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Climate disclosure in financial statements

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Abstract Climate exposure, a firm's financial risks and opportunities related to climate change, is increasingly recognized as a potential driver of firm value. Whereas firms increasingly discuss climate exposure in ESG reports, investors and policymakers worry that the financial statements, the bedrock of corporate reporting, largely ignore it. Studying its reflection in the financial statements, we present three sets of findings. First, EU firms increasingly disclose climate issues related to key accounting items highlighted by standard setters and enforcers, such as asset impairments and contingent liabilities. Second, these disclosures increase in firms' fundamental climate exposure and vary with supply frictions (e.g., preparation costs) and demand (e.g., from enforcers). Third, in contrast to the largely voluntary, unenforced disclosures made outside them, climate disclosures in audited financial statements align more strongly with firms' climate exposure and seem to crowd out climate-related 'cheap talk'—in line with their grounding of the corporate information environment in reliable 'hard facts.' Assessing generalizability, we find similar economic relations at work for large U.S. firms, despite these firms' lower absolute climate disclosure levels.

Keywords: climate change, reporting, ESG, financial statements, textual analysis

JEL Classifications: M41, M48, Q56

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1. Introduction

This paper studies climate disclosure *in financial statements*: the extent to which corporate financial statements reflect firms' risks and opportunities related to climate change mitigation and adaptation.[1] Amidst the rise of 'non-financial' reporting (e.g., Krueger, Sautner, Tang and Zhong [2024]), policymakers and corporate stakeholders worry that transparency about firms' climate change exposure may be lacking where it arguably matters most: in the financial statements, accounting's main regulated document. In contrast to climate-related data provided in ESG (or sustainability) reports, climate disclosure in financial statements links a firm's financially material climate change exposure to its assets, liabilities, income, and expense recognized or disclosed according to GAAP, with potential contracting consequences.[2] (Appendix B provides concrete examples from extant financial statements.)

Unlike climate disclosure *outside* financial statements (e.g., Christensen, Hail, and Leuz [2021]; Grewal and Serafeim [2020]; Haley, Shaffer, and Sloan [2024]), there is little systematic evidence so far on its counterpart *inside* financial statements. Providing such evidence is important and timely, given concerns voiced by several prominent parties. First, recent guidance published by accounting policymakers including the Financial Accounting Standards Board (FASB [2021]), the International Accounting Standards Board (IASB [2019], [2023], [2024]), and the EU's securities regulator, the European Securities Markets Authority (e.g., ESMA [2021], [2022], [2023], [2023a]), cast doubt on climate disclosures' compliance with GAAP. (Appendix C presents a timeline of policymakers' relevant pronouncements.) Second, a noted series of reports titled "Flying Blind" by Carbon Tracker, a think tank, concludes that none of the high-emitting "CA100+ focus firms provide all of the information required by the relevant standards or requested by investors" (Carbon Tracker Initiative [2022]; see also [2021], [2024], [2025]). Third, coalitions of institutional investors are pushing firms to reflect climate-related risks more fully in their financial reporting (e.g., PRI [2020]; ICGN [2023]).

[1] By *financial statements*, we refer to the annual report section that contains the primary financial statements and notes. For U.S. firms, this corresponds to the Form 10-K Item 8, Financial Statements and Supplementary Data.
[2] For example, where an automaker's sustainability report may describe an impending ban on combustion engine cars, the financial statements would be expected to explicate how the ban affects the useful lives and recoverable amounts of its production plants, potentially triggering impairment losses that affect debt covenants and management compensation (e.g., IASB [2023]). Similarly, voluntary net-zero pledges announced via firms' ESG disclosures may necessitate contingent liabilities in the accounts (e.g., IASB [2024]).

To facilitate research and support the policy debate (e.g., IASB [2024], we present a conceptual characterization of climate disclosure in financial statements and large-scale descriptive evidence guided by three questions: (1) How does climate disclosure in financial statements vary over time and cross-sectionally? (2) How is it associated with potential economic drivers? (3) How does it differ from climate disclosure *outside* financial statements? We study these questions based primarily on the IFRS financial statements of STOXX Europe 600 firms (which represent about 90% of European free-float market capitalization) during 2018-2023. The EU setting features intense high-level policy attention to climate disclosure in financial statements as an accounting topic in need of improvement, as well as firms subject to mandatory financial *and* non-financial reporting. To understand to what extent our findings are EU-specific, we replicate our main analysis using U.S. firms in the S&P 500.

Climate disclosure in financial statements differs conceptually from that made *outside* financial statements. It ties financially material climate-related matters to accounting's key summary measures – earnings, and book equity – potentially triggering contracting consequences. Also, being audited lends climate disclosure in financial statements confirmatory value, potentially disciplining 'outside' disclosures (e.g., Spence [1973]; Ball [2001]; Minnis [2011]; Ball, Jarayaman and Shivakumar [2012]).

To explore and describe this phenomenon empirically, we tag the sections of firms' annual reports and extract the audited primary financial statements and notes. We use this text corpus to create two distinct measures of climate disclosure in financial statements: the number of (1) search hits yielded by a parsimonious list of climate-related terms (e.g., "climate" and "emissions"; *DisclHits*); and (2) climate-related paragraphs identified by a language model, ClimateBERT (*DisclBERT*), which reflects firms' climate-related disclosures more flexibly and broadly, capturing the contextual meaning of words in a sentence by considering surrounding words.[3] Validation tests (Section 3.5) indicate that *DisclHits* and *DisclBERT* capture substantive disclosures that contextualize and explain the financial statement implications of climate change, rather than merely reflect 'boilerplate' disclosures.

[3] ClimateBERT is a specialized variant of BERT, the state-of-the-art natural language processing model introduced by Google in 2018. Whereas BERT was developed based on general text, ClimateBERT is pretrained based on climate-related text (Bingler et al. [2022]; Webersinke et al. [2022]). See Section 3.2.1.

We first explore how climate disclosure in financial statements varies over time and across industries. Starting from low levels in 2018, EU firms' average *DisclHits* counts (*DisclBERT* paragraphs) increase rapidly by 2023, from 4 to 21 hits (15 to 29 paragraphs), particularly after climate disclosure in financial statements was made an enforcement priority (ESMA [2021]). Cross-sectionally, high-emitting industries exhibit robustly more climate disclosure in financial statements (consistent with Sautner et al. [2023]). This evidence contrasts with recent studies demonstrating that carbon-intensive firms are less forthcoming *outside* financial statements, e.g., in unregulated filings (Bourveau, Garel, and Romec [2024]; Bolton and Kacperczyk [2025]). Interestingly, even low-emitting sectors exhibit some climate disclosure in the accounts, with considerable within-industry variation.

Our second set of tests delves into the factors associated with climate disclosure in financial statements. We posit that its primitive economic driver is a firm's *climate exposure*: its fundamental exposure to financially material climate-related risks and opportunities (e.g., due to high-emission business models). We employ three empirical measures: (i) a firm's climate change exposure based on discussions in earnings conference calls (*ExpoSvLZ*; Sautner et al. [2023]); (ii) a firm's Climate Value-at-Risk (*ExpoVaR*; from MSCI); and (iii) a firm's greenhouse gas (GHG) emissions intensity (*ExpoGHG*). We find that especially the top 20% climate-exposed firms provide substantial climate disclosures. Multivariate analyses show significant positive associations between climate exposure and disclosure across all pertinent measures. Overall, we conclude that climate disclosure in financial statements meaningfully reflects variation in firms' climate-induced financial risks and opportunities.

To better understand the sources of firms' climate exposure, we decompose our climate exposure measures. First, firms with higher regulatory exposure and climate-related opportunities provide more climate disclosure, whereas physical risk exposure is less strongly related to climate disclosure (perhaps because these effects are more complex, uncertain, and/or distant). Of note, climate opportunities exposure also shows a strong association with climate disclosure, consistent with firms being more inclined to disclose positive versus negative climate-related 'news' (e.g., Kothari, Shu, and Wysocki [2009]). Second, we find that direct and indirect GHG emissions are both related to climate disclosure – importantly implying that indirect (i.e., value chain) emissions have financial statement implications that are similar to those of emissions occurring inside the financial reporting boundary.

We further expect climate disclosure in financial statements to reflect external and internal factors that shape a firm's risks and opportunities from climate change. Specifically, the regulatory-legal external factors we examine (including firms' being subject to emissions trading schemes or climate-related regulation, litigation, and risk incidents) all exhibit significantly positive multivariate associations with climate disclosure in financial statements. Likewise, internal factors amplifying climate exposure (i.e., climate awareness, management,[4] or finance) are positively associated with climate disclosure in financial statements, and significantly so for most climate disclosure variables.

Climate disclosure in financial statements being a firm-level choice, we then analyze its variation with economic forces and frictions shown to govern disclosure choices generally (e.g., Beyer et al. [2010]). Regarding supply-side factors reflecting data availability and other reporting costs, multivariate regressions show that firms with more complete emission disclosures in their sustainability reports exhibit more climate disclosure in financial statements – suggesting cost efficiencies. Similarly, firms reporting under TCFD recommendations (which focus on the financial effects of climate risk) provide more climate disclosure in financial statements. Interestingly, firms with separate sustainability reports disclose less – consistent with lower connectivity between financial and sustainability reporting ('reporting silos;' e.g., Unerman, Bebbington and O'Dwyer [2018]). Finally, firms in more concentrated industries provide fewer disclosures (Ali, Klasa, and Yeung [2014]). These results echo prior literature emphasizing preparation and proprietary costs as key frictions impeding disclosure.

Turning to demand-side factors reflecting potential benefits, our multivariate tests consistently show that analyst following *negatively* relates to climate disclosure in financial statements, while institutional investor holdings are unrelated to it. Seeking to interpret these results, we show, for example, that these capital market participants might prefer other sources of climate information, such as data provided separately under TCFD recommendations or via the Carbon Disclosure Project. In turn, results indicate that regulatory forces (e.g., pressure from enforcement bodies) might be a key driver of emergent climate disclosures in financial statements. Specifically, we find that firms located in countries with more proactive enforcement bodies have more climate disclosures, consistent with attempts to

[4] For emission reduction targets, see Comello, Reichelstein and Reichelstein [2023] and Freiberg, Grewal and Serafeim [2021]. For ESG-linked executive pay, see Cohen et al. [2023a].

mitigate enforcement risk. Finally, firms with climate-related key audit matters have more climate disclosure, suggesting auditors increasingly elicit such disclosures from firms. These results are consistent with the importance of enforcement and auditing shaping climate disclosure (e.g., Christensen, Hail and Leuz [2013]; Gul, Wu and Yang [2013]).

Third, we explore whether climate disclosures in financial statements ('inside' disclosures), which are conceptually distinct from those made *outside the financial statements*, e.g., in ESG reports ('outside' disclosures), also differ empirically from them. Such differences would suggest that 'inside' and 'outside' disclosures serve unique, potentially complementary roles in the corporate information environment. We begin by examining how 'outside' climate disclosures developed over our 2018-2023 period, finding that their levels are an order of magnitude higher in absolute terms than those of 'inside' disclosures. While both levels exhibit a common time trend, keyword-related 'inside' disclosures have been accelerating faster in later years, mirroring heightened regulatory attention. Further, they have become more standardized than 'outside' disclosures and focus more on specific, risk-related information, as opposed to 'outside' disclosures focusing more on opportunities and commitments.

Critically, multivariate analyses show that 'inside' and 'outside' climate disclosures vary with different factors. Firms' internal climate strategies and actions are more strongly associated with 'outside' than 'inside' disclosures. But 'outside' disclosures sometimes vary only weakly with composite climate exposure measures and external exposure factors (e.g., regulation) – in contrast to 'inside' disclosures, which align more closely with climate exposure. Even firms with low climate exposure provide substantial 'outside' climate disclosures. Hence, these unenforced climate disclosures appear to some extent decoupled from climate exposure – blurring the distinction between high- and low-disclosure firms and rendering 'outside' disclosures a noisier indicator of corporate financial exposure to climate change. This is consistent with climate disclosures in audited financial statements complementing 'outside' ones by highlighting tangible, near-term financial implications of climate exposure, filtering out less financially material information from less-exposed firms, and meeting higher reliability standards (e.g., Minnis [2011]). Consistent with a disciplining function, we also find that 'inside' climate disclosures have less climate-related cheap talk 'outside' (i.e., unspecific commitments) and more stringent climate goals.

We conclude cautiously that decisions in the more formal and consequential 'inside' setting of audited financial statements may spill over into the looser 'outside' setting of ESG reporting, constraining how firms talk about climate 'outside' the financial statements. This pattern aligns with the confirmation hypothesis (Ball, Jayaraman, and Shivakumar [2012]), which posits that credible, independently verified disclosures in audited financial statements can discipline and enhance complementary voluntary disclosures. In our context, such 'inside' disclosures may not only crowd out vague 'outside' plans and aspirations but also filter which climate-related claims are credible enough to be made at all – particularly when those claims involve specific, short-term targets with clearer financial implications.

While our measures focus on climate *disclosure*, we also examine whether these disclosures relate to changes in financial statement *recognition* of climate-related risks and opportunities. To this end, we show that climate disclosures are significantly associated with asset impairments, shorter useful lives of long-lived assets, and reduced profitability. These results suggest that the 'inside' climate disclosures we document are more than 'boilerplate' statements, but capture meaningful information about how climate risks and opportunities affect firms' financial statements.

Finally, to explore if our results generalize to U.S. firms, we benchmark EU firms' climate disclosure in- and outside financial statements to those of S&P 500 firms. U.S. firms provide substantially less 'inside' climate disclosures, with little growth throughout 2018-2023. This result is not obvious ex-ante, as the FASB and the IASB issued similar educational guidance during our sample period (FASB [2021], IASB [2019]). While we observe a recent increase in 'outside' climate disclosures among U.S. firms (e.g., as risk factors or in the MD&A), the pattern is much less pronounced than among EU firms. Investigating these striking EU-U.S. differences further, we find that U.S. firms operate under lower fundamental climate exposure and external as well as internal exposure factors (e.g., fewer firms being subject to emissions trading schemes, fewer climate targets). Also, U.S. firms likely face lower demand from enforcement institutions for 'inside' climate disclosures (e.g., the SEC's [2010] guidance refers to climate risks outside the financial statements), and higher litigation risk (e.g., EU firms are rarely targeted by shareholder class action lawsuits). Overall, however, similar cross-sectional patterns across

the two groups suggest fundamentally similar economic forces at play, with U.S. firms' climate disclosures also reflecting fundamental climate exposure as well as supply- and demand-side factors.

Our results contribute to an emerging literature at the intersection of financial and sustainability reporting focusing on climate-related risks. Most pertinent work has considered attributes of 'non-financial' climate risk disclosures *outside* the financial statements (e.g., Matsumara, Prakash and Vera-Muñoz [2014], [2022]; Kölbel et al. [2024]; Ilhan et al. [2023]; Eccles and Krzus [2019]), their determinants (e.g., Ried and Toffel [2009]), and their consequences (e.g., Fiechter, Hitz, and Lehmann [2022]; Krueger et al. [2024]). Our contribution here is to present systematic large-scale descriptive evidence on climate disclosure *within the financial statements*.[5] We also contribute to the literature studying the interplay of mandatory and voluntary disclosure (e.g., Ball, Jayaraman, and Shivakumar [2012]; Cheng, Liao, and Zhang [2013]) by providing initial evidence on the 'connectivity' between climate-information reported outside and inside the financial statements, an important characteristic to which standards setters are now turning (e.g., IFRS Foundation [2024], EFRAG [2024]). We show initial evidence consistent with climate disclosures in the financial statements disciplining the crowded climate-related information environment and grounding it in 'hard facts,' provided that the fundamental climate data (which both the EU [2023] and the SEC [2024] increasingly focus on) is available.

2. Conceptual and institutional background

2.1. Climate disclosure inside and outside financial statements

Our primary accounting phenomenon of interest is climate disclosure *in financial statements*: the reflection within the financial statements of a firm's risks and opportunities related to climate change mitigation and adaptation. Firms' climate-related exposure is recognized as a key risk factor (e.g., Barnett, Brock and Hansen [2020]; Sautner et al. [2023a]), suggesting corresponding information demand. In line with guidance provided by standard setters and enforcement authorities (see, e.g., ESMA [2023a] and the discussion below), we expect firms to disclose how climate-related risks and opportunities affect

[5] Several practitioner studies, summarized in Appendix D, provide anecdotal evidence on climate disclosure in financial statements. The only academic studies that we are aware of (van der Tas, Aggarwal and Maksimovic [2022], and Agrawal et al. [2024]) document instances of climate change being referenced in the financial statements of less than 100 firms.

management's significant forward-looking assumptions, estimates, and judgments, as well as how they contribute to estimation uncertainty. Such disclosures should be located within the general "basis of presentation" section of the notes. For example, Volkswagen AG's 2023 IFRS financial statements contain a lengthy note entitled "Effects of climate change." Further, the accounting policies note and the item-specific notes to the financial statements should explain the relevance of climate change, if material, for property, plant, and equipment, intangible assets, financial assets, asset impairment, provisions and contingent liabilities, and the accounting for GHG-related obligations and credits. Appendix B provides examples of such disclosures in financial statements (see also ESMA [2023a]).[6]

Studying climate disclosure in financial statements is important for several reasons. First, though related, climate disclosure in financial statements is empirically distinct from climate-related information communicated *outside* them, e.g., via sustainability (or CSR) reports (e.g., according to TCFD recommendations, ESRS, or IFRS SDS; Sellhorn and Wagner [2024]).[7] Research shows that information provided in the financial statements differs meaningfully from that presented elsewhere (e.g., Lang and Stice-Lawrence [2015]; Christensen et al. [2017]). Whereas the latter is receiving immense academic research attention (e.g., Christensen, Hail, and Leuz [2021]), we are unaware of conceptual or large-scale empirical studies on climate disclosure in financial statements.

Second, the two types of climate disclosure -i.e., inside and outside financial statements- differ conceptually. Compared to much other financial statement information, climate information is largely forward-looking, creating a self-commitment by managers (e.g., Wagenhofer [2024]). Relative to much climate disclosure made *outside* financial statements, it ties financially material climate-related matters to accounting's key summary measures, earnings and book equity – potentially unfolding contracting consequences. Another key difference derives from its value due to verification. Financial statement

[6] Precisely because climate disclosure in financial statements is still emerging, as we show in this paper, it is not generally feasible to quantify climate-related implications relative to, e.g., earnings or total assets.

[7] The recommendations by the Task Force on Climate-related Financial Disclosures (TCFD) explicitly ask firms to disclose the potential financial effects of climate change. Importantly, none of these sets of standards govern corporate financial statements. From 2024 onwards, European Sustainability Reporting Standards (ESRS) will require a range of ESG-related disclosures to be provided in sustainability statements that form part of EU firms' management reporting. IFRS Sustainability Disclosure Standards (IFRS SDS), developed by the IASB sister body, the International Sustainability Standards Board (ISSB), provide a global baseline of standards for sustainability-related financial disclosures.

information tends to be quantitative, grounded in past transactions, as well as produced under strict internal controls, audited by independent assurance providers, and enforced by securities regulators. In contrast, information provided elsewhere is often qualitative, forward-looking, and subject to more lenient, if any, external verification.[8] A related argument comes from the confirmation hypothesis (Ball, Jarayaman, and Shivakumar [2012], Ball [2001]), under which audited financial statements discipline, and thus enhance, disclosures made elsewhere by providing a means of evaluating their truthfulness *ex post*. This confirmatory role of climate disclosure in financial statements arguably bestows greater credibility (Spence [1973]) on, and renders it an important complement to, climate disclosure made elsewhere.

Third, consistent with these arguments, climate disclosure in financial statements is currently on the agendas of policymakers – more so than any accounting topic since the financial crisis of 2007. Around the world, and most prominently in Europe, enforcement authorities like ESMA ('the EU SEC') and standard setters like the IASB and the FASB have singled it out as needing improvement. Appendix C provides a list and timeline of influential documents issued by a broad coalition of accounting policymakers and enforcers. Two key arguments pervade these documents: (a) issuers and auditors must consider material climate risks when preparing and auditing financial statements, and (b) holistic corporate reporting requires climate-related matters to be reflected consistently across the financial statements and elsewhere. Finally, our analyses facilitate future studies of *connectivity*, the interlinkage of financial reporting and sustainability reporting – a related emerging topic, with dedicated working groups recently formed by the IASB and EFRAG.[9]

[8] Regarding climate-related information, consider the difference between a firm's voluntary net-zero pledge (e.g., Comello, Reichelstein, and Reichelstein [2023]) published in an ESG report and the financial statement recognition and disclosure of its GHG emission rights (and obligations to surrender these rights) under the EU emissions trading scheme (e.g., Electricité de France [2022], notes 10.2 and 17.2). Further reasons for investors to care about climate disclosure in financial statements include its monitoring by boards, analysts, and securities regulators.

[9] These latter policy developments imply two key insights for our research design: First, standard setters' attention only turned to climate disclosure in financial statements in late 2018, which we thus consider a reasonable base year for our analysis. Second, the EU's securities regulator started in 2021 to identify climate-related matters among its top enforcement priorities (ESMA [2021]). Since enforcement decisively shapes accounting outcomes (Christensen, Hail, and Leuz [2013]), we posit that ESMA's prioritization provides another impetus for firms to reconsider the climate disclosures in their financial statements. Interestingly, while intensely felt within the EU, this enforcement-driven impetus is absent from the U.S. setting.

2.2. Factors associated with climate disclosure in financial statements

Accounting standards require the reporting of material financial information, subject to a cost-benefit trade-off (see SFAC 8, QC11-11B and QC35-39 for U.S. GAAP; IFRS Conceptual Framework, CF.2.11 and CF2.39-2.43). Accordingly, and guiding our empirical operationalizations, we conceptualize the factors driving climate disclosure in financial statements as reflecting a firm's exposure to financially material climate risks as well as its costs and benefits of disclosure.[10] Whereas the costs reflect direct and indirect frictions, the primary benefits of climate disclosure derive from its decision-useful depiction of the firm's climate exposure. We explain each of these factors in turn.

The financial materiality of climate-related matters for a given firm should be driven by its *climate exposure*, the fundamental economic variation of a firm's value (i.e., the amount, timing, and uncertainty of its future cash flows) with the climate-related risks and opportunities it faces. Emanating from the transition to a lower-carbon economy (e.g., risks arising from adverse regulation) and the physical effects of climate change on firms (e.g., from flooding or heat waves),[11] climate exposure varies with external and internal factors that act individually or jointly. Among the external factors, we consider climate regulation (e.g., related to GHG emissions) and other events (e.g., litigation or other incidents). The internal factors include a firm's climate-related strategies (e.g., net-zero pledges) and other actions (e.g., issuing sustainability-linked 'green' bonds).

