



Corporate sustainability reporting directive impact on risk framing and commitment specificity: Evidence from EURO STOXX 50

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ABSTRACT

This paper examines how the European Union's Corporate Sustainability Reporting Directive (CSRD) has altered the tone and credibility of corporate climate disclosures among EURO STOXX 50 firms. Using company sustainability reports from 2020 to 2024, we construct two textual indicators based on ClimateBERT and ClimateBERT_{CTI}: (i) the Cheap Talk Index (CTI), which measures the prevalence of vague or aspirational language, and (ii) the Opportunity-Risk Index (OppRisk), which captures the balance between opportunity and risk framing (Bingler et al., 2024). Nonparametric comparisons of pre- and post-CSRD periods reveal a statistically significant rise in the CTI and decline in the OppRisk Index, indicating a shift toward increasingly more symbolic yet more risk-aware communication. These findings suggest that regulatory standardization may simultaneously encourage a riskier yet less opportunistic tone and incentivize more the use of generic, non-specific commitment language.

1. Introduction

The Corporate Sustainability Reporting Directive (CSRD) (Directive 2022/2464/EU)¹ marks a paradigm shift in the European Union's sustainability disclosure landscape, significantly expanding both the scope and depth of non-financial reporting. By mandating comprehensive and comparable sustainability information, the CSRD reshapes how firms communicate their environmental and social impacts. This regulatory overhaul offers a unique opportunity to assess not only what firms disclose under mandatory rules, but also how they articulate their narratives.

A central question is whether regulatory pressure enhances the substantive quality of sustainability disclosures or merely encourages more standardized and symbolic communication. While prior work has focused on disclosure volume, compliance, and quality (e.g., Korca et al. (2021)) and green innovation (e.g., Mbanye et al. (2022)), relatively little is known about the linguistic and tonal shifts induced by regulation. Understanding these expressive shifts is critical for investors and stakeholders to manage climate related-risks, opportunities and assess the credibility (e.g., Engle et al., 2020; Bolton and Kacperczyk, 2022; Yang et al., 2025).

Early evidence from New Zealand's TCFD/ISSB-aligned framework provides a useful benchmark. Gehricke et al. (2025) show that mandatory climate reporting improves disclosure quality and induces portfolio reallocation toward lower-carbon assets, indicating that standardized

reporting can affect real economic behavior. However, differences in market size and regulatory context limit direct generalization to the EU. Consistent with this concern, EU-based evidence points to heterogeneous effects of disclosure mandates across firms and industries (e.g., Nampoothiri et al. (2024)).

Recent advances in Natural Language Processing (NLP) enable systematic evaluation of the credibility and tone of sustainability disclosures. ClimateBERT-based analyses show that even TCFD-aligned reporting may rely on selective or non-material language (Webersinke et al., 2021; Bingler et al., 2022). Related work documents persistent symbolic communication and strategic framing in corporate climate disclosures (Coen et al., 2022; Bronzini et al., 2023), underscoring the value of linguistic measures for assessing regulatory and reputational responses.

Building on this literature, we examine how the CSRD reshapes the tone and credibility of climate-related communication. Mandatory reporting may increase firms' acknowledgment of climate risks while simultaneously incentivizing more generic or aspirational language to preserve managerial discretion. This dual effect motivates the following hypotheses:

- **H1:** CSRD reduces opportunity-versus risk-based sentiment, as reflected in lower median values of the OppRisk index.

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¹ The first reporting under CSRD applies to the financial year 2024.

