

Tone in Climate Disclosures under CSRD/ESRS: Evidence from the Oslo Stock Exchange

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Abstract

This study investigates firms' mandatory climate-related communication under the new European sustainability reporting rules, the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS). We study whether ESRS E1 disclosures on climate change have a neutral tone and whether tone is related to firms' ESG performance.

The sample consists of firms listed on the Oslo Stock Exchange, required to report under CSRD in 2024. We analyze the text of their disclosures using dictionary-based tone measures. We measure positive versus negative language, certainty versus uncertainty language and test whether tone is associated with firms' ESG scores and with negative changes in ESG scores.

The results show that the disclosures are generally not neutral in tone. On average, firms use more positive than negative words and more certainty than uncertainty words. We also find that firms with higher ESG scores and firms with declining ESG scores use more positive language than other firms. The latter result is not robust across all tests.

The study contributes early evidence on the language used in climate reporting under CSRD/ESRS. It suggests that tone remains a strategic part of sustainability reporting even when disclosure requirements are detailed, mandatory, and subject to assurance.

Key words: Climate disclosure, CSRD, ESRS E1, disclosure tone, ESG performance

1. INTRODUCTION

The Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS) represent a fundamental shift in the regulation of corporate sustainability reporting in Europe. In contrast to earlier voluntary reporting environments characterized by voluntary frameworks, heterogeneous reporting practices, and limited standardization, the CSRD requires firms within its scope to provide extensive, standardized, and assured sustainability disclosures. ESRS E1, which governs climate-related reporting, is important to this development because it requires firms to disclose detailed information on climate-related impacts, risks, opportunities, governance, targets, transition plans, and metrics. The shift aims at improving comparability, transparency and decision usefulness in sustainability reporting (Christensen et al., 2021; Haji et al., 2023).

At the same time, tighter regulation of disclosure content does not eliminate managerial discretion over the disclosures. Even when firms are obliged to follow detailed requirements regarding what must be reported, they still retain flexibility in how climate-related information is framed, emphasized, and linguistically communicated. Narrative tone is one important dimension of this residual discretion. Tone may affect whether firms communicate climate topics in an optimistic, cautious, confident, or neutral manner and as a consequence shape how stakeholders interpret the substance and credibility of the disclosure (Cho et al., 2010; Fisher et al., 2020).

Prior research shows that the tone of environmental and climate-related disclosures does not necessarily mirror underlying environmental performance. Firms with weaker environmental performance may use optimistic or self-promotional language in ways consistent with impression management (Cho et al., 2010), while firms with stronger sustainability performance may use positive language as a credible signal of superior performance or strategic preparedness

(Connelly et al., 2011). More recent evidence on climate disclosures further suggests that favorable narrative tone can diverge from substantive climate outcomes, giving rise to concerns about symbolic communication or cheap talk (Bingler et al., 2024).

However, most prior evidence on tone in environmental and climate disclosure comes from voluntary reporting environments or from earlier, less standardized regulatory settings. In addition, some related studies focus more narrowly on carbon reporting quality rather than on the broader set of climate-related disclosures required under ESRS E1 (e.g., Houqe and Khan, 2023). Prior research on mandatory sustainability reporting further shows that regulation has an impact on disclosure quality (Hamed et al., 2022). However, little is known about whether tone remains a strategic communication device under a mandatory regime such as CSRD/ESRS, where disclosure requirements are more detailed, reporting is subject to external assurance, and the regulatory ambition is to align sustainability reporting more closely with the rigor of financial reporting (Christensen et al., 2021; Haji et al., 2023). This creates an important empirical question: When disclosure content becomes more tightly regulated, does the overall narrative tone become more neutral, or does it remain a channel for strategic communication? Evidence from the EU Non-Financial Reporting Directive suggests that mandatory regulation can affect environmental disclosure tone, but that it does not necessarily eliminate variation in narrative style (Anwar et al., 2025). To better understand the impact of the new mandatory regulation, research, particularly in Scandinavian contexts, is valuable as the Scandinavian countries are characterized by strong institutional trust and climate ambition.¹

¹ Norway and Denmark are the only Scandinavian countries with CSRD rules applying already to the 2024 financial year. Sweden implemented CSRD into national law with effect from 1 July 2024, but for most companies the Swedish rules apply to financial years beginning after 30 June 2024, meaning calendar-year firms first report under CSRD for financial year 2025. Iceland, as of early 2026, does not appear to have completed national implementation of CSRD.

Research on the implications of CSRD/ESRS is beginning to emerge, and show, for instance, that CSRD sustainability disclosures attract a similar level of web-traffic as the financial disclosures (Hagemeier and Müller, 2026). Our paper fits into this stream while also providing evidence on the debate of greenwashing, evaluating whether this new regulatory initiative has delivered on its promises.

This study investigates how firms use disclosure tone under the mandatory ESRS E1 regime², using a sample of firms listed on the Oslo Stock Exchange that were subject to mandatory CSRD reporting requirements in 2024. We focus on two related questions. First, we examine whether climate-related disclosures under ESRS E1 are characterized by a neutral tone in the first year of mandatory reporting. Second, we investigate whether disclosure tone varies systematically with firms' ESG performance. In particular, we examine whether firms with higher ESG scores use more positive tone, and whether firms experiencing a deterioration in ESG scores adopt a more positive tone in their climate disclosures.

The paper contributes to prior literature in three ways. First, it provides early evidence on the linguistic features of climate-related disclosures under the newly implemented CSRD/ESRS regulation. Second, it contributes to the literature on sustainability disclosure tone by examining whether narrative framing remains strategically relevant when disclosure content is highly standardized (Cho et al., 2010; Bingler et al., 2024). Third, by focusing on firms listed on the Oslo Stock Exchange, the paper provides evidence from a setting characterized by strong

² We focus on climate disclosures under ESRS E1 because ESRS E1 offers a particularly structured and comparable setting for studying sustainability reporting under CSRD. ESRS E1 requires firms to disclose detailed information on climate-related governance, strategy, risks, opportunities, transition plans, metrics, and targets (European Commission, 2023). Climate is among the most salient and decision-relevant sustainability issues for investors (Krueger et al., 2020). Compared with broad ESG reporting, which combines heterogeneous environmental, social, and governance dimensions and often suffers from substantial variation in scope and measurement, a climate-specific focus provides a cleaner empirical setting for identifying disclosure tone (Berg et al., 2022).

institutions, high climate-policy salience, and active reporting supervision. Norway performs strongly on standard international measures of institutional quality (World Bank, 2024), has sustained and ambitious climate-policy commitments (OECD, 2022), and operates in an environment in which The Financial Supervisory Authority of Norway explicitly reviews sustainability reporting for comparability, reliability, and compliance with ESRS requirements.