Following Friedman and Ormazabal [2024] and Breuer, Hombach, and Müller [2024], we argue that climate *disclosure*, like other disclosure decisions, is driven by demand and supply factors that capture the (marginal) benefits and costs, respectively, of providing climate disclosures. Demand from investors and other stakeholders for decision-useful information about firms' material climate-related risks and opportunities (i.e. climate *exposure*) gives rise to potential disclosure benefits to firms. For example, providing climate disclosure might reduce the uncertainty of investors and other stakeholders

[10] Since assessing materiality (i.e., if it is expected that omitting, misstating, or obscuring a given piece of information could influence investor decisions based on financial statements) requires judgment (e.g., Schipper [2007]), this calculus is subject to firm-level discretion.

[11] Consistent with the notion of impact materiality (e.g., ESRS 1.43), a firm's climate exposure can (but need not) originate from *its own impact* on the climate, including due to its high-emissions business model, such as in the case of climate litigation (e.g., Sato et al. [2023]).

about the financial effects of climate change on firm value (e.g., Verrecchia [2001]; Beyer et al. [2010]). These demand-side benefits should increase in the firm's climate exposure.

For a given level of climate exposure, demand should vary with other demand-side factors, such as user characteristics. Prior literature shows that institutional investors seek climate disclosures and drive firms to provide them (Azar et al. [2021]; Cohen, Kadach and Ormazabal [2023]; Ilhan et al. [2023]). However, investors and analysts facing processing costs (Blankespoor, deHaan, and Marinovic [2020]) and/or being rationally inattentive due to capacity constraints (Lu [2022]) may prefer less detailed or complex financial statements (Guay, Samuels and Taylor [2016]). Another source of demand stems from increasingly 'climate-conscious' policymakers. The push for firms to reflect their climate exposure in their financial statements is at the core of the policy debate summarized above. Accordingly, mitigating compliance risk is a likely demand-side benefit, since enforcers publicly demand more information (e.g., ESMA [2021], [2022], [2023]). In a similar vein, audit organizations have highlighted focus areas related to the consideration of climate-related risks in external audits (e.g., IAASB [2020]).

The supply-side factors represent firm-level costs of climate disclosure, which the firm trades off against the demand-driven benefits. These costs reflect frictions that, *ceteris paribus*, impede 'full disclosure.' The direct costs of preparing the disclosures are one such friction. First, firms might face costs in generating the information needed to understand the financial implications of climate change (e.g., remote suppliers' GHG emissions).[12] Second, disclosing these implications in line with auditors' and enforcers' requirements is costly, reflecting uncertainty about transition risks (e.g., future regulation) and/or physical risks (e.g., the effects of extreme weather events). Finally, linking climate disclosure in financial statements to climate-related information provided outside them (e.g., in separate sustainability reports; as demanded by TCFD recommendations) might cause additional costs, especially where the two areas operate independently in 'silos' (e.g., Unerman, Bebbington and O'Dwyer [2018]).

The other set of supply-side frictions encompasses indirect costs. Ilhan et al. [2023], for example, show that proprietary costs impede climate disclosures outside the financial statements. Given the broad

[12] Among the EuroStoxx50 firms, for example, only 19% voluntarily disclosed (qualitative) information on anticipated financial effects from material physical and transition risks and potential climate-related opportunities in their 2024 sustainability statements (Sustainability Reporting Navigator [2025]).

range of corporate stakeholders, it is also plausible that such costs might arise vis-à-vis competitors but also other parties, such as, regulators, labor unions, or climate activists and NGOs. Taken together, we expect that a firm's climate disclosure will be shaped by trading off these costs and benefits arising from the supply of, and demand for, climate disclosure.

3. Research design, data, and sample

3.1. Research design

To understand the factors associated with climate disclosure in financial statements, we estimate the following regression model (firm and year subscripts as well as control variables omitted):

$$DISCL = \alpha + \beta_1 EXPO + \beta_2 EXT + \beta_3 INT + \beta_4 SUPPLY + \beta_5 DEMAND + \epsilon \quad (1)$$

The dependent variable, *DISCL*, represents two metrics of climate disclosure in financial statements, *DisclHits* and *DisclBERT*. The independent variables reflect the five sets of potential drivers of climate disclosure, as derived in Section 2.2, defined in Appendix A, and explained in the next section. *EXPO* is a stand-in for three composite metrics of firms' climate exposure; *EXT* (*INT*) captures a range of individual external (internal) exposure factors; and *SUPPLY* (*DEMAND*) reflects the supply-side (demand-side) factors shaping disclosure costs (benefits) for a given level of climate exposure.[13]

We use OLS regressions with heteroskedasticity-robust standard errors clustered at the firm level.[14] Our main research design is cross-sectional in nature and abstains from the inclusion of (high-dimensional) fixed effects. Since we are exploring a new phenomenon, we focus on describing patterns in the data to inform future research (Breuer and deHaan [2023]). Yet, the analyses reported in Table OA.2 are estimated using an augmented Equation (1) with different combinations of fixed effects.

[13] We further control for several firm-level factors: Firm size, measured as *Ln(Sales)*, *Leverage* (total debt over total assets), *PP&E Intensity*, measured as (net) property, plant, and equipment over total assets, and *ROA* (operating income over total assets). We also control for *Length*, the (log of) the financial statements and notes pages.

[14] As explained in Section 3.2.1, *DisclHits* and *DisclBERT* are count variables. Scholars have recently proposed new methods to analyze count data (see, e.g., Cohn, Liu, and Wardlaw [2022], Chen and Roth [2023]). We note that our results are robust to using Poisson regressions (see Table OA.1).

3.2. Variable measurement

3.2.1 Climate disclosure in financial statements

We download firms' PDF reports and tag the financial statement and notes sections.[15] Following prior literature (Brié, Stouthuysen, and Verdonck [2024]), we then use a text-parsing algorithm to decompose the raw text into more than 6.3 million paragraphs, which form the basis for our measurement of climate disclosure.[16] Our first measure, *DisclHits*, is the count of hits based on a parsimonious list of climate-related keywords (e.g., "climate", "emissions", "transition risk") in our text corpus. While arguably failing to capture the full richness of firms' climate-related disclosures (Bochkay et al. [2023], Loughran and McDonald [2016]), this bag-of-words approach provides a useful benchmark for more sophisticated but less tangible textual analysis measures. Our second measure is *DisclBERT*, the number of climate-related paragraphs identified by ClimateBERT. Based on a successor of the BERT model developed by Google in 2018, this language model is specifically adapted to the domain of climate change (Webersinke et al. [2022]). Trained on a set of climate-related language found in news articles, research abstracts, and corporate climate reports, ClimateBERT identifies climate-related text.[17]

DisclHits and *DisclBERT* complement each other to capture climate disclosures comprehensively, with *DisclBERT* using an established language model to more broadly capture nuanced climate-related discussions that do not explicitly mention the specific keywords picked up by the more precise *DisclHits*.[18] We provide extensive validation tests for *DisclHits* and *DisclBERT* in Section 3.5. In our main analyses, we use their log-transformed versions, Ln(*DisclHits*) and Ln(*DisclBERT*).

3.2.2 Climate exposure

We conceive of a firm's climate exposure – arguably the key fundamental driver of decision-useful climate disclosure in financial statements – as a bundle of factors that individually and/or jointly

[15] Doing so is necessary since, compared to U.S. firms' 10-Ks filed with the SEC, the structure of European firms' annual reports is less standardized (El-Haj et al. [2020]).

[16] We parse the raw text with a Python package (PyPDF and pdfminer) per page, split each page into paragraphs, and apply the cleaning steps laid out in prior literature (i.e., stripping white space, removing non-alphanumeric or punctuation characters, dropping paragraphs containing less than 15 words or less than ten unique words).

[17] Specifically, we use a simple classification header that outputs whether a paragraph discusses climate-related topics, using a probability threshold of 0.75.

[18] Relating to our earlier example, an automaker discussing how a future ban on combustion-engine cars affects its PP&E might do so entirely without mentioning words like "climate," "CO_2," or "emissions".

render climate risks and opportunities financially material. To operationalize it, we use a set of decomposable composite measures used in prior literature, which we complement with variables capturing specific, more nuanced external and internal climate exposure factors at the firm level.

Composite Exposure Measures A firm's climate exposure comprises three main areas – transition risks, physical risks, and opportunities. Since the measurement of these constructs is still evolving in capital markets and academia (e.g., Engle et al. [2020]), we use three established and complementary approaches. Our first, the firm-level climate change exposure measure by Sautner et al. [2023], *ExpoSvLVZ*, identifies the attention paid by earnings conference call participants to a firm's climate change exposure. It can be broken down into exposure measures capturing regulatory (i.e., transition) risks, physical risks, and opportunities. Second, we use a firm's MSCI Climate-Value-at-Risk (*ExpoVaR*), a time-invariant measure based on an estimate of how climate change could affect a firm's valuation depending on transition risks, physical risks, and technology opportunities. Third, to reflect a firm's climate exposure due to its own contribution to climate change, we use total GHG emissions scaled by revenues (*ExpoGHG*), which we decompose into direct and indirect emissions.[19]

External exposure factors A primary way for transition risks to create financially material exposure is through regulation. We use four variables to capture this channel: (1) a Refinitiv variable indicating whether a firm is subject to a regulated emissions trading scheme (*Emissions Trading*); (2) the count of climate change policies and laws enacted in a country since 1963, as covered by the Climate Change Law Database (Grantham Research Institute at LSE and Columbia Law School; *Climate Laws*); (3) a variable that indicates whether a firm is subject to climate-related litigation, based on Sato et al. [2023] and the Global Climate Change Litigation database developed by Columbia Law

[19] A potential concern is that our climate exposure measures may be influenced by firms' climate disclosures made outside the financial statements, thereby conflating disclosure with exposure. We note, however, that the earnings call-based exposure measure (*ExpoSvLVZ*) reflects investor and analyst attention to climate topics and is therefore less likely to be mechanically driven by firms' own voluntary disclosure. Similarly, the MSCI Climate Value-at-Risk (*ExpoVaR*) measure incorporates estimates of physical risk exposure as well as technology opportunities, which are largely unrelated to firms' own climate disclosures. Moreover, our regressions control for the granularity of GHG emission disclosures, capturing variation in firms' climate reporting practices outside the financial statements. These factors help mitigate concerns that our exposure variables are confounded by climate disclosure.

School (*Climate Litigation*); and (4) RepRisk data to identify whether the firm had a climate-related risk incident raising public concerns about its climate-related reputation (*Climate Incident*).

Internal exposure factors We also expect that a firm's active addressing of, instead of ignoring, climate-related challenges will amplify its climate exposure. We operationalize such internal factors in four ways: (1) a Refinitiv variable indicating a firm's awareness of potential climate-related commercial risks and opportunities (*Climate Awareness*); a Refinitiv variable indicating whether a firm targets emissions reductions (*Climate Target*); (3) the count of a firm's sustainability-linked debt from Refinitiv's Bond Search database (mostly linked to climate targets (*Climate Finance*); and (4) a Refinitiv variable indicating whether the firm has ESG-linked executive compensation (*ESG Compensation*).

3.2.3 Supply- and demand-side factors of climate disclosure

Supply-side factors On the disclosure supply side, we expect four costly frictions to impede climate disclosure in financial statements: (1) preparation costs, measured as the opacity of a firm's emission disclosures in its sustainability reporting (*Emission Opacity*), which is the fraction of missing values among 21 Refinitiv emissions disclosure items; (2) the limited internal availability and financial integration of climate-related information reflected in a firm's decision to *not* follow TCFD recommendations (*No TCFD*); (3) a firms' separation of sustainability and financial reporting into separate 'silos,' as suggested by a firm's decision to provide a separate sustainability report – as opposed to integrating climate-related disclosures into the annual report (*Separate SR*); and (4) proprietary costs driven by industry concentration, as approximated by the Herfindahl-Hirschman Index (*HHI*).

Demand-side factors For a given level of climate exposure, we expect disclosure benefits originating from the demand for such information from analysts, institutional investors, enforcement bodies, and auditors. We use four proxies: (1) the log number of analysts following the firm based on IBES (Ln(*Analysts*)); (2) the share of institutional ownership based on Refinitiv (*IO*); (3) country-level enforcement intensity, based on data in Bissessur, Litjens, and Ormazabal [2025], measured as the time-invariant share of firms being subject to yearly proactive reviews by the national financial reporting enforcement body (*Enforcement Proactivity*); and (4) auditor demand, reflected by the occurrence of climate-related keywords underlying *DisclHits* in the firm's key audit matters (KAM) included in the audit opinion within the financial statements (*Climate KAM*).

3.3. Sample

Our sample includes EU firms listed in the STOXX Europe 600 as of September 30, 2023. This index covers 90% of the free-float market capitalization of the European stock market. Our six-year sample period (2018-2023) yields a sample size of 3,600 firm-year observations,[20] of which we lose 73 due to non-machine-readable PDF reports.[21] Panel B (Panel C) of Table 1 tabulates our sample across the six years of our sample period (the 12 Fama-French industries). The sample is well-balanced over time, and its industry composition (while skewed towards large firms due to the STOXX Europe 600 inclusion criteria) is fairly representative of the Worldscope universe (correlation of 90%).

3.4. Descriptive statistics

Table 2 reports descriptive statistics. As revealed in Panel A, our disclosure variables are right-skewed. On average, firms have 11 climate-related keyword hits (*DisclHits*) and 21 climate-related paragraphs (*DisclBERT*), with median levels much lower (*DisclHits*: 2; *DisclBERT*: 6). A similar pattern emerges for the climate exposure variables in Panel B (consistent with, e.g., Sautner et al. [2023]; Greenstone, Leuz, and Breuer [2023]). The correlations (Panel A of Table 3) show that climate exposure and climate disclosure are strongly positively correlated. Among the composite exposure proxies, *ExpoSvLVZ* and *ExpoVaR* have (highly significant) correlations of 25-58% with *DisclHits* and *DisclBERT*. These two climate disclosure variables have a correlation of 69%, indicating that both capture similar constructs but somewhat different dimensions of climate disclosure.

The descriptive statistics for the external exposure factors (Panel B of Table 2) indicate that 22% of sample firms are subject to an emissions trading scheme (*Emissions Trading*), 30% have a *Climate Incident*, and *Climate Litigation* is rare (with only 19 firms subject to it). Across countries, there is also substantial variation in the number of (cumulative) climate laws and policies. Turning to the internal exposure factors, 82% of firms exhibit *Climate Awareness*, 66% have a *Climate Target*, and 63% have

[20] Whereas Fiechter, Hitz, and Lehmann [2022] find that firms already began their CSR reporting before the NFRD came into effect in 2017, firms' inclusion of climate-related matters into their financial statements occurred much later, as our discussion of the regulatory initiatives in Section 2.1 and Appendix C shows.

[21] For additional analyses and to provide a baseline for our results in the EU, we also analyze the climate disclosures of U.S. firms. This sample covers all firms listed in the S&P 500 in September 2023, hence 2,500 firm-years.

ESG Compensation. The issuance of sustainability-linked bonds (*Climate Finance*) is much rarer, however (only 25 firms). The supply-side factors (Panel C) reveal that firms, on average, omit 67% of the 21 granular emissions metrics collected by Refinitiv from corporate reports (*Emission Opacity*), 37% provide *no TCFD* reports, and 41% have a separate sustainability report (*Separate SR*). The average industry concentration (*HHI*) is 7%. On the demand side, we find that firms are followed, on average, by 15 analysts and have 46% institutional ownership (*IO*). The share of sample firms proactively reviewed in a country-year is 21% (*Enforcement Proactivity*), and 11% of sample firms' audit reports include a *Climate KAM*.

Consistent with our discussion in section 2.2, many of the external and internal exposure factors are significantly positively correlated with climate disclosure (Panel A of Table 3). On the supply side, most of the variables capturing disclosure costs are negatively correlated with disclosure. On the demand side, the variables related to enforcement and auditing are positively correlated with disclosure.

3.5. Validation of climate disclosure variables

While the above descriptive statistics indicate that climate disclosure is correlated with climate exposure, as expected, we next describe three sets of analyses to validate our climate disclosure variables. First, we ask OpenAI's GPT-4-mini to classify each *DisclHits* or *DisclBERT* paragraph as to whether it discusses how climate-related matters impact financial reporting, and which IFRS standard the disclosure relates to. Figure OA.1 shows that climate disclosures most often relate to financial instruments, provisions and contingent liabilities, impairments, revenues, business combinations, and long-lived assets. These topics were prominently highlighted by the IASB in its educational guidance (IASB [2023]) and in ESMA's enforcement priorities (ESMA [2021], [2022], [2023]).

Second, 43 of our sample firms' financial statements have been assessed by the Carbon Tracker Initiative ([2021], [2022], [2024]) for consideration of climate risks. Their report is based on a comprehensive methodology to assess whether the financial statements (i) demonstrate how material climate-related matters are incorporated; (ii) disclose quantitative climate-related assumptions and estimates; (iii) are consistent with other reporting; and (iv) use assumptions and estimates aligned with achieving net zero emissions by 2050. Firms can either meet, partially meet, or not meet these criteria. Across all

criteria, Figure OA.2 shows that firms (partially) meeting the criteria have significantly higher disclosure levels, as measured by our metrics *DisclHits* and *DisclBERT*.

Third, 18 of our sample firms' disclosures feature in ESMA's 2023 report to "demonstrate potential [...] ways to disclose climate-related matters in the financial statements" (ESMA [2023], p. 5). In Table OA.3, we find that *DisclHits,* our climate disclosure proxy based on keywords, correctly identifies 15 out of 18 examples, while *DisclBERT*, the proxy based on ClimateBERT, identifies all of these 18 'good practice' examples. Of note, OpenAI's GPT-4-mini identified 15 out of 18 cases correctly.[22]

Overall, these validations show that our climate disclosure proxies *DisclHits* and *DisclBERT* plausibly capture meaningful information (e.g., contextualization and explanation, rather than empty 'boilerplate') about how climate risks and opportunities affect firms' financial statements.

4. Results

4.1. Variation in climate disclosure in financial statements

We first explore how climate disclosure in financial statements varies over time and cross-sectionally, focusing on three metrics: *DisclMention*, an indicator of whether the financial statements mention "climate", one of the keywords used to construct *DisclHits*, and *DisclBERT*, the number of climate-related paragraphs identified by ClimateBERT. Figure 1 documents a strong upward trend for EU firms over the 2018-2023 period across all three. *DisclMention* (Panel A) rises fivefold, from 15% of firms to 75%, with a jump in 2021 – the year when climate-related matters first became an ESMA enforcement priority (ESMA [2021]). Similarly, *DisclHits* (Panel B) increases more than fourfold, from 4 to 21, on average. *DisclBERT* (Panel C) exhibits a slower climb, from 15 to 29 paragraphs, on average.

Figure 2 documents average climate disclosure per industry on the *y*-axes, based on *DisclHits* (Panel A) and *DisclBERT* (Panel B), respectively, and juxtaposes it with averaged climate exposure, calculated as the average over *ExpoSvLVZ*, *ExpoVaR*, and *ExpoGHG*, on the *x*-axes. The 12 industries scatter close to the OLS regression lines in both panels, indicating considerable industry-level correlations of climate disclosure and exposure, consistent with high-emissions industries (e.g., extractive

[22] In three cases, the paragraph extracted by our algorithm was short and did not discuss the topic precisely. When manually prompting the large language model with the full example, it identified the correct topic.

firms, #1, and utilities, #2) exhibiting more climate disclosure. However, we also find (untabulated) considerable variation in disclosure *within* industries (the average standard deviation is 2.2 times the mean), mirroring similar findings related to climate change exposure in Sautner et al. [2023].[23]

Overall, climate disclosure in EU firms' financial statements has increased over time, varies across and within industries, and is correlated with fundamental climate change exposure. In what follows, we explore what drives this discretionary accounting phenomenon in more detail at the firm-level.

4.2. Factors associated with climate disclosure in financial statements

4.2.1 Climate change exposure

Turning to climate change exposure as a likely fundamental driver of climate disclosure, Figure 3 graphically documents the relation between the two, again distinguishing between the two disclosure measures, *DisclHits* (Panel A) and *DisclBERT* (Panel B). We group firms into climate exposure deciles based on *ExpoSvLVZ*, *ExpoSvVaR*, and *ExpoGHG*. Across all permutations, we find a striking relation: the roughly top 20% of firms in terms of climate exposure exhibit higher climate disclosure levels, whereas the 80% less-exposed firms show relatively similar climate disclosure levels. As shown in Panel C, the disclosure patterns across exposure deciles mirror exposure patterns. We cautiously interpret this as indicating that, on average, firms extensively disclose climate-related matters in their financial statements (only) once they pass a certain materiality threshold.[24] Yet, this materiality threshold seems to be shifting over time. Figure OA.3 shows that some firms with very low climate exposures have increased their climate disclosure levels in 2023 relative to 2018 – perhaps to indicate, as requested by policymakers (e.g., IASB [2023]), that climate-related matters do *not* materially affect their financial statements, although investors might expect them to. However, high-exposure firms, too, have increased their climate disclosure. Accordingly, the time-series increase documented in Figure 1 is not specific to high-exposure firms; rather, we see no differential time trends for high- and low-exposure firms.

[23] Consistent with this, a variance decomposition regressing the natural logarithms of *DisclHits* and *DisclBERT* on different fixed effects in Panel B of Table 3 indicates that idiosyncratic firm-level factors are the key determinants of variation in climate disclosure, with common industry factors a secondary source of variation.

[24] The top 20% (in terms of disclosure) firms' emission intensity is 381 tCO_2eq/m in revenues, on average, much higher than for the bottom 80% (4 tCO_2eq/m). At a cost of carbon of 50 $/tCO_2eq$, the top 20% firms' emissions amount to around 2% of revenues (i.e., plausibly above most materiality thresholds).

Next, we turn to multivariate regressions of climate disclosure in the financial statements – again measured as *DisclHits* (columns 1 and 2) and *DisclBERT* (columns 3 and 4) – and fundamental climate change exposure – again captured by our three composite measures *ExpoSvLVZ* (Panel A), *ExpoVaR* (Panel B), and *ExpoGHG* (Panel C). Within each panel, Table 4 presents results for the composite exposure measures (columns 1 and 3) as well as results for three disaggregations of these composites (columns 2 and 4), respectively. As shown in the shaded lines, the composite exposure variables are all significantly positively related to the climate disclosure variables. For example, a one-standard-deviation exposure increase based on Sautner et al.'s [2023] earnings call measure, *ExpoSvLVZ*, is associated with a 41.8% increase in climate-related search hits, *DisclHits* (Panel A, column 1). At 30.8%, the magnitude is similar for the climate exposure measure based on MSCI Climate-Value-at-Risk, *ExpoVaR* (Panel B, column 1), but somewhat lower, at 16.7%, for the exposure measure based on total emission intensity, *ExpoGHG* (Panel C, column 1), likely due to its lower comprehensiveness.

