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RESEARCH ARTICLE

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Are corporate climate efforts genuine? An empirical analysis of the climate 'talk–walk' hypothesis

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Abstract

This study conducts machine-aided textual analysis on 725 corporate sustainability reports and empirically tests whether climate 'talk' within the sampled reports translates into performance 'walk', proxied by changes in greenhouse gas emissions over a 10-year period. We find mixed results for the 'talk–walk' hypothesis, depending on the type of talk and the associated climate change actors involved. Indeed, our empirical models show that while some climate commitments are genuine, many constitute little more than 'greenwashing'—producing symbolic rather than substantive action. We attribute this result to false signalling of climate transitioning in order to mislead due to misaligned incentives. An unexpected positive finding of the study is that talk about operational improvements is a significant predictor of climate performance improvement. On the other hand, reactive strategies are consistent with poor climate performance. Our findings highlight the significance of corporate climate strategies other than emissions reductions in assessing the effective contribution of business to the climate transition.

KEYWORDS
climate governance, corporate reports, emissions performance, greenwashing, sustainability reporting

1 | INTRODUCTION

The Intergovernmental Panel on Climate Change (IPCC) Summary for Policymakers 2018 Report warns that greenhouse gas (GHG) emissions must decline sharply by 2030 in order to limit global warming to below a potentially catastrophic 2°C (and ideally 1.5°), as laid out in the Paris Climate Agreement. Private sector participation will be essential to meeting radically ambitious emissions reduction targets—both globally and within-country—given that a substantial share of the world's emissions come from the corporate sector (Griffin & Heede, 2017; Hahn et al., 2017; Jeswani et al., 2008). So far, based on emissions performance, private sector climate action has not matched the scale of the challenge (Lewandowski, 2017). This poses the key question: to what extent are climate transition strategies published by corporations an actual reflection of their climate performance?

To gauge corporate climate action, a group of scholars have analysed firms' sustainability reporting (Boiral, 2013; Diouf & Boiral, 2017; Dragomir, 2012; Lock & Seele, 2016). According to this scholarship, these reports provide some 'convincing evidence that many companies are engaged in sustainability practices' (Whiteman et al., 2013, 311). Through sustainability reports, typically published

Abbreviations: CCI, Corporate Climate Initiatives; CDP, formerly the Carbon Disclosure Project; CDSB, Carbon Disclosure Standards Board; CERES, Coalition for Environmentally Responsible Economies; ESG, Environmental, Social and Governance; GHG, greenhouse gas; GRI, Global Reporting Initiative; IAS, International Accounting Standards; IPCC, Intergovernmental Panel on Climate Change; NLP, natural language processing; SBTi, Science Based Targets Initiative; TCFD, Taskforce on Climate-related Financial Disclosures; UNFCCC, United Nations Framework Convention on Climate Change; WBCSD, World Business Council for Sustainable Development; WWF, World Wildlife Fund.

annually, companies can commit to climate action and, ideally, follow through on commitments. Alternatively, recent research has focused on the effect of firms' participation in 'Corporate Climate Initiatives' (CCIs) (Coen et al., 2021). CCIs, such as the Science Based Targets Initiative (SBTi) and the CDP (formerly the Carbon Disclosure Project), undertake various activities to enhance corporate climate performance, including third-party verification of emissions reporting and the development of scientifically informed climate targets. A small but growing body of scholarship explores the mitigation potential of such climate initiatives, including how normative commitments to corporate climate action can be reinforced. Participation in CCIs is, therefore, a plausible proxy for assessing corporate commitment to climate transitioning (Schneider, 2020).

We build upon the research into CCIs and sustainability reporting more generally to address a central question: when it comes to climate action, firms increasingly 'talk the talk' but do they 'walk the walk' (Backman et al., 2017, p. 569)? In other words, do firms that publicly commit to the climate transition (vis-a-vis sustainability reporting and engaging with CCIs) follow through with climate action, the most visible of such activities being an improvement in emissions performance over time?