2. THEORIES, LITERATURE, AND HYPOTHESES DEVELOPMENT

2.1. Mandatory climate disclosure under ESRS E1 and the continued relevance of tone

The introduction of the CSRD and ESRS changes the institutional setting for sustainability reporting in Europe in fundamental ways. Earlier reporting environments often combined voluntary frameworks, broad principles, and substantial variation in reporting practices across firms. By contrast, the ESRS framework introduces standardized disclosure requirements, greater comparability, and external assurance. ESRS E1 requires firms to report structured information on climate-related impacts, risks, opportunities, governance, targets, transition plans, and performance metrics. More broadly, recent reviews of sustainability-reporting regulation suggest that mandatory disclosure regimes may alter both the quantity and quality of corporate sustainability communication (Christensen et al., 2021; Haji et al., 2023).

This increased standardization reduces managerial discretion over whether climate-related topics are disclosed and narrows discretion over disclosure content. However, it does not fully eliminate the discretion. Climate disclosures remain partly narrative, especially in discussions of strategy, transition planning, risk management, and future commitments. As a result, firms may still vary in how they frame equivalent disclosure topics, the emphasis they place on achievements versus risks, and the linguistic tone they adopt. In this sense, mandatory reporting shifts the central disclosure choice from whether to disclose to how to disclose. This distinction is important

because tone can influence how stakeholders interpret the seriousness, credibility, and strategic orientation of climate-related reporting. Prior work on corporate accountability narratives shows that tone is not simply cosmetic but can materially shape how disclosure is perceived and evaluated (Fisher et al., 2020). Tone therefore remains a relevant object of analysis even under a highly standardized regime.

2.2. Legitimacy theory, signaling theory, and tone in climate disclosure

Legitimacy theory suggests that firms seek to maintain congruence between their actions and broader societal expectations in order to preserve continued support and access to resources (Suchman, 1995; Deegan, 2002). Climate-related issues are particularly salient in this respect because firms are increasingly expected to demonstrate credible responses to climate risk and the low-carbon transition. Corporate climate disclosures therefore serve not only an informational role but also a legitimizing role. When firms face legitimacy threats, such as weak sustainability performance or deteriorating external assessments, they may seek to protect or restore legitimacy by emphasizing positive initiatives, commitments, or future improvements (Suchman, 1995; Deegan, 2002).

Signaling theory provides a complementary, but distinct explanation. Because climate-related risks, transition strategies, and sustainability performance are difficult for external stakeholders to observe directly, firms with stronger underlying performance may use disclosures to signal private information (Spence, 1973; Connelly et al., 2011). In this perspective, positive disclosure tone may reflect an attempt to signal strategic preparedness, superior environmental performance, or managerial confidence. However, signaling theory also highlights that communication is only credible when supported by observable outcomes or governance mechanisms. Where positive

tone is not supported by substantive action, stakeholders may interpret it as symbolic communication rather than informative disclosure (Connelly et al., 2011; Bingler et al., 2024). Together, legitimacy theory and signaling theory imply that disclosure tone may vary with underlying sustainability performance, but for different reasons. Firms with strong ESG performance may use positive tone to signal credible strength, whereas firms facing deteriorating ESG assessments may use positive tone to offset negative perceptions and defend legitimacy.

2.3. Prior literature on tone, environmental performance, and disclosure credibility

Prior research shows that tone is an important feature of environmental and sustainability disclosure. Cho et al. (2010) demonstrate that environmental disclosures may reflect impression management rather than neutral communication of underlying environmental performance. Their findings suggest that firms with weaker environmental records may adopt favorable language in order to influence stakeholder perceptions. Similarly, Arena et al. (2015) show that disclosure tone in environmental reporting is linked to governance characteristics, suggesting that narrative framing is related not only to performance but also to the reporting context in which information is produced.

Subsequent studies strengthen the view that climate-related disclosure tone may be only weakly aligned with actual climate outcomes. Bingler et al. (2024) show that favorable climate disclosure language does not necessarily correspond closely to substantive climate initiatives or emissions-related outcomes, which is consistent with concerns about cheap talk and symbolic communication. More broadly, meta-analytic evidence suggests that the relationship between environmental performance and environmental disclosure is complex and not uniformly positive across settings, measures, and institutional contexts (Doan and Sassen, 2020). At the same time, favorable tone need not always indicate opportunistic reporting. Firms with stronger

sustainability performance may have legitimate reasons to communicate climate-related achievements in positive terms. Governance and assurance structures are therefore relevant because they may affect whether disclosure tone is perceived as informative or opportunistic. Prior literature suggests board oversight, governance quality, and reporting systems are associated with more credible and higher-quality climate-related disclosure (Arena et al., 2015; Houqe and Khan, 2023).

Against this backdrop, the implementation of ESRS E1 offers a setting in which competing forces operate simultaneously. On the one hand, standardization, assurance, and enforcement may constrain overly promotional reporting and encourage more neutral language. On the other hand, firms still retain some room to shape narrative tone, and incentives for signaling or legitimacy management may persist. This makes the tone of ESRS E1 disclosures an empirical question rather than something that can be assumed a priori.

2.3. Hypotheses development

Overall tone under mandatory climate reporting

The first issue examined in this study is whether climate-related disclosures under ESRS E1 are characterized by an overall neutral tone. The shift from voluntary to mandatory reporting is likely to affect disclosure style. ESRS E1 requires firms to provide structured, detailed, and assured disclosures on climate-related topics, which may reduce the scope for highly promotional reporting. The standards require firms to discuss both risks and opportunities, targets and performance, and governance and transition plans. In addition, external assurance and regulatory scrutiny may increase the cost of exaggerated or one-sided language. Prior research shows that assurance and governance structures improve the credibility and informational quality of sustainability disclosures (Caglio et al., 2020; Houqe and Khan, 2023).

For these reasons, mandatory climate disclosure under ESRS E1 may be expected to produce an overall tone that is more neutral tone than has often been observed in earlier sustainability-reporting settings (Christensen et al., 2021; Haji et al., 2023; Anwar et al., 2025).

H1: Climate-related disclosures under CSRD/ESRS E1 exhibit an overall neutral tone.

Tone as a response to ESG performance

Although regulation, assurance and scrutiny from supervisory authorities constrain disclosure content, they do not eliminate the narrative discretion. As a result, firms may still adjust the tone of their communication in response to changes in sustainability performance. From a signaling perspective, firms with stronger ESG performance are more likely to possess favorable private information about their sustainability profile and may have greater incentives to communicate that strength to stakeholders (Spence, 1973; Connelly et al., 2011). Positive tone may therefore function as a credible signal of superior sustainability performance, especially when disclosures are made in a setting characterized by assurance and regulatory oversight (Connelly et al., 2011). In addition, stronger sustainability performers may face lower risk that positive wording will be interpreted as opportunistic because their favorable claims are more likely to be supported by substantive underlying performance. Accordingly, firms with higher ESG scores may be expected to use a more positive tone in their climate-related disclosures.