Turning to the decomposed climate exposure factors (columns 2 and 4 of Table 4), Panels A and B suggest that the association is primarily driven by regulatory risks and opportunities, and less so by physical risks.[25] Interestingly, in Panel C, the association is driven by both direct emissions as well as indirect ones in the value chain. This result suggests that factors arising outside the financial reporting boundary (i.e., in the value chain) can be as material as those inside. For example, automakers face downstream regulatory risks as some countries set strict CO_2 emission limits for vehicles sold, forcing firms to adapt their fleets. Upstream, rising consumer demand for low-carbon products pressures manufacturers to reduce the carbon footprint of vehicle production. Assets in which these transition risks manifest (e.g., production plants, inventories) are subject to impairment risks.

We next explore the roles of distinct exposure factors in a firm's climate disclosure decisions. Recall Equation (1), which models climate disclosure as a function of fundamental climate change exposure as well as disclosure supply and demand factors. Table 5 displays separate columns for each disclosure measure (*DisclHits* and *DisclBERT*) and composite exposure measure (*ExpoSvLVZ*, *ExpoVaR*, and *ExpoGHG,* Panel A), with Panel B (Panel C) dedicated to a set of four external (four

[25] Transition risks are likely nearer term than physical risks and often imply opportunities (e.g., 'greener' firms benefiting from stricter environmental standards), which firms usually disclose along with their risk exposures.

internal) exposure factors. Among the external factors capturing regulation, the statistically significant coefficients on *Emissions Trading* across most columns show that firms forced by emissions trading schemes to buy emission permits provide robustly more climate disclosure. We similarly find significant associations for firms operating under more stringent climate laws and policies (*Climate Laws*) and for the small subset of firms subject to a legacy of climate litigation cases (*Climate Litigation*), which might trigger disclosures related to contingent liabilities. These results are consistent with legal obligations triggering material financial effects, which the financial statements reflect. Further, the occurrence of climate risk incidents (*Climate Incident*) is also associated with more climate disclosure.

Turning to the internal exposure factors, which capture firms' climate-related actions and strategies, Panel C of Table 5 shows that firms with specific emissions reduction targets (*Climate Target*) have significantly higher climate disclosures. Such targets, typically embedded in a climate strategy with dedicated expenditures, often have financial effects that trigger financial statement disclosure. We further find some evidence that firms tying executive compensation to ESG targets (*ESG Compensation*) have higher climate disclosures. A small subset of our sample firms also issues sustainability-linked bonds, most of which tie borrowing conditions to GHG emissions. We find that a cumulative count of sustainability-linked bonds (*Climate Finance*) is positively associated with climate disclosures. There is only weak evidence, however, that the Refinitiv awareness indicator (*Climate Awareness*) significantly explains climate exposure in financial statements.

In summary, the analyses in this section provide robust evidence that climate disclosure in financial statements is associated with firm-level climate change exposure – both in terms of composite measures and, conditioning on these, in terms of disaggregated risk factors (Table 4) as well as distinct exposure factors (Panels B and C of Table 5). Overall, we conclude that the various ways in which business models, regulations, actions, and strategies can trigger a firm's fundamental exposure to risks and opportunities of climate change are plausible drivers of climate disclosure in financial statements. The next subsection explores how climate disclosure varies with supply- and demand-side factors.

4.2.2 Disclosure supply and demand factors

Again based on Equation (1), Panels D and E of Table 5 report results for the multivariate associations of supply- and demand-side factors with climate disclosure in financial statements. Among the

supply-side factors in Panel D of Table 5, we find that firms disclosing little information on their direct and indirect emissions in their ESG reports (*Emission Opacity*) exhibit less climate disclosure. Recommendations intended to enhance the disclosure of financial effects of climate risks come from the TCFD. Consistently, we find that firms *not* reporting under TCFD (*No TCFD*) provide less climate disclosure in their financial statements. Combined, these results seem to indicate that such firms are less cognizant of their carbon footprints and their financial statement implications (e.g., due to information acquisition and integration costs) – or have lower transparency incentives. We also examine the placement of climate-related information across reporting channels. Some of our sample firms choose to integrate climate information into their annual reports, while others release separate reports. Across some specifications, firms with separate sustainability reports (*Separate SR*) provide less climate disclosure in their financial statements. This result is consistent with the notion of reporting 'silos' and lower connectivity between financial and sustainability reporting (e.g., Unerman, Bebbington and O'Dwyer [2018]). Finally, our results related to industry concentration (*HHI*) are consistent with proprietary costs impeding the disclosure of climate information in the financial statements (e.g., Ali, Klasa, and Yeung [2014]).

We expect that firms trade off supply-side disclosure costs against benefits originating from the demand for such disclosures. Turning to the demand-side factors in Panel E of Table 5, we first examine demand from capital market participants. Notably, we find no evidence that a higher share of institutional investors (*IO*) is associated with more climate disclosure in financial statements. In addition, firms with higher analyst following (*Analysts*) tend to provide *less* climate disclosure. These results are hard to reconcile with capital market benefits of climate-related information in financial statements (e.g., by reducing information asymmetry vis-à-vis investors). Whereas we lack a definitive explanation, it seems plausible that firms strongly scrutinized by institutional owners and analysts cater to them by providing climate information through alternative channels (e.g., ESG reports), avoid including uncertain disclosures due to litigation concerns, or prioritize financial metrics over ESG disclosures.

In contrast, we find that the demand from enforcement bodies and auditors is positively associated with climate disclosures in financial statements. Specifically, firms operating in countries where national enforcement bodies conduct more proactive reviews (*Enforcement Proactivity*) disclose more.

One possible interpretation is that firms cater to the climate-related enforcement priorities issued by ESMA (e.g., ESMA [2021]) to reduce the risk of costly sanctions. Relatedly, we find that firms in which auditors identify climate-related matters as key audit matters in their audit opinions (*Climate KAM*) disclose more climate-related information in their financial statements.[26]

Taken together, we conclude that enforcement and auditing are primary demand-side factors driving climate disclosure in financial statements. Our evidence on capital market participants (*IO* and *Analysts*) contrasts with recent evidence that institutional investors do demand climate disclosures (e.g., Ilhan et al. [2023]). That evidence, however, relates to climate disclosure provided through channels *outside* the financial statements. Accordingly, in the following section, we replicate our analysis for climate disclosures *outside* the financial statements.[27]

4.3. Climate disclosure inside versus outside the financial statements

4.3.1 Univariate comparisons

We next explore the notion that climate disclosures in financial statements are conceptually and empirically distinct from those made *outside* the financial statements (e.g., in ESG reports), suggesting their unique and potentially complementary roles in the corporate information environment (Section 2.1). To this end, we now compute our climate disclosure proxies based on keyword search hits (*DisclHits)* and paragraphs identified by ClimateBERT (*DisclBERT*) for disclosures provided *outside* firms' financial statements, i.e., in other annual report sections and/or separate sustainability reports.

Starting with visual inspection, Figure 4 compares time trends in climate disclosures inside and outside the financial statements (hereinafter referred to as 'inside' and 'outside' disclosures, respectively) both in absolute and relative terms.[28] Several key differences are evident. First, absolute disclosure levels are an order of magnitude higher for 'outside' disclosures, which increase from 143 to 541

[26] Similar to the financial statements and notes, untabulated analyses reveal a striking increase in climate-related keyword search hits and paragraphs in audit opinions, especially since 2021.
[27] Table 5 reports cross-sectional associations. As shown in Table OA.2, most associations are robust to including year fixed effects. The external exposure variables, which exhibit meaningful within-industry variation, are robust to the inclusion of industry and year fixed effects. Given the short time-span of our sample and limited within-firm variation of most variables over time, including firm fixed effects renders several variables insignificant.
[28] The time trend for absolute 'inside' *DisclHits* (*DisclBERT*) in Figure 4 Panel A (Panel C) reproduces Figure 1 Panel B (Panel C), now rescaled to accommodate the higher absolute incidence of 'outside' climate disclosures.

search hits (*DisclHits*) and 186 to 418 climate paragraphs (*DisclBERT*) from 2018 to 2023. This level difference reflects that the 'outside' sections are much longer,[29] often with dedicated sections relating to climate change, providing information on climate-related risks and opportunities and the firm's climate-related impact. To gauge the relative increase over time, we index both 'inside' and 'outside' climate disclosures at their 2018 levels (Panels B and D of Figure 4). We find that both exhibit a common time trend, i.e., similar growth rates.

Second, and interestingly, 'inside' *DisclHits* – in contrast to 'inside' *DisclBERT* – has been growing faster than its 'outside' equivalent. Since *DisclHits* captures distinct keywords commonly used in regulatory guidance, whereas *DisclBERT* reflects climate disclosures independently of terminology used, this result indicates that firms' 'inside' disclosures increasingly follow regulatory guidance on climate disclosure (e.g., ESMA [2021]).

Third, to characterize how 'inside' and 'outside' climate disclosures differ, we follow Dyer, Lang, and Stice-Lawrence [2017] and compute commonly used textual characteristics for climate-related and non-climate-related text inside and outside of the financial statements. The four panels of Figure 5 show the shares of paragraphs that contain *Standardized wording* (Panel A), *Duplicate sentences* (within the report, Panel B), *Repeated phrases* (compared to prior year's report, Panel C), as well as the average Fog index (*Fog*; Panel D), respectively. 'Inside' disclosures (red dots) are more homogeneous, containing more standardized, duplicated, and repeated language compared to 'outside' disclosures (blue triangles). Strikingly, we find an increase in 'inside' *Standardized wording* that is matched neither in the 'outside' disclosures nor in non-climate 'inside' paragraphs (hollow dots in Panel A). We interpret this differential pattern as indicating greater standardization of 'climate language' inside financial statements and notes, potentially driven by regulatory intervention (again, e.g., ESMA [2021]) and users' benchmarking/monitoring demand.

[29] The average annual report and (if available) sustainability report combined comprises 1,370 paragraphs, while the average financial statements and notes section has 422 paragraphs. On a per-paragraph basis, 'inside' *DisclHits* increased from 0.01 in 2018 to 0.04 in 2023 (i.e., by a factor of 4.3), whereas 'outside' *DisclHits* increased from 0.11 to 0.37 (i.e., by a factor of 3.2). Similarly, 'inside' *DisclBERT* increased from 0.03 to 0.07 (i.e., by a factor of 2) and 'outside' *DisclBERT* grew from 0.15 to 0.27 (i.e., by a factor of 1.8). Our regressions control for the volume of overall 'inside' and 'outside' disclosure corpora Tables 4, 5, and 6.

Fourth, we examine how 'inside' and 'outside' climate disclosures differ in terms of content, as measured by distinct ClimateBERT dimensions (Webersinke et al. [2022]). Figure 6 plots the shares of 'inside' (red dots) and 'outside' (blue triangles) paragraphs pertaining to *Risks* (Panel A), *Opportunities* (Panel C), that are *Specific* (Panel B), and that reflect a climate *Commitment* (Panel D). While 'inside' disclosures are more specific and more strongly related to risks, 'outside' disclosures more strongly reflect opportunities and commitments. These findings suggest that 'inside' climate disclosures are more precise, technical, and exhibit a notion of 'conservatism' – potentially rendering them a complement and disciplining benchmark to the opportunity-oriented, forward-looking 'outside' disclosures.

4.3.2 Multivariate analyses

To compare 'inside' and 'outside' climate disclosures more fully and formally, we re-estimate Equation (1) for 'outside' climate disclosures.[30] Mirroring the Table 5 display, Table 6 provides results for 'outside' disclosures, with explanatory variables again grouped into composite exposure (Panel A), external and internal exposure factors (Panels B and C), as well as supply and demand factors (Panels D and E). Additional specifications, provided in the Online Appendix, are referenced where important.[31]

Some notable patterns emerge from these analyses. First, whereas composite exposure and external exposure factors are consistently positively associated with 'inside' climate disclosures (Table 5), the associations between 'outside' climate disclosure and composite (Panel A of Table 5) as well as external exposure factors (Panel B) are weaker. In Table OA.4 (columns 1 through 5), the negative coefficients on the interaction of *Variable* × *Outside* corroborate this finding. This indicates that 'outside' climate disclosures reflect financial materiality less strongly than 'inside' ones. That is, in their largely unregulated 'outside' reporting, firms' levels of climate information are less related to their financial risks from climate exposure. Figure OA.4 compares climate disclosure 'inside' (in Panels A and B, reproduced from Figure 3) and 'outside' (in Panels C and D) across exposure deciles and provides climate exposure across exposure deciles as a reference point in Panel E (as in Figure 3).

[30] We exclude variables specific to sustainability reporting content (e.g., *Emission Opacity*) and the financial reporting environment (e.g., *Climate KAM*).

[31] Specifically, Table OA.4 shows results from specifications stacking and pooling both 'inside' and 'outside' climate disclosures (using an averaged exposure variable, *AvgExp* for parsimony; column 1) and including interactions between a focal variable (*Variable*; e.g., *Emissions Trading* in column 2), and an indicator variable for 'outside' climate disclosure (*Outside*).

Unlike 'inside' the financial statements, even firms with only modest levels of climate exposure provide substantial climate disclosures 'outside,' which masks the actual exposure differential between low and high exposure firms. That is, variation in 'outside' climate disclosure is less indicative of variation in climate exposure than variation in 'inside' climate disclosure.

This result is consistent with firms' mandatory, audited, and enforced 'inside' disclosures complementing those 'outside' by filtering out less-material information for less-exposed firms and stressing the financial implications of firms' climate exposure, especially due to external factors. Notably, the set of internal exposure factors is *more* strongly associated with 'outside' climate disclosures (Panel C of Table 6; see also the significantly positive interactions in Table OA.4, columns 6, 7 and 9). One possible explanation of this result is that firms describe climate-related planned actions and forward-looking strategies 'outside' the financial statements rather than 'inside.'

Second, regarding the supply-side factors, Panel D of Table 6 reveals that firms providing separate sustainability reports (*Separate SR*) provide *more* 'outside' disclosures. Recalling the opposite pattern for 'inside' disclosures (Table 5), this finding again suggests that firms with separate 'silos' for sustainability reports ('outside') and financial reports ('inside') tend to substitute 'outside' disclosures for 'inside' disclosures. Further, unlike those 'inside,' 'outside' disclosures seem unrelated to industry concentration (*HHI*), possibly since information revealed in 'outside' disclosures is less proprietary.

Finally, the 'outside' disclosure results for demand-side factors (Panel E of Table 6) are in stark contrast with those for 'inside' (Panel E of Table 5). Analyst following (Ln(*Analysts*)) is unrelated to 'outside' disclosures in most specifications – while consistently negatively associated with 'inside' disclosures. In turn, Table 6 reveals that institutional investor holdings (*IO*) are positively associated with 'outside' climate disclosures in some specifications, whereas they are unrelated to 'inside' ones. Apparently, institutional investors do demand *some* climate-related information, including via ESG reports (e.g., Ilhan et al. [2023]) – but do not necessarily need it provided 'inside' the financial statements.[32]

[32] See also the stacked regression results in Table OA.4, columns (12) and (13). Further, in Table OA.5 we show explicitly that institutional investor holdings and analyst following vary positively with specific 'outside' climate disclosures: firms' TCFD reporting (*TCFD Reporter*; columns 1 through 3) and firms' participation in the Carbon Disclosure Project (*CDP Participant*; columns 4 through 6). These results again suggest that capital market participants have a stronger demand for 'outside' than 'inside' climate disclosures, potentially because such disclosures can be more comprehensive (and potentially familiar). Given the endogenous nature of our capital

Overall, we conclude from this 'inside-outside' comparison that 'inside' climate disclosures complement 'outside' disclosures by highlighting financially material and potentially more reliable (Minnis [2011]; Ball, Jarayaman, and Shivakumar [2012]) information on firms' climate exposure – filtering out disclosures from less-exposed firms and 'softer' and more forward-looking disclosures. To explore this complementary role more directly, we next examine associations of 'inside' climate disclosures with the content of 'outside' disclosures.

In particular, in Panel A of Table 7 we examine how 'inside' disclosures relate to the number of climate-related 'outside' paragraphs that are specific (*Specific*), are risk-related (*Risk*), contain commitments (*Commit.*), and discuss opportunities (*Opps.*). Whereas columns (1) to (4) show a positive relation between 'inside' disclosures and 'outside' specific as well as risk- and opportunity-related paragraphs, the relation is *negative* for 'outside' paragraphs about commitments. That is, more 'inside' climate disclosures are associated with more specific, risk-, and opportunity-related disclosures 'outside' – but *fewer* climate commitments 'outside.' Similarly, columns (5) to (8) show positive relations between corresponding 'inside' and 'outside' textual dimensions – again, except for commitments.

While these results are consistent with 'inside' disclosures disciplining 'outside' disclosures by reducing unspecific commitments ('cheap talk') there, they could also indicate that 'inside' disclosures 'crowd out' potentially informative climate commitments as firms worry about their potential negative financial statement implications – especially where they are relatively concrete and short-term.[33] To explore this issue further, we analyze whether firms with more 'inside' climate disclosures commit to more specific and ambitious climate targets outside the financial statements (Panel B of Table 7). Following Bingler et al. [2022], we measure 'cheap talk' (columns 1 and 2) as the share of unspecific climate commitment paragraphs in 'outside' disclosures. Results show both *DisclHits* and *DisclBERT*

market participant variables, however, this is just one potential interpretation and an interesting avenue for future research.

[33] A case in point is the IASB's recent clarification that a firm may have to recognize a provision (i.e., the IFRS equivalent of what under U.S. GAAP is labeled a "contingent liability") – along with an associated expense – when, at the reporting date, its climate commitment is expected to lead to an outflow of future economic benefits (IASB [2024]). In passing, we note another possible explanation: Firms with high 'inside' disclosures may be 'sourcing in' some of their more forward-looking climate disclosures into the financial statements and notes.

being negatively associated with *Outside cheap talk*. We further expect that more specific climate commitments are associated with less distant and more ambitious climate targets. To test this relation, we regress *DisclHits* and *DisclBERT* on two indicator variables. *Late target* (columns 3 and 4) indicates whether the target year of the firm's emissions reduction target is after 2030, and *Low target* (columns 5 and 6) indicates whether the firm seeks to reduce emissions by 25% or less. We consistently find significantly negative associations. Taken together, these results indicate that decisions in the formal and consequential 'inside' setting of audited financial statements may spill over into the looser 'outside' setting of ESG reporting, constraining how firms talk about climate 'outside' the financial statements.

4.4. Association of 'inside' disclosure with financial statement recognition

Whereas the validation analyses (Section 3.5) indicate that our 'inside' climate disclosure measures capture meaningful variation in how climate risks and opportunities affect firms' financial statements, we now formally test for associations of 'inside' climate disclosures with financial statement recognition. Such recognition could be a channel through which 'inside' climate disclosures discipline 'outside' disclosures. Based on the recent attention from policymakers (Section 2.1) and our analyses clustering 'inside' climate disclosures along IFRS standards (Figure OA.1 and Section 3.5), we expect that a primary way in which climate-related risks will come to be recognized in financial statements is through 'stranded assets' (i.e., asset impairments and shorter useful lives). Since other potential recognition consequences (e.g., climate-related asset retirement obligations), are challenging to identify empirically, we also examine whether 'inside' climate disclosure collectively maps into lower profitability.

Table 8 presents the results of these tests. In columns (1) and (2), we find that more 'inside' climate disclosures are associated with a higher propensity to record asset impairments (*Impairment dummy*). In addition, in columns (3) and (4), we find some evidence that more climate disclosures are associated with shorter asset useful lives, *Useful life* (which, in turn, could give rise to impairments). Finally, column (6) documents that more climate disclosure, as measured by *DisclBERT*, is significantly associated with lower *ROE*. Taken together, these results are in line with 'inside' climate disclosures reflecting impacts of climate risks on recognized financial statement amounts.

4.5. Generalizability to U.S. firms

We have shown that climate disclosures – both inside and outside the financial statements – have increased substantially over time. These results obtain for large, listed EU firms reporting under IFRS, for which the relevant standard-setter (IASB) and enforcement body (ESMA) have been emphasizing this issue since about 2021 (Section 2.1). In addition, these firms have been under a sustainability reporting mandate, the NFRD (e.g., Fiechter et al. [2022]) since 2017. To explore the generalizability of our results to U.S. firms, we repeat our analysis for the constituents of the S&P 500.[34] We capture U.S. firms' climate disclosures from their Form 10-Ks by applying the *DisclHits* and *DisclBERT* approaches to the 'inside' (i.e., Item-8) and 'outside' disclosures (all other Items, including, e.g., the MD&A and separate sustainability reports if they exist).

To ease comparison, Figure 7 compares absolute and relative disclosure time trends for *DisclHits* (Panels A and B) and *DisclBERT* (Panels C and D). In absolute terms, U.S. firms provide substantially less 'inside' climate disclosure, with little to no growth throughout 2018-2023. This result is not necessarily expected ex ante, given that both the FASB and the IASB had issued similar climate-related guidance during our sample period (FASB 2021, IASB 2023). Further, whereas U.S. firms do increase 'outside' climate disclosure (e.g., as risk factors or MD&A disclosures), their disclosure levels remain much lower than those of EU firms.

Table OA.6 sheds some light on the potential drivers of these marked EU-U.S. differences. For example, the results in Panel B suggest that U.S. firms operate in an institutional environment shaped by lower composite climate exposure (e.g., significantly lower *ExpoSvLZ*, *ExpoVaR*, and *ExpoGHG*) and lower incidence of external (e.g., *Emissions Trading*) and internal exposure factors (e.g., *Climate Target*, *ESG Compensation*). Also, U.S. firms likely face lower demand from enforcement institutions for 'inside' climate disclosures (e.g., the SEC's [2010] guidance refers to climate risks *outside* financial statements as risk factor disclosures).

To expand upon these univariate comparisons, we examine whether the relation between climate exposure and 'inside' climate disclosure documented for EU firms differs in the U.S. sample. Pooled

[34] Of note, S&P 500 firms are considerably larger than our STOXX Europe 600 firms, with average (median) market capitalization being higher by a factor of 3.2 (2.9).

regressions reported in Table OA.7, which pool both samples and interact the composite exposure measures (*ExpoSvLZ*, *ExpoVaR*, and *ExpoGHG*) with a U.S. firm dummy (*Comp. Exposure × U.S. firm*), confirm a level difference between EU and U.S. firms for low-exposure firms (statistically significant negative coefficients on the *U.S. firm* indicator). However, we also find some evidence that climate disclosure increases in climate exposure for U.S. firms (see also Figure 8), often in a similar fashion as for EU firms – especially when examining *DisclBERT* [35] and when adding external and internal exposure factors as well as supply and demand factors (insignificant or even positive coefficients on *Comp. Exposure × U.S. firm* in columns 4 through 6 of Panels A and B).