Prior research highlights the perennial problems with private sector climate data, not least the extensive number of variables available from various data platforms (including Thomson Reuters, Bloomberg and Sustainalytics) (Busch et al., 2020; Callery & Perkins, 2021). Ongoing concerns with data anomalies and inconsistencies surrounding corporate climate metrics necessitated the original approach to data extraction, transformation and modelling techniques employed in this paper. Our approach exploits machine-aided content analysis to build 12 explanatory variables. In addition, due to the high degree of missing observations for firm-level climate and environmental data, we rely on firm-level emissions changes as our proxy for 'climate walk'. This methodological approach constitutes an original contribution to tackling this vexing problem and we hope will encourage scholars to further advance the state-of-the-art on modelling corporate climate metrics.

Our empirical results deliver some unexpected findings with regard to the talk–walk hypothesis. In line with related research (Damert et al., 2017; Diouf & Boiral, 2017; Doda et al., 2016), it appears that while some commitments to climate transitioning are strongly linked to substantive climate action in the form of GHG performance, a larger proportion of corporate climate talk does not translate into climate walk. Overall, we conclude that positive communication on corporate climate strategies and commitments are largely symbolic in nature (Bowen, 2014; Delmas & Montes-Sancho, 2010; Doda et al., 2016). Our results support the contention that voluntary, bottom-up climate governance systems alone are inadequate for dealing with the massive, systemic problem of emissions mitigation in the corporate and private sectors (Berliner & Prakash, 2015; Dingwerth & Eichinger, 2010; Diouf & Boiral, 2017; Marimon et al., 2012). Recent advances in climate regulation are promising. However, concerns persist over whether corporate climate commitments will translate into action absent explicit sanctions for non-compliance.

This paper begins by outlining the research gap in empirical methods when it comes to assessing corporate climate walk versus talk. We then locate corporate sustainability reporting within the literature on 'cheap talk' (Farrell & Rabin, 1996), discrete 'greenwashing' activities (Bowen, 2014), as well as 'tick-box' compliance exercises (Marquis et al., 2016). Thereafter, we introduce the private-led climate initiatives which have proliferated in response to demands to align firm's emissions trajectories with climate science. Section 3 presents the data and methodology, paying particular attention to the construction of our explanatory variables based on machine-aided text mining of climate talk. Section 4 discusses the empirical results, exposing an undercurrent of greenwashing in corporate climate transitioning. The paper concludes by highlighting the implications of our findings for corporate climate governance and policy, with particular emphasis on strengthening the emerging EU Taxonomy on Sustainable Investment.[1]

2 | CORPORATE ACTION ON CLIMATE: FROM STRATEGY TO IMPLEMENTATION

It is now well established that steep emissions cuts by the private sector are vital to the success of the Paris Climate Agreement (Walenta, 2020). Yet, despite advances in research, there are few studies research which causally assess the impact of outward-facing corporate climate strategies (such as sustainability reports or 10k filings) on climate performance, as opposed to a more narrow focus on carbon performance alone (*see* Doda et al., 2016). We respond to this deficit and build upon studies which have leveraged corporate sustainability textual data to ascertain the degree to which corporate climate transition efforts are genuine and substantive (Boiral et al., 2020; Talbot & Boiral, 2015). And, while our modelling approach rests on the climate talk–walk hypothesis (Backman et al., 2017; Green et al., 2021), we distinguish our empirical models from prior research by constructing explanatory variables based on, literally, what companies are saying within their sustainability reports about various climate transition activities.

2.1 | Corporate sustainability reports: What do they signify?

What firms say they are doing about climate change matters, not least for companies themselves. Since the Paris Agreement in 2015, a vast amount of capital has already flowed into sustainable investment funds, increasing by 34% between 2016 and 2018 to over $30 trillion globally (Global Sustainable Investment Review, 2018). Catalysing private sector action on climate is therefore a key plank of climate governance (Van Asselt, 2016), and it is paramount that climate-transition aligned companies receive the lion's share of sustainable investment (Unruh et al., 2016). But first, it is necessary to explain the nuances involved in identifying climate-transition aligned companies, a vexing challenge which we turn to now.