H2a: Firms with high ESG scores exhibit a more positive tone in their climate-related disclosures under CSRD/ESRS E1 than firms with lower ESG scores.

A different mechanism arises when firms experience deterioration in external ESG assessments. Legitimacy theory suggests that organizations facing adverse signals may attempt to preserve or restore legitimacy by emphasizing favorable actions, commitments, or future improvements

(Suchman, 1995; Deegan, 2002). A negative change in ESG score may increase stakeholder concern and create pressure to explain or offset that deterioration. Under such circumstances, firms may adopt a more positive tone in climate-related reporting in order to reassure stakeholders and reduce the perceived severity of the negative signal. This expectation is consistent with evidence showing that firms with weaker environmental performance may employ more favorable language in their disclosures and with recent work indicating that climate narratives may contain a significant symbolic component (Cho et al., 2010; Bingler et al., 2024).

H2b: Firms experiencing a negative change in ESG scores exhibit a more positive tone in their climate-related disclosures under CSRD/ESRS E1 than firms which do not experience a negative change in ESG scores.

3. DATA AND RESEARCH DESIGN

3.1. Data and sample

Our sample consists of firms listed on the Oslo Stock Exchange (OSE) that were subject to mandatory CSRD reporting requirements in 2024.³ According to information from The Financial Supervisory Authority of Norway, a total of 106 firms were subject to mandatory CSRD reporting in 2024. We exclude firms only listed with debt securities, financial firms, firms not reporting in accordance with the CSRD framework, and firms reporting only in Norwegian. After these exclusions, the sample used in the analyses of overall disclosure tone, hypothesis 1, comprises 68 firms. To test hypotheses 2a and b, we further exclude firms with missing ESG data, resulting in a final sample of 51 firms. The details of the sample selection process are presented in Table 1.

³ We identified these firms with the help of The Financial Supervisory Authority of Norway.

[Insert Table 1 about here]

3.2. Data preprocessing

ESG reports were retrieved from the firms' websites and transferred into txt-files. We used the R-packages `tm` and `stringi` to create a corpus for analyses for each firm. We then used `tidytext`, `dplyr`, `tidyverse` and `stringr` to unnest tokens and remove stopwords⁴ to isolate interpretable word frequencies when at the same time preserving comparability across firms before analyzing the disclosures (Laviola and Cucari, 2026).

3.3. Measurement of tone

Research on tone in text is conducted across different disciplines and with different methods (see for instance, Kerney and Liu, 2014, for a summary of text-based sentiment analysis in finance, and Todd et al., 2024 for a more recent summary). Existing literature applies various measures, with particular attention to positive and negative tones. Also, other tones, such as neutral tone (Tan et al., 2014), and optimism, realism, and certainty (Fisher et al., 2020) are measured. Prior research shows, for instance, that report ambiguity (use of uncertainty words) in 10-K-filings has an impact on firms' borrowing costs (Ertegrul et al., 2017).

When tone is measured using dictionary-based methods in financial disclosure settings (see, for instance, Loughran and McDonald, 2016, for an overview of prior research), commonly used general-purpose tone dictionaries (e.g., DICTION) are found to perform poorly in forward-looking corporate disclosures (Li, 2010) and domain-specific dictionaries generally outperform

⁴ To measure certainty and uncertainty, stopwords are, however, included in the counts as many of the most important certainty and uncertainty words are treated as stopwords in the `stop_words` dataset in `tidytext`.

general purpose word lists (Loughran and McDonald, 2011, 2016). Prior research on disclosure tone in the ESG context using dictionary-based methods relies on different wordlists such as the Bing lexicon and the AFINN score (e.g., Laviola and Cucari, 2026). We rely on multiple tone measures and robustness tests rather than assuming that any single dictionary fully captures tone in ESRS E1 disclosures, and, in additional analyses, explore whether the Loughran and McDonald wordlist (2011) is suitable for analyzing certainty tone in ESG disclosures.

With a lexicon-based approach, the words in the text are assigned with a sentiment if they are listed in any of the dictionaries applied (Zhang, 2018). We count the use of words in four categories: (1) positive words (2) negative words (3) certainty words, and (4) uncertainty words. Words that are not listed in any of the above-mentioned categories are considered neutral.

To measure positive and negative tone, we use the Bing lexicon (Hu and Liu, 2004) in the `tidytext` R-package, a dictionary used in recent sentiment ESG research such as Laviola and Cucari (2026). To measure certainty tone as well as uncertainty tone, we construct two short dictionaries based on the most important words in the Loughran and McDonald wordlist categories of strong modals and uncertainty⁵ (Loughran and McDonald, 2011), but we also include a small number of words that are typical for ESG reports and relevant for the certainty concept. We suggest that prior measures do not really capture how firms express certainty in their ESG disclosures and therefore include four words that are used a lot in ESG disclosures and express this important dimension. Consequentially, to measure certainty tone, we count the following words in the text: will, must, committed, target, reduce, and reduction. Hedging is a

⁵ In the Loughran and McDonald wordlist, will, best, and must are the three most important certainty words. We do not include best as we find it irrelevant in the ESG setting. May, could, and might are the three most important uncertainty words in the Loughran and McDonald wordlist.

way to express uncertainty or caution, often used in scientific writing (Hyland, 1996) with words such as may, could, and possibly. We build on Loughran and McDonald’s terminology and use the term uncertainty for such words. To measure uncertainty tone, we count the following words in the text: may, might, could, aim, and seek. For robustness testing, we measure positive and negative tone using the Loughran and McDonald wordlist⁶ and the AFINN score (Loughran and McDonald, 2011; Nielsen, 2011) from the R-package `tidytext`. For use in our additional analyses, we measure certainty tone with the words that Loughran and McDonald (2011) label strong modals, and to measure uncertainty tone, we use the uncertainty words from Loughran and McDonald’s wordlist.

After counting the sentiment words in the ESRS E1 disclosures, we construct two scales: (1) a net positivity scale measuring how positive the firms are in their reporting as the number of positive words minus number of negative words divided by the total number of words in the report and (2) a net certainty scale measuring how the reports convey uncertainty as the number of certainty words minus the number of uncertainty words divided by the total number of words in the disclosure.

Prior ESG disclosure research has, to our knowledge, not tested the extent to which such disclosures may actually use a neutral tone, but such testing has become more relevant as the CSRD/ESRD requirements turn what used to be disclosures with a high degree of freedom of expression into more template-based reporting with closer scrutiny by auditors and financial regulators. According to Ding (2024, p. 3) neutral tone in financial disclosures “refers to language that is objective, unbiased, and avoids extreme sentiments, neither overly positive nor

⁶ Given regulators’ ambition of the CSRD to align ESG disclosures with other financial disclosures, we find the Loughran and McDonald wordlist, in particular used in the field of finance, highly relevant for our study.

negative”. We therefore suggest that a useful measure for tone neutrality is to consider the tone in a disclosure neutral when (1) the number of positive words is equal to the number of negative words, and/or 2) the number of certainty words is equal to the number of uncertainty words.