Collectively, and despite notable differences in levels, these results suggest similar economic forces at play in the EU and the U.S. when it comes to large, listed firms' decisions about providing climate disclosures within the financial statements and notes. Specifically, whereas U.S. firms exhibit lower levels of 'inside' climate disclosure, U.S. firms with higher climate exposure – much like their EU counterparts – do so to a greater extent and provide more 'inside' climate disclosure than U.S. firms with lower climate exposure. It is an interesting avenue for future research to tease out the factors that drive (differences in) climate disclosure across jurisdictions and reporting channels.

5. Conclusion

Amidst widespread concerns among policymakers about the absence of climate matters in financial statements, we show that large EU-listed firms have substantially increased climate-related disclosures in their financial statements since 2018. This trend is strongest in firms that have higher exposure to financially material climate-change-related risks, especially due to 'green transition' efforts and related regulation. Such climate disclosure in financial statements varies predictably with supply frictions, as firms need to overcome the costs of acquiring, processing, and integrating knowledge about the impact of climate change on their business models, as well as consider proprietary costs. We also find evidence that firms trade off these costs against the demand-side benefits of providing such information, which appears mainly driven by enforcement bodies and auditors, and less so by capital market actors.

[35] Interestingly, the differences are more pronounced for keyword-related 'inside' disclosures, likely reflecting differential regulatory attention in the EU regarding disclosures specifically on "climate".

Climate disclosures in financial statements differ from those made elsewhere. The most pronounced difference is that climate disclosures *outside* the financial statements are significantly less related to a firm's climate exposure – rendering these disclosures noisy signals of the financial implications of climate change for firms. Hence, 'inside' climate disclosures complement the disclosures made elsewhere by filtering out information that is less financially material. That is, many firms address climate-related matters *outside* the financial statements (including those with low exposure to climate change) – but only those with higher exposure do so inside their (mandatory, audited, and enforced) financial statements. Overall, disclosure in financial statements seems to serve the role of grounding and disciplining the increasingly crowded climate-related information environment in 'hard facts' – in line with repeated calls from accounting standard setters (e.g., IASB [2023], FASB [2021]), enforcement bodies (e.g., ESMA [2021], [2022], [2023]) and investor groups (e.g., PRI [2020]; ICGN [2023]).

Our European setting is characterized by recent and unprecedented attention to climate-related disclosures in financial statements from said standard setters and enforcement institutions. Hence, this setting likely yields an upper-bound estimate of climate disclosure in financial statements. While the time-series patterns we document are more pronounced in the EU (large U.S. firms do *not* exhibit a comparable upward trend), our main cross-sectional findings – i.e., that climate exposure and generic disclosure supply frictions and demand forces importantly shape climate disclosure in financial statements – hold both in the EU and in the U.S.

While our sample of STOXX Europe 600 firms captures approximately 90% of the free-float market capitalization of the European stock market, it is heavily weighted toward larger firms. As such, the findings presented here may not generalize to smaller listed companies or to large (or smaller) private firms, whose climate exposures and other determinants of climate disclosure may differ from those of our sample firms. Investigating these cohorts represents a promising direction for future research.

More generally, our findings call for more research to understand the recent evolution of climate reporting. For example, future research could explore in more detail the sources of variation in the emergent climate disclosure patterns across jurisdictions (including EU vs U.S.) and reporting channels

(including inside vs. outside the financial statements). Other promising avenues relate to within-industry variation in climate disclosure (which we find but do not explore further; see also Sautner et al. [2023]), the role of firm-level incentives to obfuscate, as well as the (capital-market and 'real') effects of variation in climate-related disclosure in financial statements.

Appendix A: Variable definitions

Variable	Source	Technical Description
Climate disclosure		
DisclMention	Self-constructed	An indicator variable that is 1 if the firm's financial statements contain the word "climate"
DisclHits	Self-constructed	The number of hits found in a text corpus by a parsimonious list of the following climate-related uni- and bigrams based on regular expression patterns: co\s?2, emission(?:s), greenhouse gas, ghg, climate, carbon, physical risk, transit(?:)\w* risk, regulat(?:)\w* risk.
DisclBERT	Self-constructed	The number of paragraphs flagged by ClimateBERT (Webersinke et al., 2022) as relating to climate with an accuracy of more than 75%.
Length	Self-constructed	The number of paragraphs in a text corpus.
Composite climate exposure		
ExpoSvLVZ	Sautner et al. [2023]	Number of bigrams related to climate change in earnings conference calls, scaled by total bigrams
ExpoSvLVZ (Regulatory)	Sautner et al. [2023]	Number of bigrams related to climate-related regulatory shocks in earnings conference calls, scaled by total bigrams
ExpoSvLVZ (Physical)	Sautner et al. [2023]	Number of bigrams related to physical aspects of climate change in earnings conference calls, scaled by total bigrams
ExpoSvLVZ (Opportunities)	Sautner et al. [2023]	Number of bigrams related to climate change opportunities in earnings conference calls, scaled by total bigrams
ExpoVaR	MSCI	Percentage change in firm value that might arise from regulatory/physical risks/opportunities given a climate path.
ExpoVaR (Regulatory)	MSCI	The portion of total Climate-Value-at-Risk that stems from regulation.
ExpoVaR (Physical)	MSCI	The portion of total Climate-Value-at-Risk that stems from the physical effects of climate change.
ExpoVaR (Opportunities)	MSCI	The portion of total Climate-Value-at-Risk that stems from climate change-related opportunities.
ExpoGHG	Refinitiv, Worldscope	The sum of Scope 1, Scope 2 and Scope 3 GHG emissions scaled by sales (ITEM7240) and multiplied by 1,000
ExpoGHG (Scope 1)	Refinitiv, Worldscope	Scope 1 GHG emissions scaled by sales (ITEM7240) and multiplied by 1,000
ExpoGHG (Scope 2)	Refinitiv, Worldscope	Scope 2 GHG emissions scaled by sales (ITEM7240) and multiplied by 1,000
ExpoGHG (Scope 3)	Refinitiv, Worldscope	Scope 3 GHG emissions scaled by sales (ITEM7240) and multiplied by 1,000
Averaged exposure	Self-constructed	The average of the standardized *ExpoSvLVZ*, *ExpoVaR*, and *ExpoGHG* variables.

(continued)

External exposure factors		
Emission Trading	Refinitiv	Indicator for a firm's being subject to a regulated emissions trading scheme
Climate Laws	Climate Change Law Database	Cumulative count of policies and laws enacted in a country since 1963 covered by the Climate Change Law Database
Climate Litigation	Sato et al. [2023], GCCLD	Cumulative count of climate litigation case filings and decisions for a firm covered by Sato et al. [2023] from 2007-2021 and the Global Climate Change Litigation Database (GCCLD) for 2022
Climate Incident	RepRisk	Indicator for the occurrence of a climate risk incident
Internal exposure factors		
Climate Awareness	Refinitiv	Indicator for a firm's awareness of climate-related business risks and opportunities
Climate Target	Refinitiv	Indicator for a firm's emission reduction target
Climate Finance	Refinitiv	Cumulative count of a firm's sustainability-linked bonds and loans since 2019
ESG Compensation	Refinitiv	Indicator if executive compensation is tied to ESG targets
Supply-side factors		
Emission Opacity	Refinitiv, self-constructed	Share of emission items not reported in Refinitiv
No TCFD	Self-constructed	Indicator if the firm does not mention the phrase "TCFD" at least once in its annual or sustainability report
Separate SR	Self-constructed	Indicator if the firm provides sustainability-related information in a report that is separate from its annual report
HHI	Worldscope	Herfindahl-Hirschman Index: Sum of squared market shares per three-digit SIC industry
Demand-side factors		
Ln(*Analyst*)	I/B/E/S	Natural logarithm of average analyst following
IO	Refinitiv	Percentage of a firm's shares held by institutional investors.
Enforcement Proactivity	Bissessur, Litjens, and Ormazabal [2025]	Percentage of firms being reviewed by the financial reporting enforcement body per year in a given country
Climate Key Audit Matters	Audit Analytics, self-constructed	Whether the auditor identified climate-related matters as a key audit matter in its report/opinion

(continued)

Control Variables		
Sales	Worldscope	Sales in USD (ITEM7240)
ROA	Worldscope	Operating income (ITEM1250) scaled by assets (ITEM2999)
PP&E Intensity	Worldscope	Net PP&E (ITEM2501) scaled by assets (ITEM2999)
Leverage	Worldscope	Total debt (ITEM3255) scaled by assets (ITEM2999)
Other Variables		
Late Target	Refinitiv	Whether the emission reduction target is later than 2030
Low Target	Refinitiv	Whether the emission reduction target corresponds to a reduction in less than or equal to 25%.
Impairment	Worldscope	Whether there exists a goodwill (ITEM18225) or property, plant, and equipment (ITEM18274) impairment.
Useful life	Worldscope	Gross property, plant, and equipment (ITEM2301) divided by depreciation (ITEM1148).
ROE	Worldscope	Net income in USD (ITEM7250) scaled by total equity in USD (ITEM7220).
CDP Reporter	CDP	Indicator for a firm having submitted a response to the CDP in a given year.
TCFD Participant	Self-constructed	Indicator for a firm mentioning the keyword “tcfd” in its reporting.

Appendix B: Examples of climate disclosure in financial statements

Drawing on the European Securities and Markets Authority (ESMA) report "The Heat is On: Disclosures of Climate-Related Matters in Financial Statements" (ESMA 2023), this appendix provides examples of climate disclosure in the general "basis of presentation" notes (Panel A) and climate disclosure in item-specific notes to the financial statements (Panel B). Similar to the disclaimer in ESMA [2023], the purpose of these examples is to illustrate the forms that climate disclosure in financial statements can take, rather than to exemplify particularly informative or uninformative disclosures.

Panel A: Climate disclosure in item-specific notes	**Panel B: Climate disclosure in general notes**
"Accounting policies: intangible assets" note (Volkswagen 2022, p. 317) The Volkswagen Group's automotive market and volume planning reflects the above regional differentiation and takes account of the impact of the Covid-19 pandemic, the Russia-Ukraine conflict, and shortages of intermediates and commodities on the initial years of the planning period. The negative impact on earnings expected to arise from 2023 onward from more stringent emission and fuel consumption legislation and the sustained effects of the Covid-19 pandemic is to be offset by corresponding programs to increase efficiency. In addition, the planning is based on the assumption that the supply situation for intermediates and commodities will improve from fiscal year 2023 onward. The change in the operating return on sales assumed for fiscal year 2023 for the purpose of the impairment test is within the range forecast by Volkswagen. *"Accounting and measurement: Property, plant, and equipment" note* (Hapag-Lloyd 2022, p. 163) The provisional assessment of the impact of new environmental regulations on the economic viability and efficiency of some older vessels particularly affected by these regulations resulted in a recalculation for these vessels in the third quarter of 2021 and thus a shortening of their estimated remaining useful lives by one to five years. The rules for implementing these provisions have now been clarified, permitting these vessels to remain in use for longer. Therefore, these vessels are now to be decommissioned later than had been assumed in the previous year. Due to the individual extension of their useful life by one to three years, this improved EBIT both in the second half and for	*Omnibus "effects of climate change" note* (Volkswagen 2023, p. 284) Against the backdrop of climate change and the resulting stricter emissions regulations, the transformation of the automotive industry towards e-mobility and further digitalization continues to make progress. In its NEW AUTO strategy, the Volkswagen Group has again stepped up the pace of its transformation towards e-mobility. In the preparation of the consolidated financial statements, the Board of Management took into account the potential effects of climate changes and future regulatory requirements, and especially the corresponding transformation towards e-mobility. Potential effects, especially on noncurrent assets, provisions for emissions levies and future cash flows were, as far as possible, incorporated as part of the significant estimates and assumptions included in the consolidated financial statements. The Volkswagen Group aims to increase the share of all-electric vehicles as a proportion of total deliveries from 8.3% in 2023 to more than 50% in 2030. The Group aims to offer its customers worldwide around 50 completely battery-electric models by 2030. The effects of the transformation towards e-mobility and the planned increase in the share of all-electric vehicles planned in this context are taken into account in compiling the medium-term planning and therefore in the calculation of future cash flows for determining recoverable amounts in impairment tests of goodwill and intangible assets with indefinite useful lives, especially when planning future vehicle models, development costs and production facilities. An amount in the low triple-digit billion euro range has been earmarked for this purpose in the medium-term planning. In addition, Volkswagen regularly assesses whether these developments give rise to the need for ad hoc impairment tests or for adjustments to the

the 2022 financial year as a whole in the amount of EUR 77.0 million. The effect for Q4 2022 amounts to EUR 38.5 million. The effect will be reversed in the three complete consecutive financial years from 2023 onwards. However, the general useful life of vessels remains unchanged at 25 years.

"Other provisions: Provisions related to environmental schemes" note (EDF 2022, p. 452)
Through the renewable energy certificates scheme, the EDF group has an obligation to surrender renewable energy certificates, particularly in the United Kingdom and Belgium. At 31 December 2022, a provision of €1,117 million was booked in connection with the obligation to surrender renewable energy certificates at that date, essentially concerning EDF Energy (United Kingdom) and Luminus (Belgium). A large portion of these obligations is covered by purchases of certificates included in intangible assets (see note 10.2).

useful lives of other noncurrent non-financial assets. No material effects on the useful lives of capitalized development costs or property, plant and equipment were identified, given the periods under consideration for the regulatory requirements and due to the parallel production of battery-electric vehicles and vehicles with combustion engines in the coming years. With reference to increasingly stringent emissions regulations, it is ensured that the various international regulations are taken into account and that any obligations are recognized appropriately. This did not result in any material effects on the consolidated financial statements. The increase in development costs in the areas of e-mobility and digitalization have, however, led to a corresponding increase in internally generated intangible assets.

Panel C: Climate disclosures by U.S. firms

"Commitment and contingencies" note (Illinois Tool Works 2023, p. 71)

The Company is subject to various legal proceedings and claims that arise in the ordinary course of business, including those involving environmental, product liability (including toxic tort) and general liability claims. […] The Company believes resolution of these matters, individually and in the aggregate, will not have a material adverse effect on the Company's financial position, liquidity or future operations.

"Significant accounting policies" note (Royal Caribbean Cruises 2023, F-12)

Our useful life and residual value estimates take into consideration the impact of anticipated technological changes, environmental regulations, long-term cruise and vacation market conditions and historical useful lives of similarly built ships.

"Other contingencies and commitments" note (Chevron 2023, p. 94)

The company is subject to loss contingencies pursuant to laws, regulations, private claims and legal proceedings related to environmental matters that are subject to legal settlements or that in the future may require the company to take action to correct or ameliorate the effects on the environment of prior release of chemicals or petroleum substances by the company or other parties. Such contingencies may exist for various operating, closed and divested sites, including, but not limited to, U.S. federal Superfund sites and analogous sites under state laws, refineries, chemical plants, marketing facilities, crude oil fields, and mining sites.

Appendix C: Timeline of policy documents on climate disclosure in financial statements

This Appendix provides a (non-exhaustive) list and timeline of influential policy documents issued by financial reporting standard setters and enforcement authorities on the topic of climate disclosure in financial statements.

2018-12 | *Australian Accounting Standards Board (AASB) and Auditing and Assurance Standards Board (AUASB)*, Climate-related and other emerging risks disclosures: assessing financial statement materiality using AASB Practice Statement 2: "Climate-related risks and other emerging risks are currently predominantly discussed outside the financial statements, if at all. However, as set out in AASB Practice Statement 2 Making Materiality Judgements (APS 2), qualitative external factors … and investor expectations may make such risks 'material' and warrant disclosures when preparing financial statements, regardless of their numerical impact." The AASB and AUASB "expect that directors, preparers and auditors will be considering APS 2, when preparing and auditing financial statements for their next half and full year ends. Even though the guidance is not mandatory, it represents the IASB's best practice interpretation ... and entities in Australia are already being subject to lawsuits regarding lack of disclosure."

2019-11 | International Accounting Standards Board (IASB), In Brief: IFRS Standards and climate-related disclosures: IASB Board member Nick Anderson provides an overview "intended to help investors understand what already exists in the current requirements and guidance on the application of materiality, and how it relates to climate and other emerging risks. While climate-change risks and other emerging risks are not covered explicitly by IFRS Standards, the Standards do address issues that relate to them."

2020-11 (republished 2023-07 | International Accounting Standards Board (IASB), Effects of climate-related matters on financial statements: "This educational material was first published in November 2020 and is intended to support the consistent application of requirements in IFRS Accounting Standards. … IFRS Accounting Standards do not refer explicitly to climate-related matters. However, companies must consider climate-related matters in applying IFRS Accounting Standards when the effect of those matters is material in the context of the financial statements taken as a whole."

2021-10 | *European Securities and Markets Authority (ESMA)*, European common enforcement priorities for 2021 annual financial reports: "ESMA, together with national enforcers, will pay particular attention to these areas when monitoring and assessing the application of the relevant reporting requirements. Based on the examinations performed, enforcers will take enforcement actions whenever material misstatements are identified and ESMA will report subsequently on their findings.

2022-10 | *European Securities and Markets Authority (ESMA)*, European common enforcement priorities for 2022 annual financial reports: Update of ESMA's 2021 common enforcement priorities; see above.

2022-11 | Autorité des Marchés Financiers (AMF, France), Overview of the information provided in the 2021 financial statements on the effects of climate change and the commitments made by companies: "The 2022 overview of the information provided by companies on the effects of climate change … is to provide a new assessment of how companies are taking the effects of climate change into account in their financial statements, along with some examples of current practices."

2023-10 | *European Securities and Markets Authority (ESMA)*, European common enforcement priorities for 2023 annual financial reports: Update of ESMA's 2021 and 2022 enforcement priorities; see above.

2023-10 | *European Securities and Markets Authority (ESMA)*, The Heat is On: Disclosures of Climate-Related Matters in the Financial Statements (Report): "This report aims to assist and to enhance the ability of issuers to provide more robust disclosures and create more consistency in how climate-related matters are accounted for in financial statements drawn up in accordance with IFRS. The report focuses on disclosures related to climate matters included in the 2022 annual financial statements of European non-financial corporate issuers."

2023-11 | *New Zealand External Reporting Board (XRB)*, Climate-related matters in financial statements (Staff Guidance): "This publication is intended to help Climate Reporting Entities understand the requirements in New Zealand accounting standards relating to climate-related matters in financial statements."

2024-06 | *European Financial Reporting Advisory Group (EFRAG)*, EFRAG Connectivity Project: Connectivity Considerations and Boundaries of Different Annual Report Sections: "The purpose of the initial paper is to raise awareness of the articulation and conceptual foundations of the notion of connectivity as primarily reflected in the ESRS' and ISSB Standards' connectivity/connection requirements and of the boundaries of different Annual Report sections. Another objective is to highlight the pivotal role of connectivity in ensuring the coherence and complementarity of the information across the Annual Report."

2024-07 | *International Accounting Standards Board (IASB)*, Exposure Draft: Climate-related and Other Uncertainties in the Financial Statements: "The Exposure Draft proposes eight examples illustrating how an entity applies the requirements in IFRS Accounting Standards to report the effects of climate-related and other uncertainties in its financial statements."

Appendix D: Studies illustrating climate disclosure in financial statements

This Appendix provides a summary of practitioner studies investigating climate disclosure in financial statements. The objective of these studies is to generate illustrative examples of corporate practices. The non-exhaustive list has been originally prepared by the EFRAG Secretariat for discussion in the EFRAG Connectivity Advisory Panel and has been complemented by the authors. For each study, we present the year of publication (in descending order), the originator, the title and source link, as well as the sample covered.

Year	Originator	Title and Link to Source	Sample
2024	Mazars	Financial reporting by European companies on climate issues	94 companies from France / EU
2024	Agrawal, Bayne, Hellman, Wee	Connectivity and Boundaries of Climate-related disclosures in Annual Reports	80 large listed companies
2024	Carbon Tracker	Flying Blind: In a Holding Pattern	140 companies globally
2023	UKEB	A Study in Connectivity: Analysis of 2022 UK Company Annual Reports	9 companies from UK
2023	AASB-AUASB / You, Simnett	Trends in climate-related disclosures and assurance in the Annual Reports of ASX-listed entities	All companies listed on the Australian Securities Exchange
2022	AASB	Commentary: Climate-Related Risks Disclosures in the Notes to Financial Statements: Descriptive Evidence from Australia	75 companies from Australia
2022	Carbon Tracker	Still flying blind: The absence of climate risk in financial reporting	134 companies globally
2022	Mazars	Financial reporting of European companies on climate issues: Findings from 2021 financial statements	79 companies from France / EU
2022	van der Tas, Aggarwal, and Maksimovic	Effects of climate change on financial statements of entities listed in the Netherlands	88 companies from the Netherlands
2021	ACCA / Baboukardos, Dionysiou, Slack, Tsalavoutas, Tsoligkas	Climate Change Risk-related Disclosures in Extractive Industries: A Comparative Study Climate Change Risk-related Disclosures in Extractive Industries	56/60 listed companies in the extractive industries
2021	Carbon Tracker	Flying blind: The glaring absence of climate risks in financial reporting	107 companies globally

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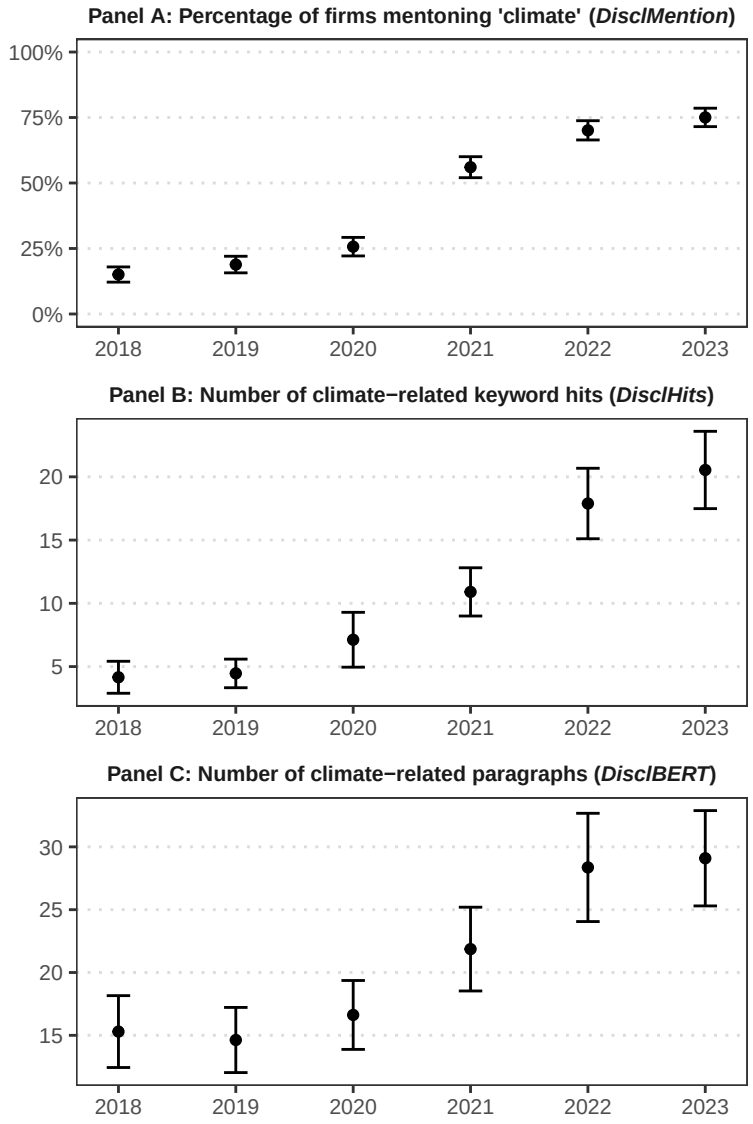
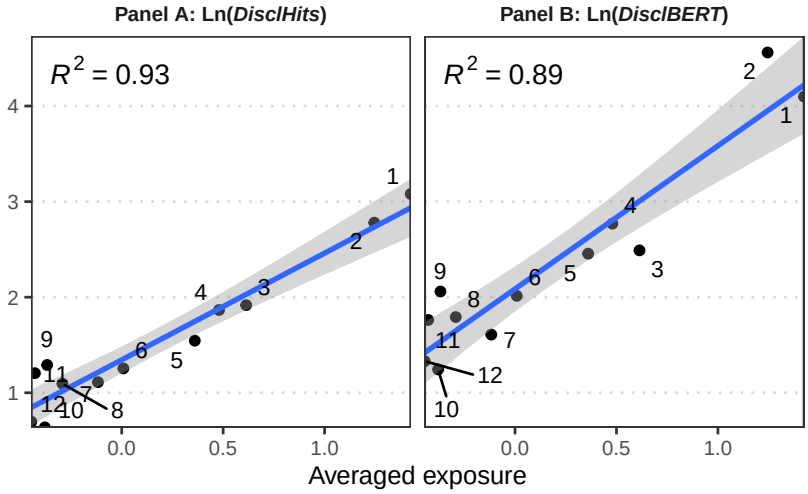
Figure 1: Time-series variation in climate disclosure in financial statements



Notes: This figure plots time trends in climate disclosure in financial statements in terms of three measures. Panel A shows the percentage of firms mentioning the word "climate" (*DisclMention*). Panel B plots the number of climate-related keyword search hits (*DisclHits*), and Panel C displays the number of climate-related paragraphs as labeled by ClimateBERT (*DisclBERT*). Dots represent means and error bars represent 95% confidence intervals. All variables are defined in Appendix A.