2.1.1 | Sustainability reports: Cheap talk?

While corporate environmental reporting goes back at least to the 1970s (Abbott & Monsen, 1979), it has increased markedly in recent years due to the growth of mandatory reporting requirements across domestic jurisdictions (Hahn & Kühnen, 2013; Marimon et al., 2012). With the addition of the EU Taxonomy on Sustainable Investment and delegated acts,[2] regulatory demands for more transparency in the climate transition are set to grow.

Sustainability reports and the information contained therein—notwithstanding valid concerns flagged in the following section—can provide useful data if properly cleaned and integrated such as through machine-aided textual analysis (Connelly et al., 2011; Dragomir, 2012). Interestingly, although such data can shed light on whether companies are making the substantive efforts required to meet the international target to limit global warming to well below 2°C, rather than following a business-as-usual pathway (Levy, 1997; Milne et al., 2006, 2009; Tregidga & Milne, 2006), 'researchers have rarely used the actual data contained in these reports' (Dragomir, 2012, p. 233).

Critical scholarship, however, is dubious of the claim that sustainability reports provide credible signals. So-called 'window dressing' sustainability reporting and the self-serving motivations underlying such practices have been interrogated in detail (Kolk & Perego, 2014). Indeed, literature focused on corporate 'greenwashing' suggests that public commitment is often not aligned to actual performance (Bowen, 2014; Lyon & Maxwell, 2011). What these practices have in common is the intentional use of environmental 'talk' to camouflage the absence of real behavioural change (Moneva et al., 2006).

2.2 | Standardising sustainability reporting

Concerns surrounding corporate self-reporting and conflicts of interest have long been recognised in the Environmental, Social and Governance (ESG) literature (Lindblom, 1994; Milne et al., 2006). This body of scholarship suggests one possible solution lies with non-state climate change actors, such as the Global Reporting Initiative (GRI) and the CDP (formerly the Carbon Disclosure Project), in their mission to enhance the reliability of corporate ESG and climate disclosure (Cho et al., 2012). Below we discuss these actors and weigh up the contribution to corporate disclosure of this largely private climate governance system.

2.2.1 | Non-state actor support of sustainability and climate initiatives

The involvement of the corporate sector in climate change governance has been a feature since the earliest days of the UNFCCC, for good and ill (Newell & Paterson, 1998). Corporations not only have a business interest in shaping the international climate policy agenda but have also benefited from the neoliberal turn which places significant trust in their capacity to act as climate action leaders (Sapinski, 2015).

Reflecting deeper critiques of decades-long neoliberal policy creep towards bureaucratic rationalisation and the privileging of 'efficiency' and 'competition' metrics over state oversight (Chakrabarty & Wang, 2013), some scholars maintain that, while companies might gain legitimacy from self-reporting procedures, such procedures do little to address the underlying environmental challenge (Talbot & Boiral, 2015). Given such concerns, researchers have begun to focus on a new class of non-state climate change actors with an express mandate to ensure consistency in climate transition policies across the private sector. Indeed, the EU's Taxonomy explicitly endorses the Taskforce on Climate-related Financial Disclosures (TCFD), a prominent member of this new generation of non-state climate actors which we integrate into our models below.

During the formative years of the UNFCCC process, sustainability-oriented business groups such as the WBCSD (World Business Council for Sustainable Development) and the CERES (Coalition for Environmentally Responsible Economies) were formed to promote corporate sustainability action and to ensure that business had access to decision-makers in high-level intergovernmental forums (Wright & Nyberg, 2015).

As noted in the introduction, CCIs are voluntary, non-state actors, often spearheaded by longstanding business groups such as CERES and the WBCSD. The remit of CCIs expands beyond emissions mitigation efforts to include internal working procedures within the corporate sector and targeting key decision-making domains at management level. Indeed, while some CCIs focus on corporate emissions improvement specifically (e.g., the CDP), others address corporate climate and environmental reporting (e.g., the GRI).

