency regarding climate challenges, rather than simple exposure, is the factor that activates the mitigating influence of external monitoring and reporting discipline.

While our study offers compelling evidence of the association between firm-level climate change exposure and earnings quality, it is subject to several limitations that suggest avenues for future research. The primary index of firm-level climate change exposure, from Sautner et al (2023), is a text-based index derived from earnings call transcripts. Although this methodology captures explicit managerial communication and perceived exposure, it inherently relies on disclosed information.

Sautner et al.'s (2023) index captures the quantity and tone of discussion, but cannot perfectly distinguish between substantive, risk-relevant disclosures and strategic, boilerplate language or 'greenwashing'. The true, underlying economic climate risk faced by a firm might be different from the textual exposure measured. Moreover, since the data is drawn from management's discussion during earnings calls, it may reflect selective reporting incentives rather than a neutral assessment of firm exposure, which introduces noise.

While our sentiment based analyses yield nuanced insights, particularly the finding that negative climate sentiment is associated with higher earnings quality, the scope for deeper investigation is constrained by data limitations. Because the sentiment measures are constructed by Sautner et al (2023), we cannot further decompose sentiment into more granular categories or validate managerial intent using alternative textual sources. Future research that combines proprietary sentiment measures with hand collected disclosures or alternative communication channels may provide richer insights into how tone, credibility, and transparency jointly shape financial reporting quality.

Another limitation lies in the measurement of earnings quality. We employ standard, well-validated proxies for earnings management, including absolute discretionary accruals and the income smoothing measure. However, discretionary accruals models, while standard, are model-specific and inherently noisy. They capture both intentional manipulation and genuine, but complex, estimation errors, making the precise attribution of the coefficient challenging. Future research could address those limitations.

A further limitation of our study relates to hypothesis formulation. While we develop a nuanced conceptual framework that highlights competing mechanisms, we ultimately adopt a non-directional hypothesis. Future research could strengthen the theoretical contribution by advancing more directional or conditional hypotheses that explicitly articulate when uncertainty effects are expected to outweigh monitoring effects, or vice versa. Finally, our analysis is subject to potential endogeneity and reverse causality concerns. Because the climate change exposure measure is derived from managerial discourse during earnings calls, it may partially capture firms' disclosure style rather than their underlying economic exposure to climate risks.

Nevertheless, this study contributes to the literature by firmly establishing a negative link between climate change exposure and financial reporting quality and by providing evidence on the

counteracting forces of informational uncertainty (reducing earnings quality) and transparency (improving earnings quality).

The findings carry important policy implications. For standard-setters (e.g., TCFD, ISSB), our evidence suggests that merely mandating a greater quantity of climate disclosure, which raises climate change exposure, may not be sufficient to safeguard financial reporting quality. Instead, standards must emphasize the quality, verifiability, and conservatism of climate disclosures to constrain opportunistic reporting. For investors, our study provides a cautionary signal. Climate change exposed firms, particularly those that use predominantly positive language, should be viewed with greater scrutiny regarding the credibility of their reported earnings.

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Appendix A: Variable Definition

<i>CCE</i>	Relative frequency with which bigrams related to climate change occur in the transcripts of earnings conference calls. The number of such bigrams is divided by the total number of bigrams in the transcripts. Source: Sautner et al. (2023)
<i>CC_RISK</i>	Relative frequency with which bigrams related to climate change are mentioned together with the words “risk” or “uncertainty” (or synonyms thereof) in one sentence in the transcripts of earnings conference calls. The number of such bigrams is divided by the total number of bigrams in the transcripts. Source: Sautner et al. (2023)
<i>CC_OPPE</i>	Relative frequency with which bigrams that capture opportunities related to climate change occur in the transcripts of earnings conference calls. The number of such bigrams is divided by the total number of bigrams in the transcripts. Source: Sautner et al. (2023)
<i>CC_SENT</i>	Relative frequency of climate change bigrams that occur in the vicinity of positive and negative tone words that are summarized by Loughran and McDonald (2011) in one sentence in the transcripts of earnings conference calls. The number of such bigrams is divided by the total number of bigrams in the transcripts. Source: Sautner et al. (2023)
<i>SENT_POS</i>	Relative frequency with which bigrams related to climate change are mentioned together with positive tone words that are summarized by Loughran and McDonald (2011) in one sentence in the transcripts of earnings conference calls. The number of such bigrams is divided by the total number of bigrams in the transcripts. Source: Sautner et al. (2023)
<i>SENT_NEG</i>	Relative frequency with which bigrams related to climate change are mentioned together with the negative tone words that are summarized by Loughran and McDonald (2011) in one sentence in the transcripts of earnings conference calls. The number of such bigrams is divided by the total number of bigrams in the transcripts. Source: Sautner et al. (2023)
<i>ABS_DA</i>	Absolute value of discretionary accruals, where discretionary accruals are computed using the Jones (1991) model.
<i>ABS_DAM</i>	Absolute value of discretionary accruals, where discretionary accruals are computed using the Jones (1991) model modified by Dechow et al. (1995)
<i>IS</i>	Income smoothing ranking following Tucker and Zarowin (2006). The IS measure ranges from 0 to 1 by industry-year with the highest income smoothers having higher rankings, and lower income smoothers having lower rankings.
<i>SIZE</i>	Firm size; natural log of total assets (AT)
<i>LEV</i>	Financial leverage; interest-bearing debt (DLTT+DLC) to total assets (AT)
<i>ROA</i>	Return on asset; operating income before tax/average total assets (OIBDP/averag AT)
<i>GROWTH</i>	Book-to-market; ratio of book (CEQ)-to-market value (PRCC_C multiplied by CSHO) at the year end.
<i>LOSS</i>	An indicator variable that takes 1 if net income before extraordinary items (IB) is negative during the current year, and 0 otherwise
<i>BIG4</i>	An indicator variable that takes 1 if the firm is audited by a Big 4 auditor, and 0 otherwise
<i>AGE</i>	Firm age: Natural log of the number of years since the firm has been listed.

Appendix B. Sample Selection

Criteria	Number of Firm-Years
Compustat firm-year from 2001 to 2024	303,265
Less:	
Financial and Utility firms	(135,732)
Remaining	167,533
Less:	
Remove if sales or total assets are less than \$1 million.	(39,647)
Remaining	127,886
Less:	
Observations without climate risk exposure measure from Sautner et al. (2023)	(59,417)
Remaining	68,469
Less:	
Observations without all necessary dependent and control variables	(14,335)
Final Sample	54,134