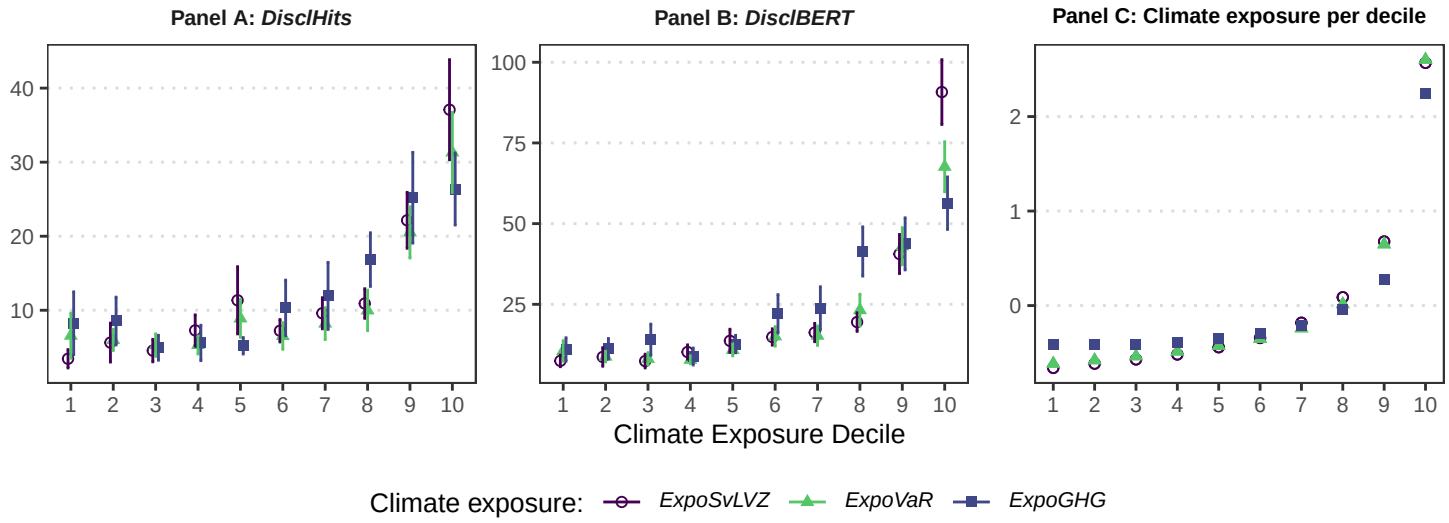
Figure 2: Climate disclosures in financial statements and climate exposure by industry



Averaged Exposure (rank)	Fama−French Industry
1	Oil, Gas, and Coal Extraction
2	Utilities
3	Consumer Durables
4	Chemicals
5	Manufacturing
6	Other
7	Wholesale and Retail
8	Consumer Nondurables
9	Telecommunication
10	Business Equipment and Software
11	Finance
12	Healthcare

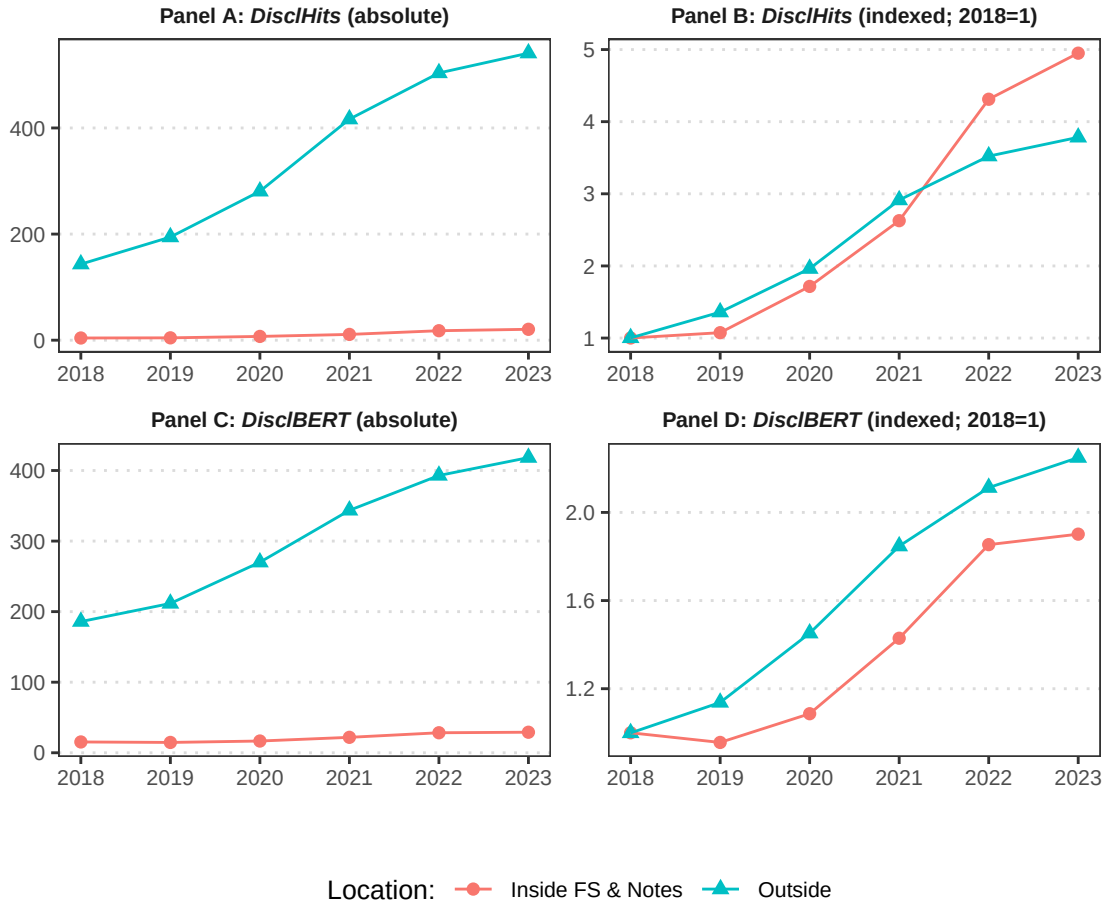
Notes: This figure plots climate disclosure in financial statements as a function of climate exposure per Fama-French industry. We measure the average climate disclosure by industry (on the *y*-axes) as *DisclHits*, the average number of climate-related keyword search hits (Panel A) and *DisclBERT*, the average number of climate-related paragraphs as labeled by ClimateBERT (Panel B). We measure climate exposure (on the *x*-axes) as the average of our three climate exposure measures (*ExpoSvLVZ*, *ExpoVaR*, and *ExpoGHG*) by industry. The solid line is based on a simple OLS regression, the shaded areas indicate 95% confidence intervals. All variables are defined in Appendix A.

Figure 3: Climate disclosures in financial statements per climate exposure decile



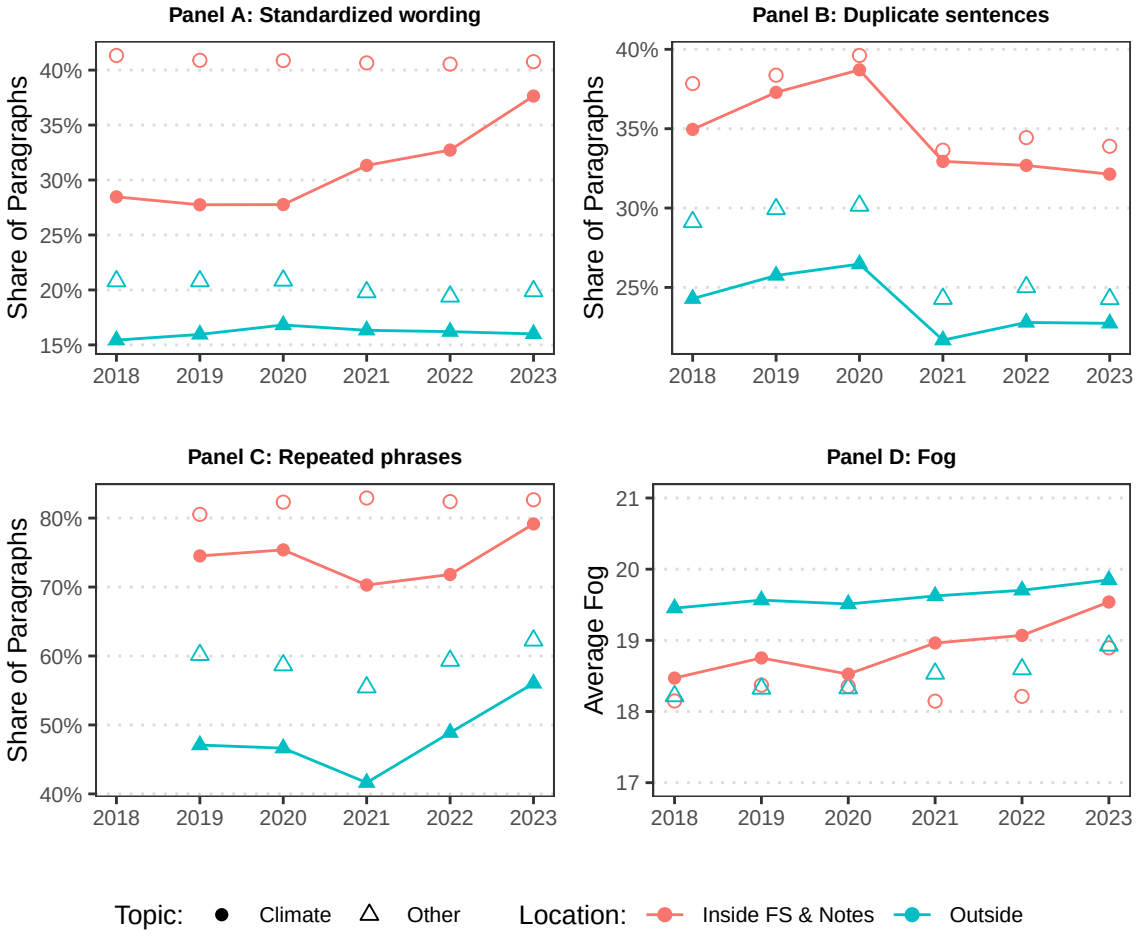
Notes: This figure plots average climate disclosure levels for increasing levels of firms' climate exposure. We measure climate disclosure as *DisclHits*, the average number of climate-related keyword search hits (Panel A) and *DisclBERT*, the average number of climate-related paragraphs as labeled by ClimateBERT (Panel B). Climate exposure deciles are generated for each of our three composite exposure measures. *ExpoSvLVZ* is based on a firm's climate change discussions in conference calls (Sautner et al. [2023]); *ExpoVaR* is a firm's Climate Value-at-Risk from MSCI; and *ExpoGHG* is a firm's greenhouse gas (GHG) emissions intensity (total emissions scaled by revenues). Panel C shows average climate exposure per decile for the respective exposure measure. All variables are defined in Appendix A.

Figure 4: Time-series variation in climate disclosure inside versus outside financial statements



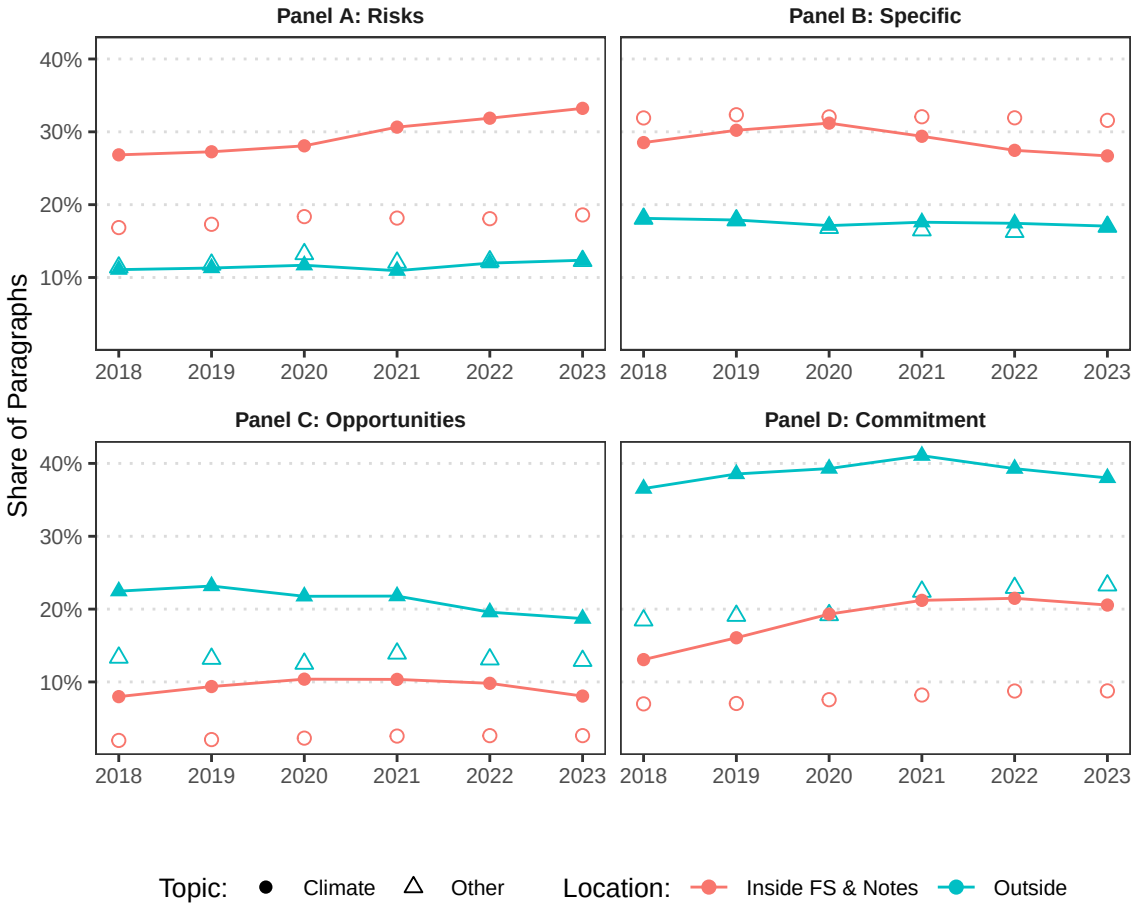
Notes: This figure compares time trends in average climate disclosure levels (*DisclHits* in Panels A and B, *DisclBERT* in Panels C and D) inside the financial statements in red dots versus outside the financial statements (i.e., in the remaining sections of the annual report and sustainability report) in blue triangles. Left-hand panels A and C show absolute values, right panels B and D show indexed values with 2018 set to 1. All variables are defined in Appendix A.

Figure 5: Time-series variation in textual disclosure characteristics



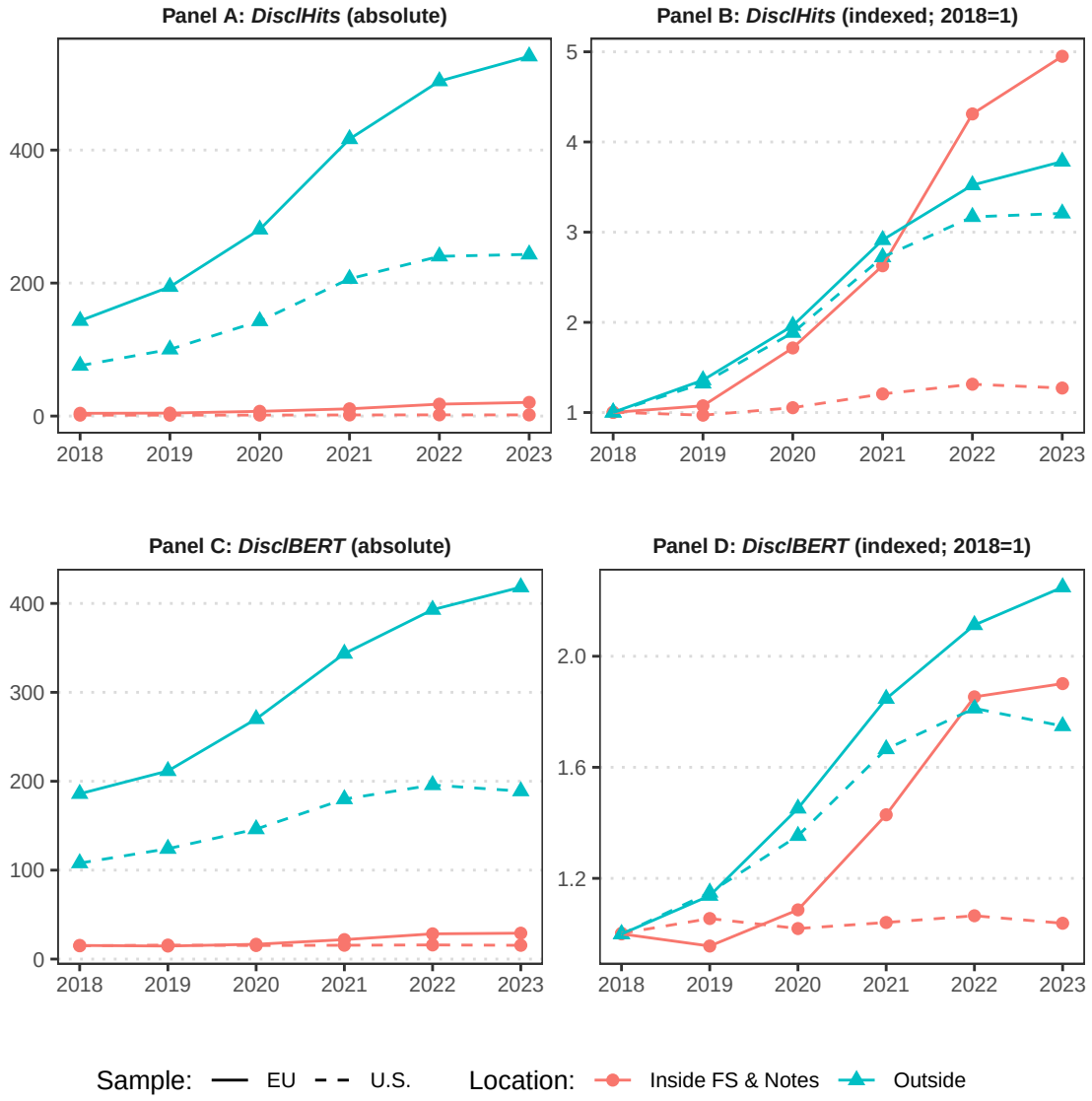
Notes: This figure recreates the main textual characteristics in Dyer et al. [2017]. The panels show the percentage of ClimateBERT-identified paragraphs that contain standardized wordings (Panel A), i.e., four-word phrases that occur in more than 30% but less than 80% of all texts, duplicate sentences (Panel B), repeated phrases, i.e., eight-word phrases that already occurred in last year's disclosures (Panel C), and the average Fog-Index (Panel D), respectively. Red dots demarcate paragraphs inside and blue triangles outside (i.e., the remaining sections of the annual report and sustainability report) the financial statements, respectively. Hollow dots and triangles show the same textual characteristics for other paragraphs, i.e., those not identified as climate-related. All variables are defined in Appendix A.