3.4. Generation of a synthetic dataset as a benchmark

To test hypothesis 1, we generate a synthetic dataset that we use as a neutral benchmark for comparison with the disclosures of our sample firms. To construct the synthetic dataset, we use the information about the actual number of words in the disclosures of the firms in the sample and set the probability for positive, negative, certainty, and uncertainty words at 2 percent. For each firm in the sample, we generate a synthetic twin firm and count the number of sentiment words for each synthetic firm. The dataset of synthetic firm disclosures is used to form the synthetic distribution. We are not aware of much prior ESG research that reports on the frequency of different sentiment words but build on Ertugrul et al. (2017) who show that 1.4 percent of words in 10-K files are uncertainty words.

3.5. Model specification

We specify the following regression model to test hypotheses 2a and 2b:

$$(1) \text{ Tone}_i = \beta_0 + \beta_1 \text{ESGScore}_i + \beta_2 \text{NegESGchange}_i + \beta_3 \ln \text{Assets}_i + \beta_4 \text{ROA}_i + \beta_5 \text{Energy}_i + \varepsilon_{i,t}$$

We use two measures for tone. To test hypotheses 2a and 2b, which predict that tone is more positive for higher ESG scores and negative changes in ESG scores, we use our *Net positivity* scale. In additional analyses, we measure tone by our *Net certainty* scale. We include two test variables: (1) *ESGScore* and (2) *NegESGchange*. *ESGScore* is a variable that measures ESG performance on a scale from 0 to 100. *NegESGchange* is a dummy variable that equals 1 if the

change in ESG score from 2023 to 2024 is negative, and 0 otherwise. Hypotheses 2a and 2b imply that the coefficients on these variables (β_1 and β_2) are expected to be positive. The ESG data are retrieved from the LSEG Data & Analytics database.

We include several control variables to control for potential confounding effects. We obtain these data from the database PROFF Forvalt, a Norwegian database containing financial and non-financial information on Norwegian firms and organizations.

To control for firm size, we include the variable *lnAssets*, measured as the natural logarithm of total assets. We include *ROA* to control for a potential effect of profitability. *ROA* is measured as net profit divided by the average of total assets from 2023 to 2024. Industry is likely to affect climate risk and consequently tone as well. To control for this, we construct a dummy variable where we identify a sector especially vulnerable to climate risk, i.e., the energy sector. *Energy* is a dummy variable that equals 1 if the firm belongs to the energy sector, and 0 otherwise. Finally, the auditor may also play a role in shaping the tone of disclosure. To control for this, we construct a variable, *IndustryLeader*, a dummy variable that equals 1 if the firm is audited by one of the audit firms defined as an industry leader, and 0 otherwise. Findings related to this variable are included in our robustness testing. Both PWC and EY are defined as industry leaders in this sample. PWC is the industry leader in terms of count, but EY is the industry leader in terms of client revenue.

The variables are also described in appendix.

4. RESULTS

4.1. Summary statistics

Our sample consists of 397,521 words in 68 ESRS E1 disclosures (see Table 2). The average report contains 5,845.9 words of which 97.4 are positive words, 71.1 are negative words, 56.8 are certainty words and 9.3 are uncertainty words. The disclosures differ considerably in size from a minimum of 1,595 words for the shortest disclosure to 13,895 words for the longest. The most frequently occurring positive word is *sustainability*, which appears 1,015 times. *Risks* and *risk* are the most used negative words, used 1,901 times. *Will* is the most used certainty word (1,169 times) and *may* is the most used uncertainty word (used 277 times). Table 3 provides an overview of the most frequently used words in the four categories.

[Insert Table 2 and 3 about here]

Figure 1 shows that 20 firms use more negative words than positive words in their disclosures, and no firms in our sample use more uncertainty words than certainty words.

[Insert Figure 1 about here]

Finally, Figure 2 illustrates that firms excluded from the final sample of 51 firms (i.e., firms without ESG data, and presumably less experienced with ESG reporting) appear slightly more cautious in their reporting.

[Insert Figure 2 about here]

The descriptive statistics of our two scales *Net positivity* and *Net certainty* as well as our synthetic dataset can be found in Table 4 (n = 68). The Pearson correlation between *Net positivity* and *Net certainty* is 0.37, i.e., indicating that more positive disclosures tend to be more certain in their climate reporting than disclosures with a less positive tone (see Figure 1). From a linguistic perspective, this suggests that some firms have a more cautious reporting style, combining less

positive language with relatively more uncertainty words compared to certainty words. Other firms appear more confident, using more positive language together with relatively more certainty words than uncertainty words.

[Insert Table 4 about here]

Table 5, Panel A, reports descriptive statistics for the variables in our sample of the 51 disclosures from firms with available ESG scores. The mean value of *Net positivity* is 0.004, suggesting that on average the number of positive words slightly exceeds the number of negative words in the disclosures. The mean value of *Net certainty* is 0.008 suggesting that on average the disclosures contain slightly more certainty words than uncertainty words.

ESGScore has a mean value of 55.88. *NegESGchange* has a mean value of 0.53, implying that 53 percent of the observations have a negative change in ESG score.

For the continuous control variables, *lnAssets* and *ROA*, the mean values are 16.98 and 0.05, respectively. The control variable specified as a dummy, *Energy*, has a mean value of 0.20. This indicates that 20 percent of the firms in the sample operate in the energy industry.

[Insert Table 5 about here]

Panel B of Table 5, presents Pearson's correlation coefficients between the variables. *ESGScore* is significantly related to *Net positivityL* at 10 percent level and *AFINN* score at 1 percent level. The variable *NegESGchange* is not significantly related to any of the dependent variables. Firms that score high on the *Net positivity* scale also tend to score high on the other positivity scales (*Net positivityL* and *AFINN*) and on the net certainty scales (*Net certainty* and *Net certaintyL*). The correlations between the test and control variables are reasonably low. The highest

correlation is 0.45 between *ESGScore* and *lnAssets*. The Variance Inflation Factor (VIF) values are low in all the regressions (untabulated), suggesting that multicollinearity is not an issue.⁷

4.2. Main results

Hypothesis 1 – Do climate disclosures have a neutral tone?

We test hypothesis 1 on our sample of 68 ESRS E1 disclosures. To test hypothesis 1, we first test whether the means of *Net positivity* and *Net certainty* is significantly different from zero. The mean score of *Net positivity* is 0.0035 and significantly different from zero ($t = 4.16$, $p = 0.000$). The mean score of *Net certainty* is 0.0077 and significantly different from zero ($t = 16.50$, $p = 0.000$).