For instance, the GRI—which was launched by CERES in 1997—focuses on sustainability disclosure; it is now the world's largest repository of corporate sustainability reports and has spearheaded transparency and disclosure across the sector. The GRI disclosure framework stipulates that firms should present information 'in a manner that enables stakeholders to analyse changes in the organisation's performance over time, [which] could support analysis relative to other organizations' (Global Reporting Initiative, 2013, p. 14).

Beyond the broader ESG-focused CCIs discussed above, others focus on disclosure of corporate emissions. These CCIs include the CDP and the Carbon Disclosure Standards Board (CDSB), which was initiated to streamline International Accounting Standards (IAS) for carbon reporting. CDP claims to collect and distribute 'high quality emissions information to investors, enterprises and governments to prevent dangerous climate change' and to 'to accelerate solutions to climate change' (CDP, 2021). By 2020, CDP had 560 investor signatories with US$106 trillion in assets disclosing their environmental data through its services; by the end of 2021, nearly 10,000 firms disclosed climate or emissions data to the CDP.

However, in an important study which bears on our research focus, Doda et al. (2016) demonstrate that while the CDP has induced companies to improve their due diligence around reporting emissions, this increase in reporting has not translated into participating firms improving their carbon performance. Based upon this finding, these author conclude that corporate carbon management practices, underscored by participation and disclosure to the CDP, are by and large not exerting a positive measurable effect on carbon emissions performance in the corporate sector.

Another significant non-state actor which we include in our analysis is the CDSB, which works towards making carbon emissions' disclosures more consistent across sectors and companies. Indicative of the influence of private actors over the corporate carbon disclosure ecosystem, the CDSB explicitly endorses the CDP and GHG Protocol—the latter being another emissions measurement tool initiated by the WBCSD. The CDSB has become a key node in the network of corporate carbon disclosure and reporting, as shown in this network analysis of the carbon-based governance regime (see: https://www.globe-project.eu/en/carbon-governance-regime_10461).

Finally, reflecting growing efforts to enlist private sector participation under the 2015 Paris Agreement, several emerging CCIs tie corporate emissions reduction to internationally agreed scientific targets. The Taskforce on Climate-related Financial Disclosures (TCFD) facilitates public companies and other organisations in disclosing climate-related risks, both physical (e.g., stranded assets) and regulatory (e.g., climate-related reporting requirements). Relatedly, the Science-based Targets Initiative (SBTi) requires participating firms to set 'scientifically informed' emissions targets and independently verifies whether targets are 'science-based,' which means aligning with the 'well-below 2°C' as set out in the Paris Agreement (Science Based Taggets, 2017a, 2017b). These two CCIs have made inroads into public climate governance, with the TCFD explicitly integrated within the EU Taxonomy, and the SBTi increasingly prominent in multisectoral efforts to enhance consistency of climate transition targets.

Based on the remit of these CCIs, we expect that if companies participate in these CCIs and 'talk' about the constituent climate alignment frameworks within their sustainability reports, they are more likely to be walking the climate walk. In other words, the expectation is that 'talk' about these CCIs within sustainability reports is indicative of substantive climate action, as opposed to empty rhetoric. It is important to note that, while we have outlined some of the actors which are integrated into our empirical models, the full list of actors and initiatives empirically examined is specified below (Table 1). More details on these actors can be found on their websites or, alternatively, in the network analysis we conducted.[3]