Figure 6: Time-series variation in disclosure content



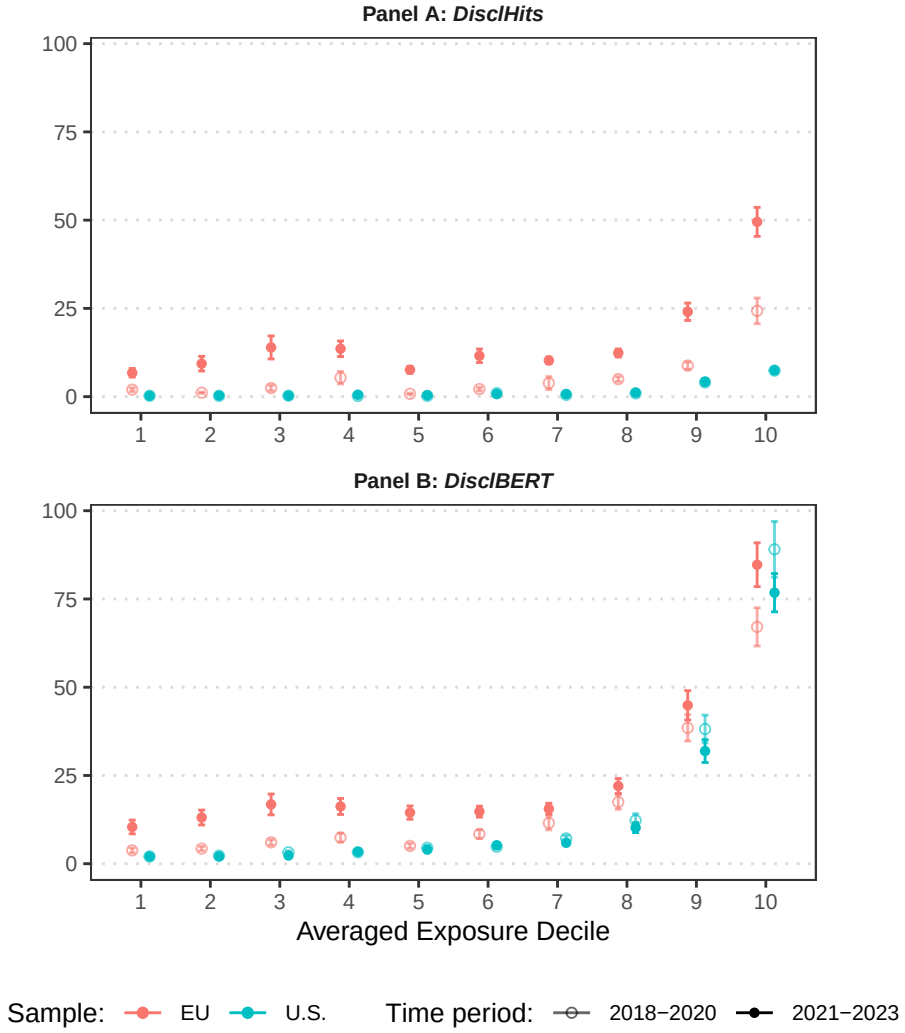
Notes: This figure plots the time-series variation of different dimensions of disclosure content based on ClimateBERT's sub-classifications of risks (Panel A), specific paragraphs (Panel B), opportunities (Panel C), and paragraphs that contain a commitment, i.e., a forward-looking climate-related pledge or target (Panel D). Red dots demarcate paragraphs inside and blue triangles outside (i.e., the remaining sections of the annual report and sustainability report) the financial statements, respectively. Hollow dots and triangles show the same textual characteristics for other paragraphs, i.e., those not identified as climate-related. All variables are defined in Appendix A.

Figure 7: Time-series variation in climate disclosure: EU vs. U.S.



Notes: This figure compares time trends in average climate disclosure levels (*DisclHits* in Panels A and B as well as *DisclBERT* in Panels C and D) in the financial statements in red dots versus outside the financial statements (i.e., in the remaining sections of the annual report and sustainability report) in blue triangles across European (solid lines) and U.S. firms (dashed lines). Left-hand panels A and B report absolute numbers of the disclosure variables, whereas right-hand panels C and D display indexed values (with 2018 set to one). All variables are defined in Appendix A.

Figure 8: Climate disclosures by climate exposure decile: EU vs. U.S.



Notes: This figure plots average climate disclosure levels for increasing levels of firms' climate exposure for the EU sample (in red) and the U.S. sample (in blue) for the first half of the sample period (lighter, empty) and the second half (filled). Climate exposure deciles are based on the average of our three composite exposure measures (i.e., *ExpoSvLVZ*, *ExpoVaR*, and *ExpoGHG*). All variables are defined in Appendix A.

Table 1: Sample description

Panel A: Sample selection

Sample observations	# Firm-Years	# Unique Firms
STOXX Europe 600 firms from 2018-2023	3600	600
Observations with machine-readable annual reports	3527	600

Panel B: Sample distribution by year

	2018	2019	2020	2021	2022	2023	Total
# Firm-Years	584	587	587	590	597	582	3527

Panel C: Sample distribution by Fama-French industry

Industry	# Firm-Years	%
Finance	792	22.46
Manufacturing	495	14.03
Other	475	13.47
Wholesale and Retail	315	8.93
Business Equipment and Software	307	8.70
Healthcare	262	7.43
Consumer Nondurables	225	6.38
Utilities	175	4.96
Chemicals	160	4.54
Consumer Durables	118	3.35
Telecommunication	113	3.20
Oil, Gas, and Coal Extraction	90	2.55
Total	3527	100.00

Notes: This table describes our European sample. Panel A reports on the sample selection procedure. We start with all firms listed in the STOXX Europe 600 and collect their annual reports for the years 2018 through 2023. We disregard firm-years where text extraction from the respective PDF document failed. Panel B tabulates the temporal distribution of firm-year observations, and Panel C displays their distribution across industries based on the Fama-French classification system.

Table 2: Descriptive statistics

	Mean	Std.Dev.	P10	P25	Median	P75	P90	N
Panel A: Climate disclosure								
Inside FS & Notes								
DisclMention	0.435	0.496	0.000	0.000	0.000	1.000	1.000	3461
DisclHits	10.834	27.581	0.000	0.000	2.000	10.000	26.000	3461
DisclBERT	20.971	41.612	0.000	2.000	6.000	19.000	58.000	3461
Length	422.148	284.482	206.000	270.000	369.000	500.000	689.000	3461
Outside FS & Notes								
DisclMention	0.937	0.242	1.000	1.000	1.000	1.000	1.000	3527
DisclHits	346.999	383.422	21.000	88.000	240.000	473.000	793.400	3527
DisclBERT	303.925	295.597	36.000	100.000	222.000	416.000	672.800	3527
Length	1369.968	914.452	458.000	746.500	1160.000	1768.000	2498.000	3527
Panel B: Climate exposure								
Composite exposure								
*ExpoSvLVZ**	0.000	1.000	-0.634	-0.571	-0.398	0.078	1.197	2909
*ExpoVaR**	0.000	1.000	-0.595	-0.537	-0.393	0.004	1.280	3527
*ExpoGHG**	0.000	1.000	-0.416	-0.408	-0.329	-0.044	0.532	2348
External exposure factors								
Emissions Trading	0.224	0.417	0.000	0.000	0.000	0.000	1.000	2965
Climate Laws	28.641	17.907	9.000	15.000	25.000	39.000	60.000	3450
Climate Litigation	0.130	1.456	0.000	0.000	0.000	0.000	0.000	3527
Climate Incident	0.300	0.458	0.000	0.000	0.000	1.000	1.000	3527
Internal exposure factors								
Climate Awareness	0.824	0.381	0.000	1.000	1.000	1.000	1.000	3033
Climate Target	0.661	0.473	0.000	0.000	1.000	1.000	1.000	3527
Climate Finance	0.032	0.349	0.000	0.000	0.000	0.000	0.000	3527
ESG Compensation	0.630	0.483	0.000	0.000	1.000	1.000	1.000	3180
Panel C: Supply- and demand-side factors								
Supply-side factors								
Emission Opacity	0.667	0.222	0.333	0.476	0.762	0.810	0.857	3188
No TCFD	0.374	0.484	0.000	0.000	0.000	1.000	1.000	3527
Separate SR	0.412	0.492	0.000	0.000	0.000	1.000	1.000	3527
HHI	0.070	0.111	0.015	0.022	0.036	0.072	0.153	3524
Demand-side factors								
Analyst	14.863	6.427	5.820	10.083	15.231	19.529	23.000	3442
Ln(*Analyst*)	2.657	0.508	1.920	2.405	2.787	3.022	3.178	3442
IO	0.456	0.241	0.184	0.282	0.420	0.605	0.754	2979
Enforcement Proactivity	0.210	0.058	0.150	0.170	0.180	0.260	0.330	3172
Climate KAM	0.108	0.310	0.000	0.000	0.000	0.000	1.000	3240
Panel D: Other variables								
Sales ($bn)	16.315	26.175	0.776	2.142	5.907	18.648	44.325	3399
Ln(*Sales*)	22.509	1.514	20.469	21.485	22.499	23.649	24.515	3399
ROA	0.073	0.070	0.006	0.022	0.063	0.105	0.157	3398
PP&E Intensity	0.240	0.245	0.007	0.050	0.156	0.353	0.603	3389
Leverage	0.258	0.154	0.045	0.145	0.251	0.357	0.464	3398

Notes: This table presents descriptive statistics on four groups of variables. Panel A describes the three climate disclosure variables, for disclosures made inside the financial statements and for those made outside. *DisclMention* indicates if a firm mentions the word "climate" in its financial statements and notes at least once. *DisclHits* is the number of keyword search hits from a parsimonious list of climate-related keywords. *DisclBERT* is the number of paragraphs identified by ClimateBERT. Panel B tabulates the composite climate exposure variables. *ExpoSvLVZ* captures climate-related discussions in a firm's conference calls (Sautner et al. [2023]), *ExpoVaR* captures the climate-related effects on a firm's valuation, and *ExpoGHG* the total emissions intensity. Panel C describes the variables capturing supply- and demand-side factors of climate disclosure, and Panel D the control variables. Variables with an asterisk (*) are standardized to have mean zero and a standard deviation of one. All variables are defined in Appendix A.

Table 3: Correlations and variance decomposition

Panel A: Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Climate disclosure																						
(1) *DisclHits*	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(2) *DisclBERT*	0.69	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(3) *DisclHits* (outs.)	0.28	0.28	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(4) *DisclBERT* (outs.)	0.28	0.42	0.87	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Composite exposure																						
(5) *ExpoSvLVZ*	0.27	0.58	0.29	0.41	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(6) *ExpoVaR*	0.25	0.41	0.18	0.26	0.47	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(7) *ExpoGHG*	0.08	0.14	0.07	0.11	0.22	0.25	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
External exposure factors																						
(8) *Emissions Trading*	0.22	0.37	0.20	0.26	0.27	0.44	0.03	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(9) *Climate Laws*	0.13	0.07	0.34	0.28	0.09	0.01	0.00	0.05	1	.	.	.	.	.	.	.	.	.	.	.	.	.
(10) *Climate Litigation*	0.12	0.13	0.29	0.22	0.19	0.18	0.06	0.13	0.01	1	.	.	.	.	.	.	.	.	.	.	.	.
(11) *Climate Incident*	0.24	0.30	0.33	0.34	0.20	0.32	0.08	0.34	0.08	0.12	1	.	.	.	.	.	.	.	.	.	.	.
Internal exposure factors																						
(12) *Climate Aware.*	0.12	0.13	0.24	0.22	0.09	0.08	0.05	0.12	0.19	0.03	0.22	1	.	.	.	.	.	.	.	.	.	.
(13) *Climate Target*	0.11	0.09	0.23	0.19	0.10	0.07	0.09	0.08	0.23	0.01	0.17	0.28	1	.	.	.	.	.	.	.	.	.
(14) *Climate Finance*	0.18	0.14	0.24	0.21	0.09	0.06	0.00	0.09	0.05	-0.01	0.06	0.03	0.04	1	.	.	.	.	.	.	.	.
(15) *ESG Compens.*	0.09	0.11	0.25	0.24	0.09	0.03	0.06	0.05	0.26	0.05	0.13	0.20	0.13	0.06	1	.	.	.	.	.	.	.
Supply-side factors																						
(16) *Emission Opacity*	-0.14	-0.10	-0.22	-0.18	-0.14	-0.10	-0.02	-0.03	-0.27	-0.06	-0.06	-0.18	-0.19	-0.05	-0.14	1	.	.	.	.	.	.
(17) *No TCFD*	-0.19	-0.14	-0.41	-0.36	-0.10	-0.02	-0.03	-0.09	-0.29	-0.04	-0.22	-0.34	-0.31	-0.06	-0.29	0.25	1	.	.	.	.	.
(18) *Separate SR*	0.01	0.03	0.31	0.33	0.02	-0.01	-0.00	0.00	0.00	0.05	0.10	0.02	0.02	0.01	0.03	-0.01	-0.10	1	.	.	.	.
(19) *HHI*	-0.07	-0.10	-0.09	-0.09	-0.09	-0.04	-0.02	-0.08	-0.11	-0.02	-0.05	-0.05	-0.06	-0.02	-0.07	0.07	0.06	-0.06	1	.	.	.
Demand-side factors																						
(20) *Climate KAM*	0.27	0.25	0.31	0.26	0.32	0.20	0.12	0.19	0.19	0.20	0.19	0.12	0.11	0.11	0.18	-0.17	-0.18	0.02	-0.05	1	.	.
(21) Ln(*Analyst*)	0.08	0.06	0.15	0.13	-0.03	0.04	-0.06	0.16	0.14	0.09	0.33	0.20	0.13	-0.01	0.07	-0.06	-0.10	0.11	-0.03	0.11	1	.
(22) *IO*	-0.10	-0.14	-0.02	-0.10	-0.09	-0.11	-0.04	-0.10	0.07	-0.04	-0.20	0.02	0.01	-0.02	0.06	-0.04	-0.11	-0.07	0.05	0.04	-0.15	1
(23) *Enforce. Proact.*	0.22	0.32	0.07	0.15	0.13	0.03	0.02	0.10	-0.24	-0.03	0.04	0.01	-0.04	0.04	-0.07	0.02	0.01	0.03	-0.03	-0.00	-0.01	-0.24

Panel B: Variance decomposition

	Ln(*DisclHits*)		Ln(*DisclBERT*)	
	Absolute R^2 (1)	Incremental R^2 (2)	Absolute R^2 (3)	Incremental R^2 (4)
Year	18.3%	18.3%	7.6%	7.6%
Year + Industry	34%	15.6%	38.9%	31.3%
Year × Industry	34.8%	0.8%	39.7%	0.8%
Year × Industry + Country	42.3%	7.5%	47.1%	7.4%
Year × Industry + Country + Firm	75.9%	33.6%	84.9%	37.8%

Notes: This table presents Pearson correlation coefficients for the variables (Panel A) and the results of the variance decomposition analysis (Panel B). The rows in Panel B list the explained variation (adjusted R^2) when adding the specific fixed effect (or fixed effect combination) to a regression explaining the two measures of climate disclosures in the columns. Columns (1) and (3) present the total R^2, columns (2) and (4) a show the incremental R^2 effect of adding the fixed effect (combination) in the respective row. All variables are defined in Appendix A.

Table 4: Composite climate exposure and climate disclosure inside the financial statements

	Ln(*DisclHits*)		Ln(*DisclBERT*)	
	(1)	(2)	(3)	(4)
Panel A: Composite climate exposure = *ExpoSvLVZ*				
ExpoSvLVZ	0.418***		0.626***	
	(0.047)		(0.043)	
ExpoSvLVZ (Regulatory)		0.232***		0.204***
		(0.037)		(0.032)
ExpoSvLVZ (Physical)		0.040		0.091**
		(0.042)		(0.044)
ExpoSvLVZ (Opportunities)		0.243***		0.435***
		(0.049)		(0.050)
N	1955	1955	1955	1955
Adj. R^2	0.306	0.303	0.522	0.494
Panel B: Composite climate exposure = *ExpoVaR*				
ExpoVaR	0.308***		0.457***	
	(0.046)		(0.053)	
ExpoVaR (Regulatory)		0.302***		0.248***
		(0.058)		(0.058)
ExpoVaR (Physical)		0.020		0.103**
		(0.063)		(0.051)
ExpoVaR (Opportunities)		0.127***		0.276***
		(0.041)		(0.048)
N	2140	2063	2140	2063
Adj. R^2	0.261	0.259	0.411	0.385
Panel C: Composite climate exposure = *ExpoGHG*				
ExpoGHG	0.167***		0.291***	
	(0.048)		(0.045)	
ExpoGHG (Scope 1)		0.253***		0.275***
		(0.066)		(0.064)
ExpoGHG (Scope 2)		0.035		0.057
		(0.045)		(0.046)
ExpoGHG (Scope 3)		0.107**		0.218***
		(0.042)		(0.040)
N	1700	1700	1700	1700
Adj. R^2	0.233	0.259	0.357	0.388
Internal and external exposure factors	No	No	No	No
Supply-side Factors	No	No	No	No
Demand-side Factors	No	No	No	No
Controls	Yes	Yes	Yes	Yes
SE Cluster	Firm	Firm	Firm	Firm

Notes: This table presents multivariate OLS regression tests of a variant of Equation (1) that omits internal and external exposure as well as supply- and demand-side factors. Panel A shows results from regressing climate disclosure on the composite climate exposure as well as its decomposed factors for *ExpoSvLVZ*, Panel B for *ExpoVaR*, and Panel C for *ExpoGHG*. Across columns (1) and (2), climate disclosure in financial statements is measured using the natural logarithm of *DisclHits*, the number of keyword search hits from a parsimonious list of climate-related keywords. Columns (3) and (4) display results for climate disclosure in financial statements measured using the natural logarithm of *DisclBERT*, the number of paragraphs identified by ClimateBERT, as the dependent variable. All columns include Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* as firm-level controls as well as *Length*, the log of total pages of the financial statement and notes. Climate exposure variables are standardized to have mean zero and a standard deviation of one. Standard errors are clustered by firm and included in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

Table 5: Factors associated with climate disclosure inside the financial statements

	Ln(*DisclHits*)			Ln(*DisclBERT*)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Composite Exposure						
	ExpoSvLVZ	*ExpoVaR*	*ExpoGHG*	*ExpoSvLVZ*	*ExpoVaR*	*ExpoGHG*
Composite Exposure	0.226***	0.267***	0.094**	0.471***	0.375***	0.227***
	(0.037)	(0.035)	(0.037)	(0.041)	(0.040)	(0.035)
Panel B: External Exposure Factors						
Emissions Trading	0.206**	0.115	0.313***	0.435***	0.365***	0.662***
	(0.096)	(0.094)	(0.099)	(0.086)	(0.093)	(0.104)
Climate Laws	0.018***	0.019***	0.018***	0.005**	0.007***	0.007***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)
Climate Litigation	0.048***	0.051***	0.059***	0.017	0.033***	0.042**
	(0.012)	(0.008)	(0.017)	(0.018)	(0.010)	(0.018)
Climate Incident	0.275***	0.216***	0.256***	0.124*	0.115	0.135
	(0.083)	(0.080)	(0.096)	(0.072)	(0.078)	(0.088)
Panel C: Internal Exposure Factors						
Climate Awareness	0.096	0.099	0.118	0.225***	0.211**	0.169
	(0.078)	(0.075)	(0.088)	(0.087)	(0.095)	(0.116)
Climate Target	0.092	0.128*	0.203**	0.279***	0.254***	0.264**
	(0.074)	(0.071)	(0.087)	(0.078)	(0.096)	(0.115)
Climate Finance	0.216***	0.199***	0.210***	0.104*	0.123**	0.142**
	(0.051)	(0.045)	(0.049)	(0.062)	(0.058)	(0.067)
ESG Compensation	0.117*	0.150**	0.115	0.207***	0.201***	0.201**
	(0.068)	(0.064)	(0.076)	(0.060)	(0.067)	(0.079)
Panel D: Supply-side Factors						
Emission Opacity	-0.524***	-0.493***	-0.654***	-0.402***	-0.469***	-0.443**
	(0.164)	(0.156)	(0.183)	(0.141)	(0.153)	(0.187)
No TCFD	-0.439***	-0.494***	-0.464***	-0.052	-0.143*	-0.110
	(0.069)	(0.069)	(0.081)	(0.070)	(0.077)	(0.090)
Separate SR	-0.114**	-0.111**	-0.115*	-0.067	-0.051	-0.058
	(0.057)	(0.055)	(0.064)	(0.052)	(0.056)	(0.064)
HHI	-0.366**	-0.399**	-0.431**	-0.778***	-1.083***	-1.019***
	(0.184)	(0.179)	(0.206)	(0.206)	(0.225)	(0.246)
Panel E: Demand-side Factors						
Ln(*Analysts*)	-0.293***	-0.248***	-0.289***	-0.376***	-0.318***	-0.331***
	(0.094)	(0.079)	(0.098)	(0.100)	(0.093)	(0.112)
IO	-0.019	-0.112	-0.094	0.052	-0.086	-0.125
	(0.156)	(0.151)	(0.179)	(0.152)	(0.178)	(0.193)
Enforcement Proactivity	3.861***	4.070***	4.155***	3.644***	4.046***	4.212***
	(0.733)	(0.707)	(0.829)	(0.672)	(0.785)	(0.859)
Climate KAM	0.627***	0.772***	0.752***	0.216**	0.461***	0.441***
	(0.105)	(0.094)	(0.097)	(0.090)	(0.088)	(0.099)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1955	2140	1700	1955	2140	1700
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.503	0.502	0.478	0.617	0.547	0.518

Notes: This table presents multivariate OLS regression tests of Equation (1) to examine the relationship between climate disclosure inside the financial statements and notes (the dependent variable) and a set of independent variables capturing a firm's climate exposure as well as supply- and demand-side factors related to disclosure. Across columns (1) through (3), climate disclosure in financial statements is measured using the natural logarithm of *DisclHits*, the number of keyword search hits from a parsimonious list of climate-related keywords. Columns (4) through (6) display results for climate disclosure in financial statements measured using the natural logarithm of *DisclBERT*, the number of paragraphs identified by ClimateBERT, as the dependent variable. All columns include Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* as firm-level controls as well as *Length*, the log of total pages of the financial statement and notes. Climate exposure variables are standardized to have mean zero and standard deviation of one. Standard errors are clustered by firm and included in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

Table 6: Factors associated with climate disclosure outside the financial statements