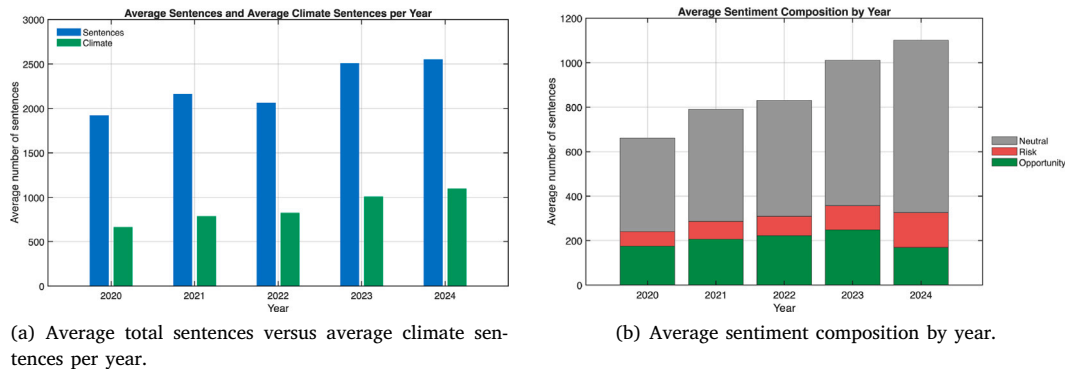


Fig. 1. Evolution of average report and climate volume and average sentiment composition in sustainability reports.

- **H2:** CSRD increases the use of vague or non-committal language, resulting in higher median values of the Cheap Talk Index.

To test these hypotheses, we apply NLP to sustainability reports of EURO STOXX 50 firms from 2020 to 2024. Following Bingler et al. (2024), we adapt ClimateBERT to construct two novel text-based indicators. The OppRisk Index captures the tone of climate disclosure by measuring the balance between opportunity- and risk-oriented language. The Cheap Talk Index (CTI) proxies for disclosure credibility by quantifying the use of non-committal or symbolic statements.

Following the CSRD’s implementation in 2024, the OppRisk Index declines while the CTI rises, indicating a shift toward more risk-aware yet more formulaic disclosure. These findings highlight the dual effects of regulatory standardization, which strengthens the salience of climate risks while also encouraging symbolic adaptation. Our study contributes new text-based evidence on how regulation shapes the tone and quality of sustainability communication, complementing Armour et al. (2024) by showing how firms adapt their narratives through expressive shifts that may signal either greater credibility or symbolic conformity.

The paper is organized as follows: Section 2 presents the data and methodology; Section 3 reports the main findings; and Section 4 concludes with implications and avenues for future research.

2. Data and methodology

We construct a panel dataset of EURO STOXX 50 firms from 2020 to 2024 and extract textual indicators from their annual sustainability reports. All reports are published in English and converted from PDF to text using optical character recognition. Following Bingler et al. (2024) and Lagasio (2024), we identify climate-related sections and apply sentence-level NLP classification. As shown in Fig. 1(a), both total report length and climate-related content increase over time.

To capture the credibility of corporate climate communication, we compute the Cheap Talk Index (CTI) proposed by Bingler et al. (2024). We apply ClimateBERT_{CTI} to climate-related sentences to classify commitment and specificity, and construct the CTI as the share of non-specific commitments among all commitment-related statements. Aggregating sentence-level classifications yields a firm-year CTI that reflects the prevalence of aspirational or non-committal language in climate disclosures.

$$CTI_{i,t} = \frac{COMMIT \cap NONSPEC_{i,t}}{COMMIT_{i,t}}, \quad (1)$$

where $CTI_{i,t}$ represents the Cheap Talk Index for firm i in year t . The denominator, $COMMIT_{i,t}$, corresponds to the total number of climate-related sentences identified as commitment or action. The numerator, $COMMIT \cap NONSPEC_{i,t}$, captures the subset of these sentences that are classified as both commitment and non-specific. In practical

disclosure terms, an increase in the Cheap Talk Index implies that a meaningful share of climate-related commitments becomes less specific, with firms relying more on aspirational language rather than concrete, verifiable actions.

The CTI captures the linguistic “cheap talk” component of climate commitments by measuring the share of non-specific commitment statements. Higher CTI values indicate greater reliance on generic language and may reflect standardization, legal caution, or template-driven reporting during regulatory transitions rather than deliberate misrepresentation. Consistent with this interpretation, Bingler et al. (2024) show that higher CTI is associated with emissions growth, more negative media coverage, and weaker links between disclosure and real climate action, suggesting that CTI can serve as an early indicator of transition and reputational risk.