2.3 | Research question and hypotheses

As outlined above, an increasingly sophisticated debate centres on the limitations of data derived from corporate sustainability reports (Boiral, 2013; Connelly et al., 2011). Careful attention to debate on the credibility of corporate sustainability reporting guides our empirical modelling technique. In particular, machine-aided content-analysis is widely used in the existing literature to ameliorate such concerns (Boiral et al., 2020; Diouf & Boiral, 2017; Dragomir, 2012; Radu et al., 2020; Rekker et al., 2021; Talbot & Boiral, 2018). In a pioneering study using this method, Dragomir (2012) conducts automated text analysis methods to estimate the extent to which five major European oil and gas companies have adhered to the requirements of the GHG protocol. Her findings indicate that, at least within the sampled sustainability reports, these companies often deliver inconsistent climate and emissions data. From a practical standpoint, this is surprising (and alarming) given that the GHG Protocol, in addition to the GRI—two initiatives which our included in the Dragomir sample—lay down stringent guidelines on how to measure and properly disclose emissions.

Surveying a larger sample of companies, Talbot and Boiral (2018) examine corporate sustainability reports disclosed through the GRI and arrive at similar conclusions. The authors leverage natural language processing (NLP) to identify specific climate strategies contained within the report texts and find that—despite GRI having rigorous standards and guidelines on climate disclosure—reports largely constitute 'impression management' strategies rather than substantive commitments to change. Impression management takes the form of both data distortions and concealment. As such, dispiritingly, Talbot and Boiral (2018, p. 369) conclude that participation by firms in the GRI more closely aligns with a 'logic of public relations than by that of transparency' making it difficult for stakeholders to reasonably assess, monitor and compare companies' climate performance on the basis of these reports. Finally, Diouf and Boiral (2017), employing similar techniques, show that firms publish excessive climate data to conceal poor performance through information overload.

However, even though these researchers have leveraged machine-aided content analysis of sustainability reports, none have taken the extra step of calculating how corporate climate talk—as derived from sustainability reports—relates to climate walk, or changes in emissions performance over time. To the best of our knowledge, this is the first paper to regress corporate climate performance (proxied by emissions) on the textual data mined from sustainability reports.

2.3.1 | Hypothesis

Given the singular focus on emissions as the key performance indicator for corporate climate transitions—indeed, GHG performance is perhaps the 'most important question raised by external stakeholders on firm-level behaviour regarding climate change impact mitigation' (Backman et al., 2017, p. 569)—we expect that changes in emissions over time should be consistent with climate talk, as derived from sustainability reports.

In line with several related empirical analyses of corporate sustainability reports and GHG performance (Backman et al., 2017; Damert et al., 2017; Patten, 2002; Trumpp & Guenther, 2017; Walker & Wan, 2012; Whelan et al., 2019), and consistent with our main research question of whether corporate climate talk leads to climate walk, our central hypothesis can be formulated as follows: *corporate climate talk, as published in annual sustainability reports, leads to corporate climate walk or improvements in emissions over time.*

TABLE 1 Dictionary categories and keywords (initiatives and actors) constructed through our own analysis of the carbon governance regime (Coen et al., 2021), and based on prior literature (Huq & Carling, 2020; Lock & Seele, 2016; Radu et al., 2020)

Category	Keyword	Dictionary
1. Regulatory reporting	ASSESSMENT_OF_ENVIRONMENTAL_IMPACT	Radu et al. (2020)
	BENCHMARKED_ENVIRONMENTAL_PERFORMANCE	
	COMMUNICATE_ENVIRONMENTAL_ISSUES	
	ENVIRONMENTAL_PERFORMANCE_GOALS	
	ENVIRONMENTAL_PERFORMANCE_INDICATORS	
	EXTERNAL_AUDIT	
	GREEN_MARKETING	
	INTERNAL_ASSESSMENT	
	INTERNAL_AUDIT	
	PUBLIC_ENVIRONMENTAL_REPORT	
	ENVIRONMENTAL_AUDIT	
	SUSTAINABILITY_REPORT	
	VOLUNTARY_PROGRAMS	
	SUPPLIER_ENVIRONMENTAL_PERFORMANCE	
2. Operational improvement	AIR_CONSUMPTION	Radu et al. (2020)
	CLEANER_PRODUCTION	
	CLOSED-LOOP	
	CLOSED-LOOP_WASTE	
	CONTROL_EQUIPMENT	
	CONTROL_EQUIPMENT	
	CONTROL_EQUIPMENT_INVESTMENT	
	DAMAGE_INSURANCE	
	ECO-EFFICIENCY	
	ECOLOGICAL_INGREDIENTS	
	ENERGY_CONSUMPTION	
	ENVIRONMENTAL_COMPLIANCE_PROGRAM	
	ENVIRONMENTAL_EXECUTIVE_INVOLVEMENT_IN_STRATEGIC_PLANNING	
	ENVIRONMENTAL_EXPERT	
	ENVIRONMENTAL_MANAGEMENT_SYSTEM	
	ENVIRONMENTAL_MEASURES_LINKED_WITH_TOP_MANAGEMEN	
	T_EVALUATION_AND_REMUNERATION	
	ENVIRONMENTAL_PLAN	
	ENVIRONMENTAL_POLICY	
	ENVIRONMENTAL_PREVENTION	
	ENVIRONMENTAL_RESPONSIBLE	
	EXTERNAL_ENVIRONMENTAL_EXPERT	
	EXTERNAL_EXPERT	