We then compare the findings from the dataset with our synthetic neutral dataset using visualization. Figure 3a and 3b show the density distributions of the two tone scales and the corresponding distributions of the synthetic datasets.

[Insert Figure 3a and 3b about here]

Table 4 contains the means and standard deviations of the distributions. As shown in Figure 3a and 3b, the real distributions for both the *Net positivity* and the *Net certainty* scale are clearly skewed to the right relative to the synthetic neutral distributions, indicating that the tone in the ESRS E1 disclosures is not neutral. To test whether the real and the synthetic samples come from the same underlying distribution, we apply the two-sample Kolmogorov-Smirnov test. The tests

⁷ Mean VIF is around 1.

indicate a statistically significant difference between the two samples for both *Net positivity* ($D = 0.4265$, $p = 0.000$) and *Net certainty* ($D = 0.8235$, $p = 0.000$).

When using the Loughran and McDonald wordlist for calculating the net positive score, the real sample is clearly skewed to the right, and there is a significant difference between the real and the synthetic sample ($D = 0.5882$, $p = 0.000$), see Figure 4a, similar to our findings using the Bing lexicon. For the net certainty score, however, the real sample is skewed to the left of the synthetic sample, but there is a significant difference between the samples ($D = 0.6471$, $p = 0.000$), see Figure 4b.

[Insert Figure 4a and 4b about here]

AFINN scores of zero are considered as neutral tone in prior research in diverse fields, such as marketing (Looi and Kahlor, 2024) and ESG research (Laviola and Cucari, 2026). Only 11 of the 68 ESRS E1 disclosures have an AFINN score below zero. The mean score of the disclosures is 76.5, significantly different from zero ($t = 7.5796$, $p = 0.000$).

Altogether, we reject hypothesis 1 that the tone in the disclosures is neutral when measured using the *Net positivity* and the *Net certainty* scales.

Hypothesis 2 – Are ESG measures associated with tone?

To examine hypotheses 2a and 2b, we use our sample of 51 ESRS E1 disclosures. We estimate regression equation (1), regressing *Net positivity* on test variables *ESGScore* and *NegESGchange* as well as the control variables. The results are presented in Table 6.

[Insert Table 6 about here]

The *ESGScore* coefficient is positive and significant at the 5 percent level (t-value = 1.82, p-value = 0.038, one-sided). Although the statistical significance is somewhat modest, likely due to the small sample size, the result provides support for hypothesis 2a, indicating that firms with higher ESG scores tend to use more positive tone in their disclosures than firms with lower ESG scores.

The coefficient for *NegESGchange* is also positive and marginally significant (t-value = 1.36, p-value = 0.09, one-sided).

To assess the robustness of these results, the model is re-tested with *lnAssets* as the only control variable. In this reduced model, the *ESGScore* variable remains positive and significant (t-value = 1.75, p-value = 0.03, one-sided), and *NegESGchange* also remains positive with similar statistical significance (t-value 1.35, p-value = 0.09, one-sided)

Overall, these results suggest that firms with better ESG performance, or those experiencing negative changes in ESG scores, tend to use a more positive tone in their ESRS E1 disclosures. However, the evidence should be interpreted with some caution.

4.3. Robustness analyses

To further test the robustness of our findings, we first investigate whether findings change with our other measures for the dependent variable: *net_positivityL* and *AFINN score*, see Table 6. In these models, *ESGScore* is positive and significant at the 5 percent level (t = 1.88, p-value = 0.03, one-sided) with *Net positivityL* as the dependent variable and significant at the 1 percent level (t = 2.91, p = 0.003, one-sided) with *AFINN score* as the dependent variable. These findings support our prior findings related to hypotheses 2a. The *NegESGchange* coefficient is still positive but not significantly associated with our two alternative measures of tone positivity.

Second, we replace the *Energy* variable with the *IndustryLeader* variable to investigate whether the auditor has an impact on the tone in the disclosures, see Table 7. *IndustryLeader*, has a mean value of 0.73. This indicates that 73 percent of the sample firms are audited by one of the industry-leading audit firms (EY or PwC). The *IndustryLeader* variable is significantly (1 percent level) associated with the *AFINN score* but not with the other dependent variables. The finding indicates that the auditors may have different policies when it comes to which words they tell their clients to use or avoid in an ESG report. Future research could look more into whether ESG-specific lexicons could better measure what constitutes positive and negative words in the ESG setting.

[Insert Table 7 about here]

4.4. Additional analyses – the use of certainty and uncertainty words

We also regress *Net certainty* on the same test and control variables using regression equation (1) with *ESGScore* and *NegESGchange* as the test variables. The results are reported in Table 8.

Neither *ESGScore* nor *NegESGchange* is significantly associated with *Net certainty*, using two-sided confidence levels, but both coefficients are positive and *NegESGchange* is significant at the 10 percent level, one-sided, with t-value of 1.47 and p-value of 0.0745 in the full model.

Altogether, these findings indicate that the ESG variables are associated also with other types of tone measures, but findings are only indicative. Future research could investigate which certainty words are the most relevant in the ESG setting to better understand how firms use certainty and uncertainty words to potentially affect the users of the reports.

[Insert Table 8 about here]

5. CONCLUSION

This study examines how firms communicate climate-related information under the new CSRD/ESRS reporting regime, using firms listed on the Oslo Stock Exchange as our sample. Our main research questions are whether climate disclosures under ESRS E1 tend to exhibit a neutral tone, and whether disclosure tone varies with firms' ESG performance.

Regarding the first question, the evidence suggests that the disclosures are not neutral. Firms consistently use more positive and more certain language than would be expected in a genuinely neutral text. This finding is somewhat surprising given the level of detail in the CSRD/ESRS framework. The standards leave firms with less discretion than voluntary reporting frameworks do, yet firms still appear to rely on relatively more favorable language when describing their climate-related activities and performance. This suggests that tone management may persist even when sustainability reporting becomes mandatory.

With respect to the second question, we find some support for the idea that disclosure tone is associated with ESG performance, although the results are modest and should be interpreted with some caution given the relatively small sample. Firms with higher ESG scores tend to use more positive language, which is consistent with signaling theory: firms with stronger performance have incentives to communicate this more confidently. More interestingly, firms experiencing declines in ESG scores also tend to adopt a more positive tone, which aligns with predictions from legitimacy theory. When performance deteriorates, firms may try to compensate through more favorable disclosure tone. However, the robustness tests do not support this latter finding.

Overall, our findings suggest that disclosure tone remains a strategic communication choice even under a tightly regulated reporting framework. Regulators and auditors may therefore want to pay

closer attention to the narrative aspects of CSRD disclosures, not just whether the required information is provided. Our findings also suggest that wordlists previously used in the finance literature may not all be as relevant in the ESG setting, in particular, when it comes to relevant certainty-related words. Future research could examine more closely which words are most important for capturing certainty in ESG reports. Future research could also explore the importance of negations in dictionary-based tone analyses.