We then apply a trained sentiment classification model based on ClimateBERT_{CTI} to classify the sentiment of climate-related sentences as opportunity, neutral, or risk,² following the approach of Webersinke et al. (2021). We construct the OppRisk Index (Opportunity–Risk Index), which captures firms’ exposure to opportunity-related climate risks by quantifying the imbalance between opportunity-related and risk-related disclosures in their sustainability reports. Formally, the index is defined as:

$$OppRisk_{i,t} = \log \left(\frac{SentOpportunity_{i,t} + 1}{SentRisk_{i,t} + 1} \right), \quad (2)$$

where $SentOpportunity_{i,t}$ and $SentRisk_{i,t}$ denote, respectively, the number of opportunity-related and risk-related sentences in the climate disclosures of firm i at time t . Positive values indicate a predominance of opportunity-related communication (optimistic tone), whereas negative values indicate a stronger emphasis on risk-related disclosures (pessimistic tone). A balanced communication results in values close to zero.

Fig. 1(b) shows the evolution of sentiment composition in climate-related disclosures over time. While the volume of climate-related content increases (Fig. 1(a)), the share of opportunity-oriented language declines, risk-related language becomes more prominent, and neutral statements expand. In parallel, the share of neutral statements has expanded consistently, suggesting a trend toward more standardized or descriptive reporting styles over time.

To assess the impact of the CSRD, we compare key textual indicators Pre-CSRD period (≤ 2023) and a Post-CSRD period (≥ 2024) using median-based nonparametric tests. Mood’s median test and the Wilcoxon rank-sum test evaluate differences in central tendency, while Hodges–Lehmann shifts and Cliff’s delta quantify the magnitude and direction of the changes. This dual nonparametric approach allows us to

² For a detailed explanation of the sentiment analysis methodology, see Bingler et al. (2024).

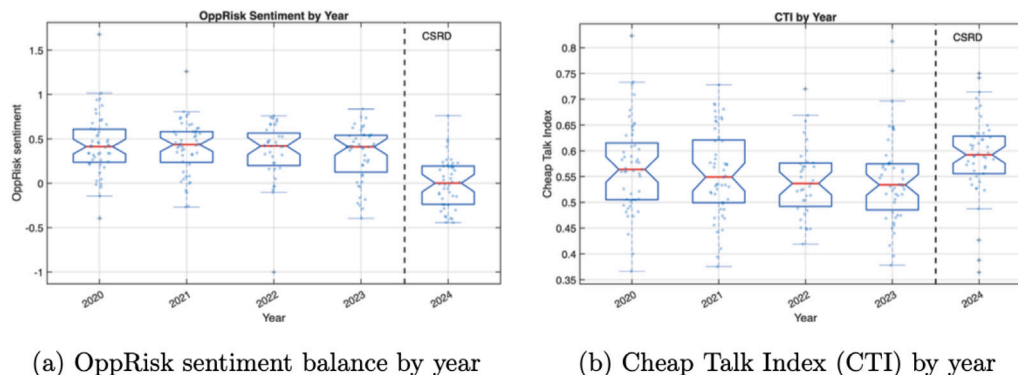


Fig. 2. Evolution of Cheap Talk Index (CTI) and OppRisk among EURO STOXX 50 firms. Both indicators show structural shifts around the CSRD implementation period: a moderate increase in the CTI (more generic or aspirational tone) and a decline in OppRisk (greater risk awareness).

detect not only statistically significant differences in language style that may violate parametric assumptions, but also economically meaningful changes associated with the introduction of the CSRD.

3. Empirical results

Fig. 2 plots the temporal dynamics of the CTI and OppRisk Index. A pronounced decline in OppRisk and a concurrent increase in the CTI around the CSRD implementation period signal a structural shift in firms' climate-related communication. Specifically, the results point to heightened risk awareness alongside a discernible move toward broader and less specific narrative framing.

The statistical evidence provides strong support for a substantive shift in disclosure tone. For the CTI, the median increases from 0.550 in the pre-CSRD period to 0.592 in the post-CSRD period, indicating a shift toward more aspirational or generic language. Mood's median test rejects the null of equal medians ($\chi^2(1) = 10.918$, $p = 9.524 \times 10^{-4}$), and the Wilcoxon rank-sum test also reports a significant difference ($z = -3.468$, $p = 5.24 \times 10^{-4}$). The Hodges–Lehmann estimator indicates a central tendency shift of 0.0456, while Cliff's delta of 0.332 reflects a moderate effect size. These results point to a statistically meaningful increase in tone inflation following the implementation of the CSRD.