	Ln(*DisclHits*)			Ln(*DisclBERT*)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Composite Exposure						
	ExpoSvLVZ	*ExpoVaR*	*ExpoGHG*	*ExpoSvLVZ*	*ExpoVaR*	*ExpoGHG*
Composite Exposure	0.160***	0.148***	0.062*	0.217***	0.159***	0.083***
	(0.031)	(0.042)	(0.033)	(0.023)	(0.034)	(0.032)
Panel B: External Exposure Factors						
Emissions Trading	0.138*	0.118	0.165**	0.173***	0.166***	0.244***
	(0.081)	(0.083)	(0.083)	(0.057)	(0.060)	(0.061)
Climate Laws	0.008***	0.008***	0.008***	0.004***	0.004***	0.005***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Climate Litigation	0.005	0.015	0.039**	-0.013*	0.001	0.013
	(0.010)	(0.010)	(0.019)	(0.007)	(0.006)	(0.011)
Climate Incident	0.101	0.079	0.083	0.068	0.057	0.080
	(0.064)	(0.066)	(0.072)	(0.047)	(0.050)	(0.054)
Panel C: Internal Exposure Factors						
Climate Awareness	0.460***	0.500***	0.336***	0.284***	0.320***	0.178**
	(0.094)	(0.097)	(0.105)	(0.070)	(0.072)	(0.080)
Climate Target	0.551***	0.608***	0.503***	0.390***	0.419***	0.366***
	(0.081)	(0.083)	(0.093)	(0.055)	(0.062)	(0.069)
Climate Finance	0.120**	0.129***	0.151***	0.075**	0.090**	0.103***
	(0.048)	(0.045)	(0.049)	(0.037)	(0.037)	(0.039)
ESG Compensation	0.311***	0.372***	0.342***	0.189***	0.231***	0.236***
	(0.062)	(0.064)	(0.070)	(0.044)	(0.048)	(0.053)
Panel D: Supply-side Factors						
Separate SR	0.472***	0.434***	0.439***	0.390***	0.369***	0.365***
	(0.059)	(0.059)	(0.064)	(0.042)	(0.043)	(0.045)
HHI	-0.140	-0.188	-0.386	-0.127	-0.255	-0.353**
	(0.246)	(0.247)	(0.247)	(0.153)	(0.160)	(0.172)
Panel E: Demand-side Factors						
Ln(*Analysts*)	-0.156*	-0.033	-0.098	-0.220***	-0.082	-0.142
	(0.094)	(0.108)	(0.117)	(0.065)	(0.084)	(0.095)
IO	0.431***	0.438***	0.339**	-0.021	-0.041	-0.073
	(0.134)	(0.136)	(0.143)	(0.102)	(0.113)	(0.116)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1955	2140	1700	1955	2140	1700
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.638	0.635	0.592	0.740	0.717	0.694

Notes: This table presents multivariate OLS regression tests of Equation (1) to examine the relationship between climate disclosure outside the financial statements and notes (the dependent variable) with a set of independent variables capturing a firm's climate exposure as well as supply- and demand-side factors related to disclosure. Across columns (1) through (3), climate disclosure outside the financial statements is measured using the natural logarithm of *DisclHits* but applied on all paragraphs outside the financial statements and notes. Columns (4) through (6) display results for climate disclosure in financial statements measured using the natural logarithm of *DisclBERT*, the number of outside paragraphs identified by ClimateBERT, as the dependent variable. All columns include Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* as firm-level controls as well as *Length*, the log of total pages of the financial statement and notes. Climate exposure variables are standardized to have mean zero and a standard deviation of one. Standard errors are clustered by firm and included in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

Table 7: Associations of 'inside' and 'outside' climate disclosure attributes

Panel A: 'Outside' textual dimensions and inside disclosure

	'Outside' Ln(*DisclBERT*) dimension							
	Specific (1)	Risk (2)	Commit. (3)	Opps. (4)	Specific (5)	Risk (6)	Commit. (7)	Opps. (8)
Averaged Exposure	0.069**	0.008	-0.017	0.072*	0.046	-0.026	-0.043**	0.033
	(0.033)	(0.034)	(0.021)	(0.040)	(0.031)	(0.033)	(0.018)	(0.031)
'Ins.' Ln(*DisclBERT*)	0.039**	0.077***	-0.032***	0.044***				
	(0.015)	(0.017)	(0.011)	(0.016)				
'Inside' Textual Dim.					0.075***	0.186***	0.011	0.181***
					(0.017)	(0.023)	(0.013)	(0.022)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3324	3324	3324	3324	3324	3324	3324	3324
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.864	0.764	0.926	0.831	0.865	0.776	0.925	0.839

Panel B: Cheap talk and tangible commitments

	'Outside' *Cheap Talk*		*Late Climate Target*		*Low Climate Target*	
	(1)	(2)	(3)	(4)	(5)	(6)
Averaged Exposure	-0.026***	-0.022**	-0.003	0.005	0.071***	0.078***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.023)	(0.024)
'Inside' Ln(*DisclHits*)	-0.005**		-0.008**		-0.037***	
	(0.002)		(0.004)		(0.010)	
'Inside' Ln(*DisclBERT*)		-0.008**		-0.016***		-0.037***
		(0.003)		(0.005)		(0.011)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	3245	3245	2343	2343	2240	2240
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.147	0.149	0.011	0.016	0.015	0.012

Notes: Panel A shows results from regressing outside climate disclosure characteristics on the overall level of climate disclosures 'inside' the financial statements (columns 1 to 4) and the corresponding characteristics of inside paragraphs (columns 5 to 8). All columns include 'outside' Ln(*DisclBERT*) as well as firm-level controls. We compute *Averaged Exposure* as the mean of the three standardized climate exposure variables *ExpoSvLVZ*, *ExpoVaR*, and *ExpoGHG*. Panel B presents multivariate OLS regressions of climate-related *Cheap Talk* outside the financial statements and other climate-related commitments on climate disclosures inside the financial statements. *Cheap Talk* in column (1) and (2) follows Bingler et al. (2024) and is computed as the share of non-specific climate commitments to overall climate commitments. For columns (3) and (4), we define *Late Climate Target* as an emission reduction target after 2030 and for columns (5) and (6), we define *Low Climate Target* as an emission reduction target corresponding to a reduction of less than or equal to 25%. All variables are defined in Appendix A.

Table 8: Association of 'inside' disclosure with financial statement recognition

	Impairment		*Useful life*		*ROE*	
	(1)	(2)	(3)	(4)	(5)	(6)
Averaged Exposure	0.025	0.009	-8.914***	-6.633***	-0.009	-0.004
	(0.020)	(0.021)	(2.317)	(2.225)	(0.007)	(0.007)
'Inside' Ln(*DisclHits*)	0.029***		-0.777		-0.003	
	(0.008)		(0.817)		(0.003)	
'Inside' Ln(*DisclBERT*)		0.042***		-3.282***		-0.008**
		(0.011)		(1.210)		(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	3324	3324	2715	2715	3324	3324
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.128	0.132	0.551	0.556	0.017	0.019

Notes: This table presents the relationship between several financial statement outcomes and the climate disclosure and averaged exposure. The dependent variable in columns (1) and (2) is an impairment dummy (an indicator variable if the firm has a non-zero goodwill or property, plant and equipment impairment in the year), in columns (3) and (4) the average total useful life, calculated as the gross amount of PP&E divided by the annual depreciation charges, and in columns (5) and (6) the return on equity. All columns include Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* (except for the last two columns) as firm-level controls. Averaged climate exposure is the mean of the three exposure variables *ExpoSvLVZ*, *ExpoVaR*, and *ExpoGHG*. Standard errors are clusted by firm and included in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

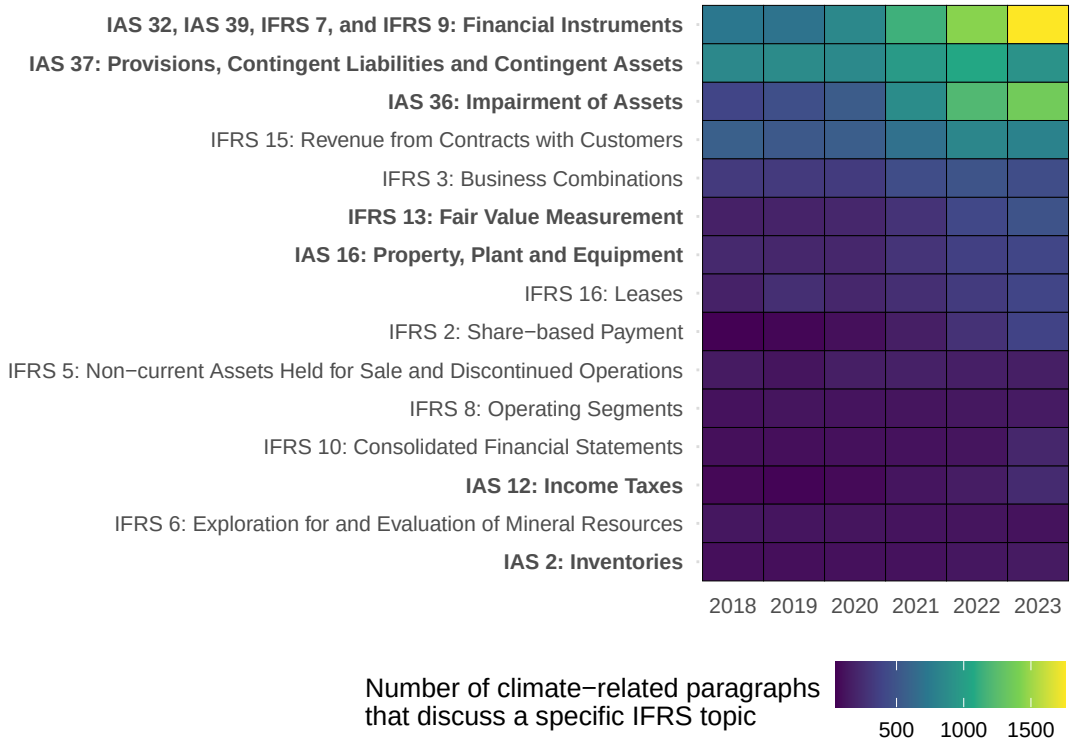
Online Appendix to

Climate disclosure in financial statements

Müller, Ormazabal, Sellhorn, Wagner

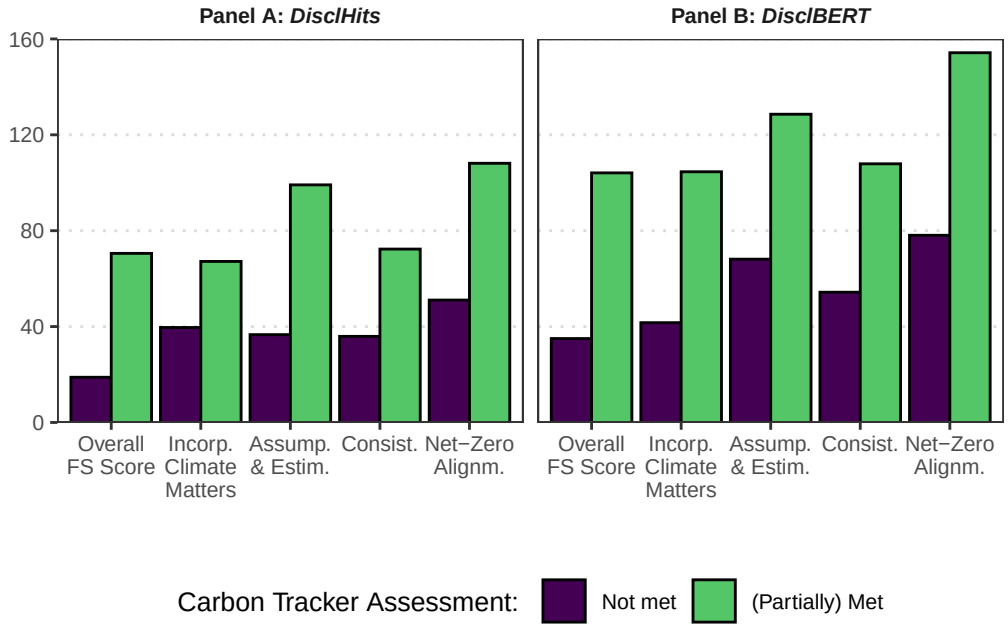
May 2025

Figure OA.1: Climate disclosure and IFRS topics



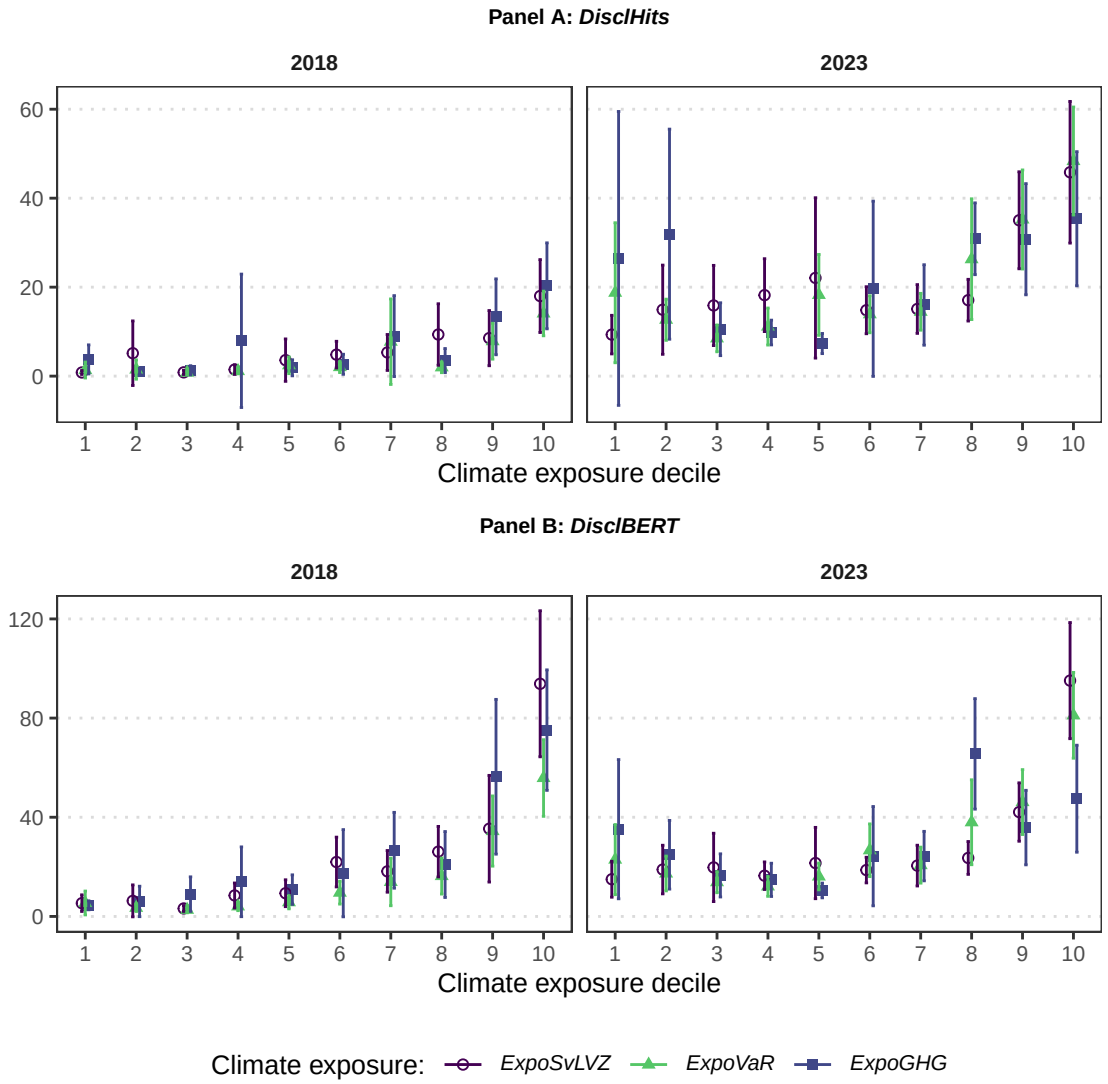
Notes: This figure presents the distribution of paragraphs classified by OpenAI's GPT-4-mini that discuss a specific IFRS topic in the context of climate-related matters. Standards printed in bold are those standards highlighted in the IASB educational material (IASB [2023]). Lighter, yellow boxes indicate a higher number of the topic in the respective year. We used the following prompt: "You are an accounting expert for IFRS standards. You will be given a paragraph from the notes section of an annual report. You have the following tasks. Assess whether this paragraph is related to climate change or not. If this paragraph is climate-related, assign it to either climate-related regulatory or phyiscal risks or climate-related opportunities. Assess whether this paragraph discusses how climate-related matters impact the financial statements. For example, a firm might disclose that is has to reduce the useful lives of its machines due to upcoming regulation or recognize a provision in the context of an emissions trading scheme. Climate-related matters frequently occur in: Significant judgements, major sources of estimation uncertainty and accounting policies; Going concern; Impairment of non-financial assets; Useful lives of tangible and intangible assets; Provisions; Inventories. Name the underlying IFRS or IAS standard the paragraph refers to. If you cannot identify the standard or topic, please say so. It is important to not assign a wrong label to the paragraph. You must name the offical and full standard name and only one standard. State if the paragraph simply states that the firm has assessed climate but came to the conclusion that it does not influence the financial statements and is therefore not material or has no effect?" Here is the paragraph […]". Further details on the textual analysis approach can be found in Appendix A.

Figure OA.2: Comparing climate disclosure levels with the assessment from Carbon Tracker



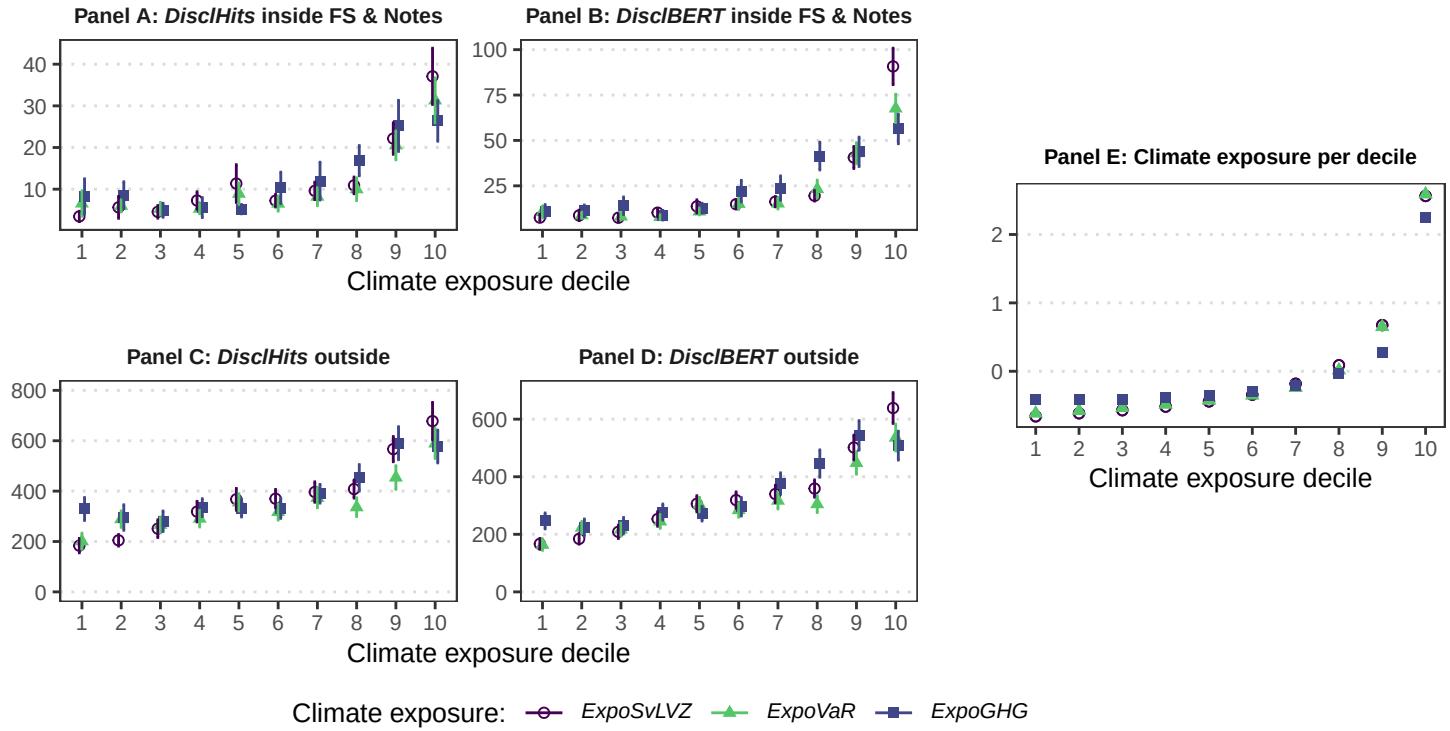
Notes: This figure compares the assessment scores from the latest Carbon Tracker [2024] report with the two disclosure measures. We combine Carbon Tracker's assessment categories "Partially met" and "Met" into the category "(Partially) Met". Carbon Tracker computes several measures, we focus on the overall financial statements and notes score, three specific metrics that assess a firm's general incorporation of climate-related matters, how they include climate-related matters in their assumptions and estimates and if their reporting is consistent with disclosures outside of the financial statements and notes. We also include a score on the alignment of a firm's net-zero goal with its financial statement assumptions. All variables are defined in Appendix A.

Figure OA.3: Climate disclosures in financial statements per climate exposure decile (over time)



Notes: This figure plots average climate disclosure levels for increasing levels of firms' climate exposure. Climate exposure deciles are generated for each of our three composite exposure measures. *ExpoSvLVZ* is based on a firm's climate change discussions in conference calls (Sautner et al. [2023]); *ExpoVaR* is a firm's Climate Value-at-Risk from MSCI; and *ExpoGHG* is a firm's greenhouse gas (GHG) emissions intensity (total emissions scaled by revenues). All variables are defined in Appendix A.

Figure OA.4: Climate disclosures inside and outside the financial statements per climate exposure decile



Notes: This figure plots average inside (Panels A and B) and outside (Panels C and D) climate disclosure levels for increasing levels of firms' climate exposure. We measure climate disclosure with *DisclHits*, the average number of climate-related keyword search hits and *DisclBERT*, the average number of climate-related paragraphs as labeled by ClimateBERT. Climate exposure deciles are generated for each of our three composite exposure measures. *ExpoSvLVZ* is based on a firm's climate change discussions in conference calls (Sautner et al. [2023]); *ExpoVaR* is a firm's Climate Value-at-Risk from MSCI; and *ExpoGHG* is a firm's greenhouse gas (GHG) emissions intensity (total emissions scaled by revenues). Panel E shows the average exposure value per its decile. All variables are defined in Appendix A.