This study has several limitations which must be considered when interpreting the results. Lexicon-based tone measurement, while widely used, does not capture how words interact with their broader textual context, meaning that some nuance is inevitably lost (Loughran and McDonald, 2016).

In addition, the sample is relatively small and covers only the first year of mandatory reporting for Norwegian firms. Nevertheless, including other jurisdictions will ultimately add more noise, and extending the analysis to later periods is challenging because the Omnibus regulation changes future ESG disclosure requirements for some firms, making it likely that less effort will be devoted to disclosures after 2024. Further, our sample comprises all listed Norwegian firms with available ESG data and is therefore well suited to improve our understanding of disclosure tone in settings characterized with high scrutiny from auditors and financial regulators. Consequently, we expect the findings to generalize to similar settings world-wide. Future research using larger samples, more advanced text analysis methods, and longitudinal designs could provide a clearer picture of how disclosure tone evolves as firms gain more experience with ESRS reporting.

APPENDIX

Variable	Definition
<i>Net positivity</i>	Number of positive words minus negative words scaled by the total word count using the Bing lexicon
<i>Net certainty</i>	Number of certainty words minus uncertainty words scaled by the total word count using our new short ESG dictionary
<i>Net positivityL</i>	Number of positive words minus negative words scaled by the total word count using the Loughran and McDonald wordlist
<i>Net certaintyL</i>	Number of strong modal words minus uncertainty words scaled by the total word count using the Loughran and McDonald wordlist
<i>AFINN score</i>	The AFINN score computed using the <code>Tidytext</code> R-package
<i>ESGScore</i>	A score representing ESG performance on a scale from 0 to 100.
<i>NegESGchange</i>	A dummy variable that equals 1 if the change in ESG score from 2023 to 2024 is negative, and 0 if not.
<i>lnAssets</i>	The natural logarithm of total assets.
<i>ROA</i>	Net profit divided by the average of total assets from 2023 to 2024.
<i>Energy</i>	Dummy variable that equals 1 if the firm belongs to the energy sector, and 0 if not.
<i>IndustryLeader</i>	Dummy variable that equals 1 if audited by one of the audit firms defined as industry leader, and 0 if not.

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Tables

Table 1 Sample selection

Sample selection	Observations
Firms subject to mandatory CSRD reporting in 2024	106
<i>Exclusion criteria</i>	
Firms listed exclusively with debt securities	21
Financial firms	11
Firms not reporting or only in Norwegian	6
Full sample (used to test hypothesis 1)	68
Firms with missing data on ESG variables	17
Final sample (used to test hypotheses 2a and b)	51

Table 2 Descriptive statistics for words measuring tone in the reports (n = 68)

	Total	Count in percent of total words	Mean	SD	Min	Median	Max
<i>Total words</i>	397,521		5,845.9	2,606.9	1,595	5,403	13,895
<i>Positive Count</i>	6,621	0.017	97.4	55.1	26	80	293
<i>Negative count</i>	4,836	0.012	71.1	30.2	17	67.5	155
<i>Certainty count</i>	3,863	0.010	56.8	35.0	6	51.5	152
<i>Un-certainty count</i>	630	0.002	9.3	6.5	0	8	30

Table 3 Top 5 words in each category (n = 68)

Positive	Count	Negative	Count	Certainty	Count	Un- certainty	Count
sustainability	1,015	risks	1,124	will	1,169	may	277
significant	442	risk	779	reduction	998	could	178
sustainable	333	waste	412	target	816	aim	114
progress	214	gross	341	reduce	662	might	40
support	213	negative	198	committed	151	seek	21

Table 4 Descriptive statistics for the real dataset and the synthetic dataset (n = 68)

Metric	Real mean	Real SD	Neutral mean	Neutral SD
<i>Net positivity</i>	0.003512	0.006961	0.000231	0.002349
<i>Net certainty</i>	0.007743	0.003868	-0.000149	0.001993

Table 5 Summary Statistics (n = 51)**Panel A: Descriptive Statistics**

	count	mean	sd	p50	min	max
<i>Net positivity</i>	51	0.004	0.006	0.004	-0.009	0.017
<i>Net positivityL</i>	51	0.005	0.004	0.006	-0.002	0.014
<i>Net certainty</i>	51	0.008	0.004	0.009	0.001	0.018
<i>Net certaintyL</i>	51	-0.006	0.004	-0.006	-0.016	0.004
<i>AFINN score</i>	51	89.510	83.357	72.000	-37.000	301.000
<i>ESG score</i>	51	55.882	16.800	57.022	11.412	83.541
<i>NegESGchange</i>	51	0.529	0.504	1.000	0.000	1.000
<i>lnTotalAssets</i>	51	16.977	1.556	17.019	12.538	21.121
<i>ROA</i>	51	0.047	0.079	0.048	-0.205	0.250
<i>Energy</i>	51	0.196	0.401	0.000	0.000	1.000

Panel B: Pearson's Correlation Matrix (n = 51)

		v1	v2	v3	v4	v5	v6	v7	v8	v9	v10
<i>Net positivity</i>	v1	1.00									
<i>Net positivityL</i>	v2	0.60***	1.00								
<i>Net certainty</i>	v3	0.33**	0.20	1.00							
<i>Net certaintyL</i>	v4	0.59***	0.12	0.53***	1.00						
<i>AFINN score</i>	v5	0.68***	0.52***	0.28**	0.36***	1.00					
<i>ESG score</i>	v6	0.17	0.25*	0.16	0.01	0.40***	1.00				
<i>NegESGchange</i>	v7	0.17	0.03	0.22	0.06	0.05	-0.03	1.00			
<i>lnTotalAssets</i>	v8	-0.02	0.08	0.12	0.02	0.37***	0.45***	0.11	1.00		
<i>ROA</i>	v9	0.05	0.06	0.13	0.10	0.09	-0.07	-0.08	0.03	1.00	
<i>Energy</i>	v10	-0.06	0.08	-0.17	-0.13	0.25*	0.18	-0.03	0.44***	-0.05	1.00

Panel A reports descriptive statistics: mean, standard deviation, median, minimum and maximum values. Panel B reports the Pearson's correlation matrix among the variables. * (**) *** indicates significance at the 10 (5) 1 percent levels.