TABLE 1 (Continued)

Category	Keyword	Dictionary
	FINANCIAL_RESOURCES_ALLOCATED_ TO_ENVIRONMENT	
	GUIDELINES	
	HANDBOOK	
	HAZARDOUS_PRODUCTS	
	INNOVATIVE_ENVIRONMENTAL_ MANAGEMENT	
	INNOVATIVE_ENVIRONMENTAL_ MANAGEMENT_PROGRAMS	
	INNOVATIVE_KNOWLEDGE	
	INSURANCE	
	INTEGRATION_OF_ENVIRONMENTAL_ ISSUES_IN_STRATEGIC_PL	
	ANNING_PROCESS	
	INTERNAL_ENVIRONMENTAL_EXPERT	
	INTERNAL_EXPERT	
	INVESTMENTS_IN_ORGANIZATIONAL_ COMPETENCIES	
	KNOWLEDGE	
	LIFE_CYCLE	
	MANAGEMENT_EVALUATION	
	POLLUTION_DAMAGE_INSURANCE	
	POLLUTION_REDUCTION_PRACTICES	
	POLLUTION_REDUCTION_PRACTICES_ IN_MANUFACTURING_PRO	
	CESS	
	PROCESS_IMPROVEMENT	
	PROCESS_LIFE_CYCLE	
	RECOVERY	
	RESOURCE_CONSUMPTION_ REDUCTION	
	REUSE	
	RECYCLE	
	SUPPLY_MANUALS	
	TECHNOLOGY_IMPROVEMENT	
	TOTAL_QUALITY_ENVIRONMENTAL_ MANAGEMENT	
	TQEM	
	TRAINING-EMPLOYEES	
	TRAINING-EXECUTIVES	
	WASTE_REDUCTION_EQUIPMENT	
	WATER_CONSUMPTION	
	SUPPLIERS	
3. Reactive strategy	AIR-QUALITY_CONTROL	Radu et al. (2020)
	AIR_CONTROL	
	AWARENESS_TRAINING	
	CATALYTIC_COMBUSTION	
	CENTRIFUGES	

(Continues)

TABLE 1 (Continued)