For the OppRisk Index, the median decreases from 0.4168 in the pre-CSRD period to 0.001 in the post-CSRD period, indicating a marked reduction in opportunity-oriented language. Mood's median test rejects the null of equal medians ($\chi^2(1) = 38.951$, $p = 4.345 \times 10^{-10}$), while the Wilcoxon rank-sum test also yields highly significant results ($z = 6.854$, $p = 7.19 \times 10^{-12}$). The Hodges–Lehmann estimator suggests a central tendency shift of -0.395 , and Cliff's delta of -0.655 implies a large effect size. Overall, these statistics indicate a statistically robust and economically meaningful reorientation toward risk-centric language in sustainability disclosures following the implementation of the CSRD.

Taken together, these results reveal a regulation-induced realignment of disclosure strategies: as reporting becomes more standardized under the CSRD, firms downplay opportunity-oriented rhetoric while amplifying risk framing and broad narrative appeals, thereby reshaping the informational texture of corporate climate communication.

Evidence from EURO STOXX 50 firms points to a marked reorientation in disclosure tone following the CSRD. The increase in the CTI indicates greater reliance on generic or aspirational language, while the decline in the OppRisk Index reflects a shift toward more risk-aware and cautious communication.

This dual movement highlights a nuanced regulatory effect. On the one hand, enhanced prescriptiveness increases the salience of climate risks; on the other, rising CTI values suggest that firms strategically adapt their language to meet compliance requirements while preserving rhetorical flexibility, consistent with prior evidence on the tension

between standardization and strategic communication (Bingler et al., 2024, 2022).

Extending the findings of Gehricke et al. (2025), our results show that the CSRD alters not only the volume and structure of disclosures but also their expressive dimensions, promoting more risk-conscious yet more formulaic communication. This linguistic adaptation highlights both the progress achieved through regulatory standardization and the persistent gap between formal compliance and substantive transparency.

For investors and regulators, these results underscore the importance of monitoring not only what firms disclose, but also how they communicate it. Text-based indicators such as the OppRisk Index and the CTI provide scalable, content-sensitive tools for detecting whether regulatory interventions translate into meaningful transparency or remain partially symbolic. These measures can help inform supervisory practices, guide standard-setting, and improve the informational efficiency of sustainability reporting regimes.

4. Conclusion

This paper provides novel evidence that the EU's CSRD has reshaped the tone of sustainability communication among large European firms. Using firm-level textual indicators from EURO STOXX 50 sustainability reports, we document a decline in opportunity-oriented language alongside a rise in vague or non-committal statements following CSRD implementation. This pattern suggests that while mandatory reporting increases acknowledgment of climate-related risks, it may also encourage more symbolic and standardized disclosure practices.

For policymakers, this underscores the need to design frameworks that do more than prescribe content—they must also reward clarity, specificity, and substance. From an investor perspective, these textual indicators can serve as early warning signals of disclosure credibility. Elevated CTI levels may flag firms whose sustainability communication is more rhetorical than substantive, potentially indicating higher reputational or transition risk. Conversely, a decline in the OppRisk Index may reflect increasing risk awareness, which can inform assessments of climate exposure, valuation, and portfolio screening. Integrating these indicators into investment strategies or ESG assessments can therefore enhance the detection of greenwashing and improve capital allocation decisions.

These findings highlight a core trade-off in sustainability regulation: harmonization can enhance comparability while potentially reducing the informativeness of firm-specific narratives. Text-based indicators such as the CTI and OppRisk Index offer scalable tools to monitor not only what firms disclose, but how they communicate it, with implications for both regulatory oversight and investment analysis.

Our conclusions should be interpreted with caution. The analysis covers only one post-CSR year, lacks a control group and unobserved macroeconomic or sectoral factors may partly account for the observed shifts, limiting causal inference. Future research should extend the time horizon, incorporate quasi-experimental designs, and link linguistic shifts to financial and environmental outcomes to assess whether these patterns reflect short-term adaptation or more persistent changes in sustainability communication.

Declaration of Generative AI and AI-assisted technologies in the writing process

Statement: During the preparation of this work, the author(s) used ChatGPT to improve language clarity and style. The author used AI and NLP to process EURO STOXX 50 reports and compute relevant measures and statistics. The author(s) carefully reviewed and edited all content generated with the assistance of AI and take full responsibility for the integrity and accuracy of the final manuscript.

Data availability

The data was downloaded from the subscription based LSEG service.

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