Table 6 Regression results

	<i>Net positivity</i>		<i>Net positivity</i>		<i>Net positivityL</i>		<i>Net positivityL</i>		<i>AFINN score</i>		<i>AFINN score</i>	
	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>
<i>ESG score</i>	0.000**	(1.82)	0.000**	(1.75)	0.000**	(1.88)	0.000**	(1.69)	1.588***	(2.91)	1.492***	(2.82)
<i>negESG</i>	0.003*	(1.36)	0.002*	(1.35)	0.000	(0.39)	0.000	(0.29)	9.404	(0.43)	5.875	(0.27)
<i>change</i>												
<i>lnTotalAssets</i>	-0.001	(-0.82)	-0.001	(-1.10)	-0.000	(-0.55)	-0.000	(-0.27)	8.294	(0.95)	12.109	(1.49)
<i>ROA</i>	0.007	(0.46)			0.005	(0.39)			132.031	(0.86)		
<i>Energy</i>	-0.000	(-0.22)			0.001	(0.55)			26.695	(0.92)		
<i>cons</i>	0.008	(0.67)	0.009	(0.92)	0.005	(0.73)	0.004	(0.55)	-156.503	(-1.22)	-202.578	(-1.64)
<i>N</i>	51		51		51		51		51		51	
<i>R²</i>	0.084		0.076		0.075		0.064		0.231		0.205	
<i>adj. R²</i>	-0.018		0.017		-0.027		0.004		0.146		0.155	

This table presents the results from regressing positivity variables on test and control variables as described in equation 1. Robust t-statistics based on Huber-White standard errors are reported in parentheses. * (**) *** indicates significance at the 10 (5) 1 percent levels using two-tailed tests and one-tailed tests for the directional hypotheses.

Table 7 Regression results alternative control variable

	<i>NetPositivity</i>		<i>NetPositivityL</i>		<i>AFINNScore</i>	
	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>
<i>ESG score</i>	0.000*	(1.88)	0.000**	(1.73)	1.929***	(3.75)
<i>NegESGchange</i>	0.003	(1.43)	0.000	(0.32)	11.374	(0.54)
<i>lnTotalAssets</i>	-0.001	(-1.20)	-0.000	(-0.28)	9.501	(1.24)
<i>ROA</i>	0.007	(0.51)	0.004	(0.35)	137.165	(0.93)
<i>IndustryLeader</i>	0.001	(0.65)	-0.000	(-0.39)	56.168***	(2.99)
<i>cons</i>	0.008	(0.83)	0.004	(0.57)	-232.863*	(-1.99)
<i>N</i>	51		51		51	
<i>R²</i>	0.091		0.072		0.306	
<i>adj. R²</i>	-0.010		-0.031		0.229	

This table presents the results from regressing positivity variables on test and control variables, substituting the control variable *Energy* with the control variable *IndustryLeader* as described in section 4.3. Robust t-statistics based on Huber-White standard errors are reported in parentheses. * (**) *** indicates significance at the 10 (5) 1 percent levels using two-tailed tests, and one-tailed tests for directional hypotheses.

Table 8 Regression results alternative tone measure

	<i>Net certainty</i>		<i>Net certainty</i>		<i>Net certaintyL</i>		<i>Net certainty</i>	
	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>	<i>Coeff.</i>	<i>t-stat</i>
<i>ESG score</i>	0.000	(1.15)	0.000	(1.03)	0.000	(0.04)	0.000	(0.02)
<i>NegESGchange</i>	0.002	(1.47)	0.002	(1.58)	0.000	(0.33)	0.000	(0.37)
<i>lnTotalAssets</i>	0.000	(0.74)	0.000	(0.20)	0.000	(0.41)	0.000	(0.06)
<i>ROA</i>	0.007	(0.98)			0.005	(0.66)		
<i>Energy</i>	-0.002*	(-1.70)			-0.001	(-1.17)		
<i>Constant</i>	0.000	(0.02)	0.004	(0.66)	-0.009	(-1.25)	-0.006	(-0.98)
<i>N</i>	51		51		51		51	
<i>R²</i>	0.149		0.077		0.033		0.003	
<i>adj. R²</i>	0.054		0.018		-0.075		-0.060	

This table presents the results from regressing certainty variables on test and control variables as described in section 4.4. Robust t-statistics based on Huber-White standard errors are reported in parentheses. * (**) *** indicates significance at the 10 (5) 1 percent levels using two-tailed tests.

Figure 1 – Sample plot (n = 68)

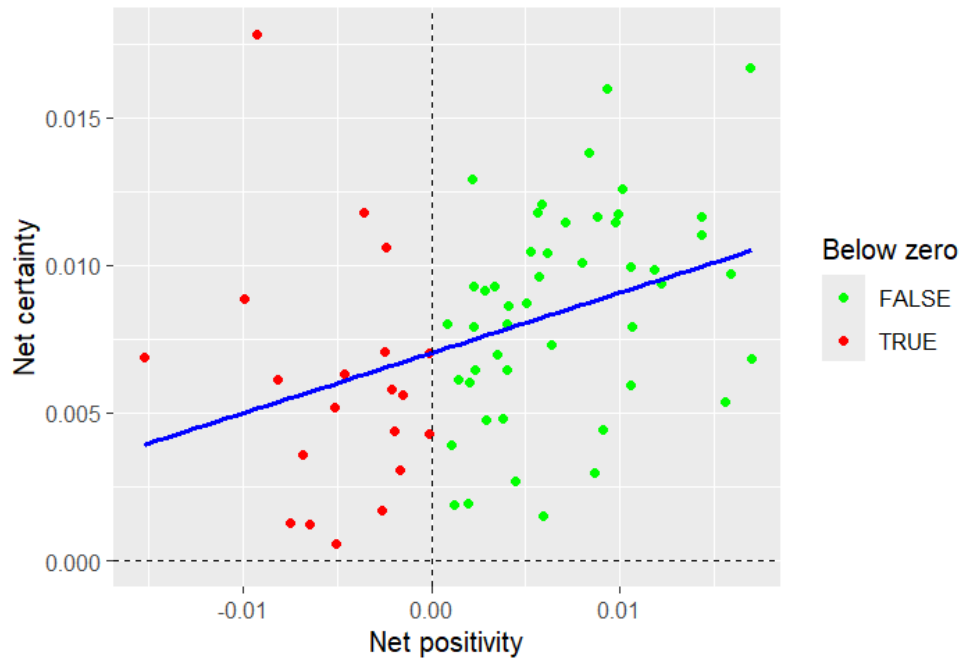
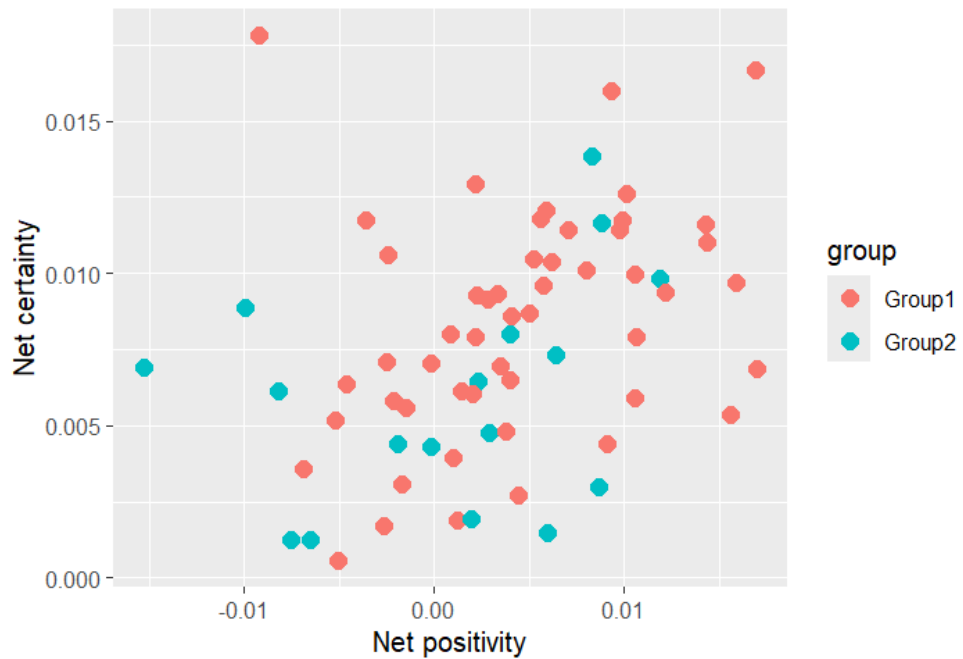