Category	Keyword	Dictionary
	COMPLIANCE	
	COMPLIANCE_WITH_NORMS	
	COMPLIANCE_WITH_LAWS	
	COMPLIANCE_WITH_REGULATIONS	
	CONDENSERS	
	COOLERS	
	CYCLONES	
	DESULPHURIZATION	
	DUST_REDUCTION	
	DUST_RESTRICTION	
	EMISSIONS	
	EMISSIONS_REDUCTION	
	EMISSION_STANDARDS	
	END-OF-PIPE	
	EXHAUST-_GAS_CLEANING	
	FILTERS	
	INCINERATION	
	INCINERATION_PLANTS	
	MAINTENANCE_OF_SPECIALIZED_ ENVIRONMENTAL_STAFF	
	MEASUREMENT_EQUIPMENT	
	NOISE_ABATEMENT	
	POLLUTION_CONTROL	
	QUALITY_ASSURANCE	
	QUALITY_REVIEWS_REPORTING	
	RECORD_KEEPING	
	REDUCE_EMISSIONS	
	REDUCING_DUST	
	REGULATORY_OUTREACH	
	RESPONSE_TO_EXTERNAL_PRESSURES	
	EXTERNAL_PRESSURES	
	RESTRICTION_OF_DUST	
	SOLID_WASTE	
	SOUND_ABSORBERS	
	THERMAL_COMBUSTION	
	TREATMENT_OF_POLLUTANTS	
	SCRUBBERS	
	WASTE_DISPOSAL	
	WASTE-WATER_TREATMENT	
	WATER_PROTECTION	
	WASTE_TREATMENT	
4. Environmental partnership	CLEANER_TRANSPORTATION_METHODS	
	COLLABORATION	
	COMMUNITY_PARTNERSHIP	
	GOVERNMENT_PARTNERSHIP	
	INDUSTRY_PARTNERSHIP	

TABLE 1 (Continued)

Category	Keyword	Dictionary
	NGO_PARTNERSHIP	
	OTHER_PARTNERSHIPS	
	PARTNERSHIP	
	SECTOR_PARTNERSHIP	
	SPONSORSHIP	
	SPONSORSHIP_OF_NATURAL_ ENVIRONMENTAL_EVENTS	
	SUBSIDIZED	
	SUBSIDIZED_NATURAL_ ENVIRONMENTAL_PROGRAM	
	SUPPLIER-DISTRIBUTION_PARTNERSHIP	
	SUPPLIER_AUDITING_SUPPORTING_ AND_COLLABORATING_PRACTICES	
	SUPPLIER_ISO_CERTIFICATION	
	SUPPLIER_ENVIRONMENTAL_AUDIT	
	TRAINING-DISTRIBUTERS	
5. GHG emissions	CARBON_MANAGEMENT	
	CARBON_PERFORMANCE	
	CARBON_REDUCTION	
	EMISSIONS_INVENTORY	
	EMISSIONS_REDUCTION	
	ESTIMATE_CARBON	
	ESTIMATED_GHG	
	GHG_COMMITMENT	
	GHG_MONITORING	
	GHG_PERFORMANCE	
	GHG_REDUCTION_COMITTMENT	
	GHG_REDUCTION_PLAN	
	MONITOR_CARBON	
	MONITOR_GHG	
	REDUCTION_OF_EMISSIONS	
	GHG_REDUCTION	
	TRACK_EMISSIONS	
	TRACK_CARBON	
	TRACK_GHG	
6. Carbon actors	CARBON_TRACKER	Coen et al. (2021)
	CDM	
	DEFRA	
	EU-ETS	
	FSB	
	GHG-P	
	GHGP	
	GHG_PROTOCOL	
	GOLD_STANDARD	
	IPCC	
	IRENA	
	JOINT_IMPLEMENTATION	

(Continues)

TABLE 1 (Continued)

Category	Keyword	Dictionary
	KYOTO	
	OECD	
	PLAN_VIVO	
	UNEP	
	UNEP-FI	
	UNFCCC	
	UN_REDD	
	VCS	
	VER+	
	VERRA	
	WORLD_BANK	
	VOS	
7. SBTi	SBT-I	Coen et al. (2021)
	SCIENCE-BASED_TARGETS	
	SBTI	
	SCIENCE_BASED_TARGETS_INITIATIVE	
8. TCFD	CLIMATE-RELATED_FINANCIAL	Coen et al. (2021)
	TASK_FORCE_ON	
	TASK_FORCE_ON_CLIMATE-RELATED_FINANCIAL_DISCLOSURES	
	TCFD	
	TASKFORCE_ON_CLIMATE-RELATED	
9. CDP	CARBON_DISCLOSURE_PROJECT	Coen et al. (2021)
	CDP	
	CDP.NET	
10. Climate initiatives	CLIMATE_WORKS_FOUNDATION	Coen et al. (2021
	EP-100	
	EP100	
	EV100	
	RE-100	
	STEP_IT_UP_COALITION	
	THE_CLIMATE_GROUP	
	RE100	
	WE_MEAN_BUSINESS_COALITION	
	UNDER2_COALITION	
11. Climate governors	CDSB|CERES|ICROA|IETA|INTERNATIONAL_STANDARDS_ORGANISATION|SASB|WBCSD|WRI|WWF|WEF	
12. GRI	GRI	Coen et al. (2021)
	GLOBAL REPORTING INITIATIVE	
	UN GLOBAL COMPACT	
	UNGC	