Table OA.1: Factors assoc. with climate disclosure inside financial statements using Poisson regression

	Ln(*DisclHits*)			Ln(*DisclBERT*)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Composite Exposure						
	ExpoSvLVZ	*ExpoVaR*	*ExpoGHG*	*ExpoSvLVZ*	*ExpoVaR*	*ExpoGHG*
Composite Exposure	0.090***	0.141***	0.058***	0.138***	0.132***	0.081***
	(0.021)	(0.022)	(0.016)	(0.017)	(0.015)	(0.011)
Panel B: External Exposure Factors						
Emissions Trading	0.124**	0.053	0.160***	0.171***	0.129***	0.249***
	(0.058)	(0.053)	(0.052)	(0.036)	(0.037)	(0.038)
Climate Laws	0.010***	0.011***	0.010***	0.002**	0.003**	0.003***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Climate Litigation	0.008	0.009**	0.012**	0.002	0.005	0.008
	(0.006)	(0.004)	(0.006)	(0.006)	(0.004)	(0.005)
Climate Incident	0.128**	0.092*	0.119**	0.024	0.015	0.027
	(0.057)	(0.054)	(0.060)	(0.034)	(0.035)	(0.038)
Panel C: Internal Exposure Factors						
Climate Awareness	0.361***	0.354***	0.487***	0.222***	0.197***	0.200**
	(0.134)	(0.123)	(0.151)	(0.069)	(0.068)	(0.084)
Climate Target	0.208**	0.226***	0.299***	0.208***	0.174***	0.176***
	(0.083)	(0.085)	(0.107)	(0.051)	(0.059)	(0.068)
Climate Finance	0.035**	0.034**	0.041***	0.006	0.012	0.021
	(0.016)	(0.015)	(0.015)	(0.016)	(0.016)	(0.018)
ESG Compensation	0.133**	0.140**	0.111*	0.120***	0.098***	0.106***
	(0.060)	(0.057)	(0.061)	(0.034)	(0.035)	(0.039)
Panel D: Supply-side Factors						
Emission Opacity	-0.354***	-0.294***	-0.453***	-0.202***	-0.200***	-0.225***
	(0.107)	(0.103)	(0.110)	(0.067)	(0.068)	(0.080)
No TCFD	-0.456***	-0.500***	-0.469***	-0.032	-0.079**	-0.060
	(0.074)	(0.070)	(0.082)	(0.038)	(0.040)	(0.044)
Separate SR	-0.099**	-0.088**	-0.084**	-0.049*	-0.031	-0.031
	(0.041)	(0.040)	(0.042)	(0.026)	(0.026)	(0.028)
HHI	-0.341	-0.440*	-0.363	-0.385**	-0.611***	-0.502***
	(0.234)	(0.240)	(0.258)	(0.154)	(0.165)	(0.169)
Panel E: Demand-side Factors						
Ln(*Analysts*)	-0.226***	-0.194***	-0.224***	-0.195***	-0.163***	-0.165***
	(0.074)	(0.064)	(0.066)	(0.050)	(0.047)	(0.050)
IO	-0.060	-0.096	-0.116	0.019	-0.022	-0.070
	(0.113)	(0.109)	(0.117)	(0.078)	(0.086)	(0.086)
Enforcement Proactivity	1.974***	2.143***	2.010***	1.333***	1.469***	1.405***
	(0.444)	(0.423)	(0.430)	(0.301)	(0.315)	(0.313)
Climate KAM	0.252***	0.300***	0.304***	0.054	0.137***	0.130***
	(0.047)	(0.047)	(0.041)	(0.035)	(0.034)	(0.034)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1955	2140	1700	1955	2140	1700
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.193	0.199	0.185	0.147	0.136	0.122

Notes: This table reproduces the main regression analysis in Table 5 of Equation (1) using Poisson regression. All columns include Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* as firm-level controls as well as *Length*, the log of total pages of the financial statement and notes. Climate exposure variables are standardized to have mean zero and a standard deviation of one. Standard errors are clustered by firm and included in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

Table OA.2: Factors associated with climate disclosure inside the financial statements with fixed effects

	Ln(*DisclHits*)					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Composite Exposure						
	ExpoSvLVZ	*ExpoSvLVZ*	*ExpoSvLVZ*	*ExpoSvLVZ*	*ExpoSvLVZ*	*ExpoSvLVZ*
Composite Exposure	0.233***	0.242***	0.146***	0.147***	0.131***	0.041
	(0.038)	(0.038)	(0.047)	(0.048)	(0.048)	(0.063)
Panel B: External Exposure Factors						
Emissions Trading	0.245***	0.255***	0.189**	0.180*	0.211**	-0.021
	(0.094)	(0.093)	(0.090)	(0.092)	(0.095)	(0.152)
Climate Laws	0.018***	0.006*	0.007**	0.007*	0.007*	0.006
	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Climate Litigation	0.056***	0.055***	0.029	0.032*	0.036**	0.114***
	(0.013)	(0.014)	(0.018)	(0.019)	(0.017)	(0.035)
Climate Incident	0.370***	0.377***	0.364***	0.373***	0.379***	0.096
	(0.083)	(0.081)	(0.084)	(0.085)	(0.083)	(0.067)
Panel C: Internal Exposure Factors						
Climate Awareness	0.129	0.097	0.119	0.114	0.033	-0.079
	(0.080)	(0.081)	(0.085)	(0.089)	(0.099)	(0.096)
Climate Target	0.122*	0.045	0.002	-0.016	-0.001	0.016
	(0.073)	(0.071)	(0.070)	(0.072)	(0.073)	(0.084)
Climate Finance	0.231***	0.196***	0.180***	0.206***	0.200***	0.132**
	(0.051)	(0.043)	(0.040)	(0.045)	(0.051)	(0.061)
ESG Compensation	0.138**	0.030	0.019	0.010	0.020	-0.044
	(0.068)	(0.066)	(0.066)	(0.068)	(0.068)	(0.062)
Panel D: Supply-side Factors						
Emission Opacity	-0.557***	-0.327**	-0.262*	-0.265*	-0.293*	-0.168
	(0.161)	(0.161)	(0.148)	(0.154)	(0.151)	(0.157)
No TCFD	-0.437***	-0.400***	-0.376***	-0.372***	-0.335***	-0.152**
	(0.070)	(0.074)	(0.071)	(0.074)	(0.081)	(0.073)
Separate SR	-0.106*	-0.060	-0.057	-0.065	-0.064	0.009
	(0.057)	(0.056)	(0.053)	(0.054)	(0.054)	(0.056)
HHI	-0.308*	-0.465**	-0.404**	-0.386	-0.414	-0.270
	(0.186)	(0.194)	(0.199)	(0.289)	(0.268)	(0.246)
Panel E: Demand-side Factors						
Ln(*Analysts*)	-0.177**	-0.027	-0.051	-0.050	0.046	-0.059
	(0.083)	(0.086)	(0.087)	(0.088)	(0.094)	(0.197)
IO	-0.116	-0.137	-0.041	-0.023	0.042	-0.940**
	(0.151)	(0.150)	(0.140)	(0.143)	(0.165)	(0.391)
Enforcement Proactivity	3.697***	2.768***	2.747***	2.731***		
	(0.731)	(0.770)	(0.735)	(0.750)		
Climate KAM	0.622***	0.565***	0.526***	0.528***	0.525***	0.364***
	(0.106)	(0.106)	(0.103)	(0.106)	(0.104)	(0.114)
Year FE	-	Yes	Yes	Abs.	Abs.	Abs.
Industry FE	-	-	Yes	Abs.	Abs.	Abs.
Industry × Year FE	-	-	-	Yes	Yes	Yes
Country FE	-	-	-	-	Yes	Abs.
Firm FE	-	-	-	-	-	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1955	1955	1955	1955	1955	1955
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.498	0.532	0.549	0.546	0.561	0.730

Notes: This table reproduces the analysis in Table 5 of Equation (1) using *DisclHits* as the dependent variable and *ExpoSvLVZ* as the composite climate exposure variable. Columns differ based on the inclusion of fixed effects. All columns include Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* as firm-level controls as well as *Length*, the log of total pages of the financial statement and notes. Climate exposure variables are standardized to have mean zero and a standard deviation of one. Standard errors are clustered by firm and included in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

Table OA.3: Validating climate disclosure with examples from ESMA [2023]

Firm	Example	Contains climate keyword (1)	Flagged by ClimateBERT (2)	Topic matched by GPT (3)
Naturgy	Sensitivity Analysis	Yes	Yes	Yes
Naturgy	Fixed Assets	Yes	Yes	Yes
Enel	Accounting Policies	Yes	Yes	Yes
Enel	Accounting Policies	Yes	Yes	No*
L'Air Liquide	Potential Impacts	Yes	Yes	Yes
Equinor	Emission Rights	Yes	Yes	Yes
Equinor	Impairments	Yes	Yes	Yes
Solvay	Emission Rights	Yes	Yes	Yes
Telia	Impairments	Yes	Yes	No*
Arkema	Sensitivity Analysis	No	No	Yes
Eni	Impairments	Yes	Yes	Yes
Saint-Gobain	Sensitivity	Yes	Yes	Yes
BASF	Impairments	Yes	Yes	Yes
Mercedes-Benz	Intangibles	No	Yes	Yes
Iberdrola	Intangibles	Yes	Yes	Yes
EDF	Provisions	Yes	Yes	Yes
RWE	Provisions	Yes	Yes	Yes
Repsol	Provisions	Yes	Yes	No*
Total		**16**	**17**	**15**

Notes: This table depicts 18 examples from firms in the sample that were featured in the ESMA report "The Heat is On: Disclosures of Climate-Related Matters in Financial Statements" (2023). We use the examples to validate our approach of extracting and classifying relevant paragraphs. Columns 1 and 2 show if the respective example was flagged as containing a keyword search hit (1) or classified by ClimateBERT (2). Column 3 indicates if OpenAI's GPT-4-mini matched the correct accounting topic. Cells with an asterisk mark cases where the extracted paragraph was rather short and did not discuss the topic precisely. All variables are defined in Appendix A.

Table OA.4: Stacked regressions including 'inside' and 'outside' disclosure for all variables

	Avg. Exp. (1)	Emiss. Trad. (2)	Clim. Laws (3)	Clim. Litig. (4)	Clim. Incid. (5)	Clim. Aware. (6)	Emiss. Target (7)	Clim. Fin. (8)	ESG Comp. (9)	Sep. SR (10)	HHI (11)	Ln(Analyst) (12)	IO (13)
Panel A: Ln(*DisclHits*)													
Outside	2.950***	2.999***	3.082***	2.934***	2.995***	2.678***	2.681***	2.936***	2.814***	2.707***	2.897***	2.083***	2.643***
	(0.093)	(0.100)	(0.114)	(0.096)	(0.093)	(0.113)	(0.104)	(0.096)	(0.105)	(0.098)	(0.099)	(0.313)	(0.133)
Variable	0.402***	0.280***	0.014***	0.065***	0.164**	0.020	0.077	0.251***	0.111*	-0.122**	-0.474**	-0.278***	-0.225
	(0.057)	(0.091)	(0.002)	(0.014)	(0.073)	(0.084)	(0.075)	(0.053)	(0.067)	(0.057)	(0.188)	(0.080)	(0.140)
Variable × Outside	-0.271***	-0.290***	-0.005**	-0.073***	-0.190**	0.307***	0.329***	-0.206***	0.185**	0.598***	0.469*	0.313***	0.634***
	(0.052)	(0.109)	(0.002)	(0.013)	(0.095)	(0.117)	(0.102)	(0.054)	(0.091)	(0.077)	(0.260)	(0.114)	(0.177)
Sum of coefficients	0.131	-0.010	0.008	-0.008	-0.026	0.327	0.405	0.045	0.296	0.476	-0.005	0.035	0.409
F-Statistic	27.67***	4.91***	21.79***	15.14***	2.68*	5.94***	12.82***	11.41***	11.46***	41.11***	3.26**	7.01***	7.45***
Adj. R^2	0.844	0.843	0.842	0.843	0.842	0.843	0.843	0.842	0.842	0.846	0.842	0.843	0.843
Panel B: Ln(*DisclBERT*)													
Outside	2.154***	2.260***	2.123***	2.120***	2.213***	2.172***	2.116***	2.120***	2.125***	1.948***	2.049***	1.558***	1.973***
	(0.076)	(0.084)	(0.098)	(0.083)	(0.080)	(0.105)	(0.095)	(0.083)	(0.087)	(0.081)	(0.085)	(0.268)	(0.120)
Variable	0.693***	0.570***	0.004**	0.050***	0.160**	0.224**	0.252***	0.192***	0.187***	-0.058	-1.017***	-0.265***	-0.209
	(0.081)	(0.089)	(0.002)	(0.011)	(0.068)	(0.094)	(0.086)	(0.067)	(0.063)	(0.055)	(0.220)	(0.085)	(0.156)
Variable × Outside	-0.514***	-0.604***	-0.000	-0.086***	-0.284***	-0.071	-0.002	-0.189***	-0.017	0.448***	0.954***	0.206**	0.313*
	(0.046)	(0.092)	(0.002)	(0.016)	(0.081)	(0.107)	(0.091)	(0.061)	(0.073)	(0.066)	(0.232)	(0.097)	(0.171)
Sum of coefficients	0.179	-0.035	0.004	-0.036	-0.124	0.154	0.250	0.003	0.170	0.390	-0.063	-0.059	0.104
F-Statistic	62.16***	24.09***	3.87**	14.66***	6.09***	3.74**	9.00***	4.81***	7.72***	42.51***	11.04***	4.88***	1.67
Adj. R^2	0.854	0.846	0.842	0.843	0.843	0.842	0.842	0.843	0.842	0.845	0.843	0.843	0.843
All other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
N	4310	4310	4310	4310	4310	4310	4310	4310	4310	4310	4310	4310	4310

Notes: This table shows results from stacked regressions where 'inside' and 'outside' *DisclHits* (in Panel A) and *DisclBERT* (in Panel B) are pooled and regressed on an indicator variable indicating if the observation relates to 'inside' or 'outside' climate disclosure. Every specification includes an amplifying variable as well as its interaction with the indicator for 'outside'. The table also shows the sum of the coefficients of the variable and the variable interacted with the outside dummy and reports the F-statistic from a Wald test testing that this sum equals zero. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

Table OA.5: Factors associated with other climate-related disclosure choices

	TCFD Reporter			*CDP Participant*		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Composite Exposure						
	ExpoSvLVZ	*ExpoVaR*	*ExpoGHG*	*ExpoSvLVZ*	*ExpoVaR*	*ExpoGHG*
Composite Exposure	0.007	-0.023*	-0.004	0.019	0.026	0.016
	(0.013)	(0.013)	(0.012)	(0.013)	(0.017)	(0.012)
Panel B: External Exposure Factors						
Emissions Trading	0.014	0.044	0.014	0.048	0.040	0.048
	(0.033)	(0.032)	(0.033)	(0.035)	(0.032)	(0.031)
Climate Laws	0.004***	0.004***	0.003***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Climate Litigation	0.003	0.005	0.004	-0.005	-0.006	-0.014
	(0.003)	(0.003)	(0.005)	(0.004)	(0.005)	(0.017)
Climate Incident	0.108***	0.100***	0.091***	0.030	0.021	0.034
	(0.027)	(0.025)	(0.027)	(0.028)	(0.028)	(0.028)
Panel C: Internal Exposure Factors						
*Climate Awareness*ess	0.241***	0.251***	0.288***	0.146***	0.152***	0.079*
	(0.037)	(0.035)	(0.042)	(0.040)	(0.038)	(0.043)
Climate Target	0.252***	0.244***	0.241***	0.120***	0.124***	0.058
	(0.031)	(0.029)	(0.036)	(0.034)	(0.033)	(0.037)
Climate Finance	0.028*	0.031*	0.026*	-0.007	-0.005	-0.002
	(0.017)	(0.017)	(0.016)	(0.015)	(0.014)	(0.013)
ESG Compensation	0.133***	0.135***	0.148***	-0.010	0.014	0.008
	(0.028)	(0.027)	(0.030)	(0.026)	(0.025)	(0.026)
Panel D: Supply-side Factors						
Separate SR	0.079***	0.072***	0.084***	0.058***	0.068***	0.071***
	(0.023)	(0.022)	(0.025)	(0.022)	(0.022)	(0.023)
HHI	-0.078	-0.092	-0.079	-0.020	-0.010	0.021
	(0.099)	(0.093)	(0.120)	(0.093)	(0.088)	(0.106)
Panel E: Demand-side Factors						
Ln(*Analyst*s)	-0.017	-0.006	-0.013	0.199***	0.223***	0.223***
	(0.042)	(0.037)	(0.041)	(0.048)	(0.039)	(0.043)
IO	0.251***	0.268***	0.223***	0.092	0.105*	0.086
	(0.064)	(0.061)	(0.063)	(0.062)	(0.059)	(0.061)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	2242	2472	1959	2242	2472	1959
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.292	0.319	0.265	0.114	0.144	0.098

Notes: This table reproduces the analysis of the relationship between other climate disclosure measures but for the indicator if a firm reports according to the TCFD recommendations (columns 1 to 3) and if it submitted a response to the CDP in a given year (columns 4 to 6). All columns include Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* as firm-level controls as well as *Length*, the log of total pages of the financial statement and notes. Climate exposure variables are standardized. Standard errors are clustered by firm and included in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All other variables are defined in Appendix A.

Table OA.6: Descriptive statistics and univariate differences between the EU and U.S. samples

	EU sample		U.S. sample			
	Mean	Std.Dev.	Mean	Std.Dev.	Diff. in Means	Std. Error
Panel A: Climate disclosure						
Inside FS & Notes						
DisclMention	0.43	0.50	0.15	0.36	-0.28***	0.01
DisclHits	10.83	27.58	1.56	5.33	-9.28***	0.48
DisclBERT	20.97	41.61	15.45	38.04	-5.52***	1.01
Length	422.15	284.48	290.20	165.79	-131.94***	5.76
Outside FS & Notes						
DisclMention	0.94	0.24	0.92	0.27	-0.02**	0.01
DisclHits	347.00	383.42	168.68	199.98	-178.31***	7.44
DisclBERT	303.92	295.60	157.38	156.15	-146.55***	5.75
Length	1369.97	914.45	771.95	372.12	-598.01***	16.86
Panel B: Climate exposure						
Composite exposure						
*ExpoSvLVZ**	0.06	0.98	-0.06	1.02	-0.12***	0.03
*ExpoVaR**	0.04	1.06	-0.05	0.92	-0.09***	0.02
*ExpoGHG**	-0.04	0.97	0.06	1.04	0.09***	0.03
External exposure factors						
Emissions Trading	0.19	0.39	0.13	0.34	-0.06***	0.01
Climate Litigation	0.13	1.46	0.33	2.36	0.20***	0.05
Climate Incident	0.30	0.46	0.30	0.46	0.00	0.01
Internal exposure factors						
Climate Awarenessess	0.82	0.38	0.81	0.40	-0.02*	0.01
Climate Target	0.66	0.47	0.58	0.49	-0.08***	0.01
Climate Finance	0.03	0.35	0.01	0.10	-0.02***	0.01
ESG Compensation	0.63	0.48	0.48	0.50	-0.15***	0.01
Panel C: Supply- and demand-side factors						
Supply-side						
Emission Opacity	0.67	0.22	0.73	0.24	0.06***	0.01
No TCFD	0.37	0.48	0.52	0.50	0.15***	0.01
Separate SR	0.98	0.13	0.87	0.33	-0.11***	0.01
HHI	0.07	0.11	0.07	0.10	0.00	0.00
Demand-side						
Analyst	14.86	6.43	18.01	7.34	3.15***	0.17
Ln(*Analyst*)	2.66	0.51	2.86	0.42	0.21***	0.01
IO	0.46	0.24	0.82	0.14	0.37***	0.01
Climate KAM	0.11	0.31	0.02	0.12	-0.09***	0.01
Panel D: Other variables						
Ln(*Sales*)	22.52	1.51	23.18	1.22	0.66***	0.03
ROA	0.07	0.07	0.10	0.08	0.03***	0.00
PP&E Intensity	0.24	0.24	0.28	0.27	0.04***	0.01
Leverage	0.26	0.16	0.30	0.18	0.04***	0.00

Notes: This table presents means and standard deviations on the four groups of variables split by sample as well as the results from *t*-tests testing for differences in means. Variables with an asterisk (*) are standardized to have mean zero and a standard deviation of one. Note that *Climate Laws* and *Enforcement Proactivity* are not available for the U.S. sample. All variables are defined in Appendix A.

Table OA.7: Climate exposure and climate disclosure for the EU and U.S. samples

Panel A: Climate disclosure measured by *DisclHits*

	Ln(*DisclHits*)					
	(1)	(2)	(3)	(4)	(5)	(6)
	ExpoSvLVZ	*ExpoVaR*	*ExpoGHG*	*ExpoSvLVZ*	*ExpoVaR*	*ExpoGHG*
Composite Exposure	0.483***	0.261***	0.251***	0.331***	0.220***	0.152***
	(0.046)	(0.042)	(0.049)	(0.043)	(0.038)	(0.043)
U.S. firm	-0.886***	-0.870***	-1.030***	-0.672***	-0.605***	-0.793***
	(0.053)	(0.055)	(0.065)	(0.074)	(0.078)	(0.088)
Comp. Exposure × U.S. firm	-0.225***	-0.163**	-0.014	-0.147**	-0.128*	0.034
	(0.061)	(0.063)	(0.060)	(0.060)	(0.067)	(0.056)
N	5395	5952	3748	3768	4009	2990
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.400	0.335	0.329	0.478	0.453	0.450

Panel B: Climate disclosure measured by *DisclBERT*

	Ln(*DisclBERT*)					
	(1)	(2)	(3)	(4)	(5)	(6)
	ExpoSvLVZ	*ExpoVaR*	*ExpoGHG*	*ExpoSvLVZ*	*ExpoVaR*	*ExpoGHG*
Composite Exposure	0.622***	0.234***	0.318***	0.547***	0.167***	0.269***
	(0.041)	(0.042)	(0.042)	(0.043)	(0.043)	(0.038)
U.S. firm	-0.296***	-0.307***	-0.490***	-0.163*	-0.060	-0.259**
	(0.060)	(0.072)	(0.080)	(0.087)	(0.105)	(0.110)
Comp. Exposure × U.S. firm	0.017	0.011	0.153*	0.036	0.070	0.148**
	(0.050)	(0.077)	(0.079)	(0.053)	(0.086)	(0.072)
N	5395	5952	3748	3768	4009	2990
SE Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.537	0.379	0.417	0.583	0.459	0.493
Internal and external exp. fact.	No	No	No	Yes	Yes	Yes
Supply-side Factors	No	No	No	Yes	Yes	Yes
Demand-side Factors	No	No	No	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reproduces the main regression analysis in Table 5 of Equation (1) pooling observations from the EU and U.S. samples to examine the relationship between climate disclosure inside the financial statements and notes (the dependent variable) and a set of independent variables. *U.S. firm* indicates if the firm is from the U.S. sample. In Panel A, climate disclosure in financial statements is measured using the natural logarithm of *DisclHits*, the number of keyword search hits from a parsimonious list of climate-related keywords. In Panel B, climate disclosure in financial statements is measured using the natural logarithm of *DisclBERT*, the number of paragraphs identified by ClimateBERT, as the dependent variable. All columns include internal and external exposure factors as well as supply- and demand-side factors, Ln(*Sales*), *Leverage*, *PP&E Intensity* and *ROA* as firm-level controls as well as *Length*, the log of total pages of the financial statement and notes. Standard errors are clustered by firm and included in parentheses. Note that *Climate Laws* and *Enforcement Proactivity* are not available for the U.S. sample and thus excluded from the regressions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix A.

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