Figure 2 – Sample plot comparing firms with and without ESG data (n = 68)



Group one includes the firms with ESG data. Group two includes the firms without ESG data.

Figure 3a Density plot of the *Net positivity* variable, real data versus synthetic data

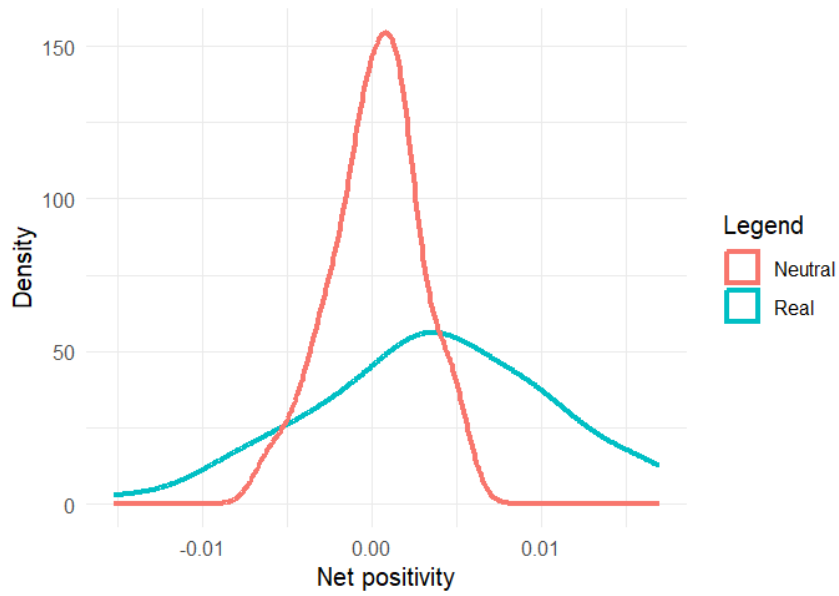


Figure 3b Density plot of the *Net certainty* variable, real data versus synthetic data

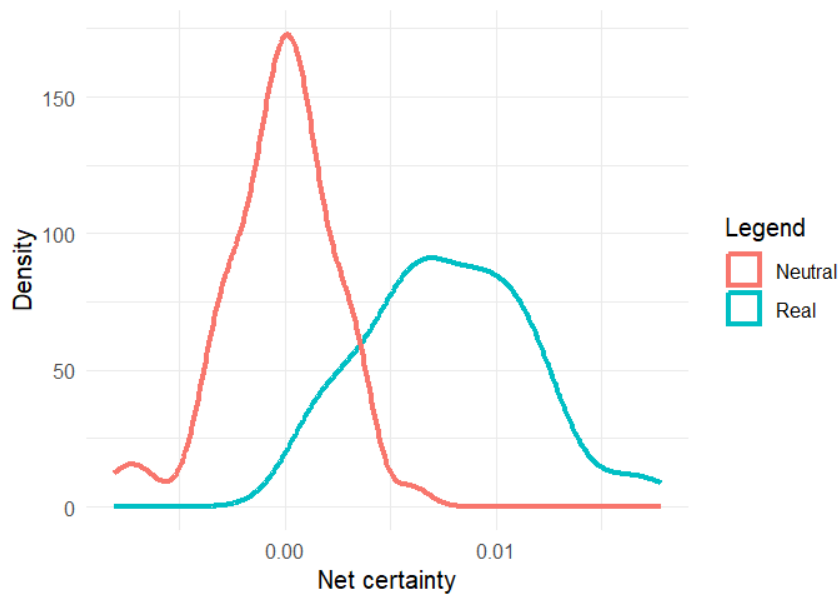


Figure 4a Density plot of the *Net positivityL* variable, real data versus synthetic data

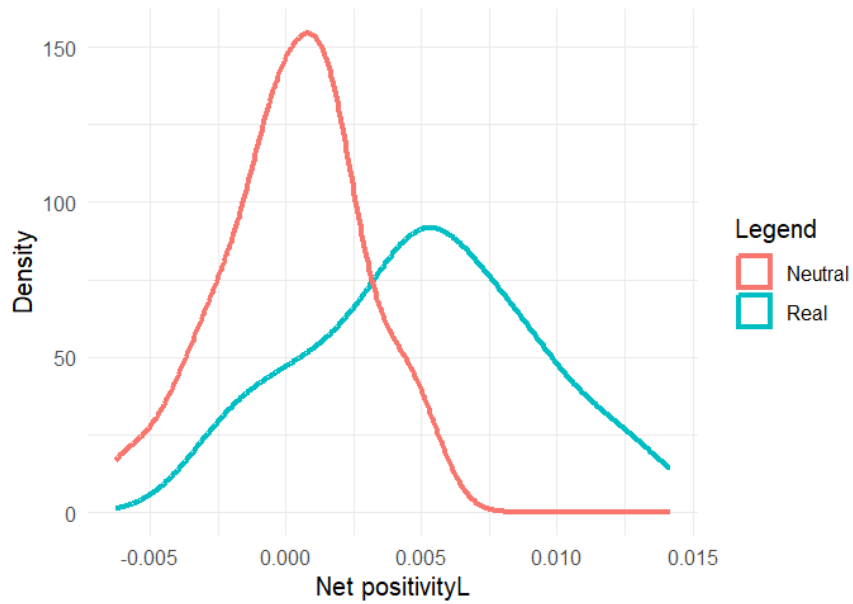


Figure 4b Density plot of the *Net certaintyL* variable, real data versus synthetic data