We test our hypothesis using data from corporate sustainability reports (our 12 explanatory variables of interest) and the natural log of reported corporate emissions, which is our dependent variable. In the next section we detail our data, sample, methods and model.

3 | METHODOLOGY

The data, sample, empirical steps and model are discussed in this section. Stated briefly, we construct our 'climate talk' variables using keyword rates, for each dictionary category, per 10,000 words. The dependent variable (natural logarithm of emissions) is then regressed on the 12 explanatory variables: the occurrence of 'climate talk' within corporate sustainability reports.

3.1 | Data and sample

3.1.1 | Sample

We created a sample based on the FTSE-100 (100 companies) and the Dow Jones Industrials (30 companies) from 2010 to 2019. These samples were selected based on data availability, climate disclosure regulations (Robertson & Samy, 2015), and because it is essential that large multinational companies reduce their GHGs (Hahn et al., 2017).

3.2 | Content analysis

The aim of automated content analysis and natural language processing (NLP) is to break down textual data through automated and systematic classification techniques (Manning & Schutze, 1999; Mora et al., 2020). This involves coding, processing, and other automated techniques in order to identify key patterns, categories, trends and themes (Boiral et al., 2020; Hsieh & Shannon, 2005). Other advantages include reduction of biases and the enabling of more fine-grained empirical analysis such as statistical models. Therefore, because NLP deals quickly and efficiently with large amounts of qualitative data—and can provide statistical inferences from the textual content—these methods are particularly well-suited for corporate reporting (Bowman, 1984; Krippendorff, 2018), and even more for corporate sustainability and ESG reporting (Boiral, 2013; Demaria & Rigot, 2021; Milne & Adler, 1999).

3.2.1 | Empirical steps: Data collation and transformation

Previous content analysis research spells out the specific steps to be carried out during the process of obtaining, cleaning and extracting data (Aykol et al., 2013; Weber, 1990). Below, we list these steps along with the specific research decisions we have taken:

1. Definition of units (pdf articles)
2. Definition of initial coding scheme (company, year)
3. Coding the sample
4. Testing on a sub-sample (e.g., run textual analysis on a random sample of about 10% of the corpus)
5. Assessment of accuracy and reliability (researcher checks computer output)
6. Revision of coding rules and categories
7. Check the coding of the sample again
8. Code the output text (topics and categories).

The pdf articles make up the corpus which is the set of documents to be analysed. This step is not automated and involves systematic, predetermined research choices (as discussed in 3.1.1). After building the corpus based on the maximum number of sustainability reports freely available for download (from corporate websites and the GRI), we then prepared the data for content analysis; these involved steps two and three. After testing a sub-sample and assessment of coding accuracy (steps 4, 5 and 6), we determined that, indeed, the dictionaries and categorisation models could be deployed successfully on the full sample of 725 sustainability reports. At that point, we refined the dictionary (keywords and categories) and re-ran the text analysis using the full sample. The important step of outputting category statistics based on 'climate talk' followed. (step 7). Finally, the explanatory 'climate talk' variables, constructed using the keywords statistics for each category, were integrated into the econometric models.

3.3 | Empirical model

3.3.1 | Dependent variable

We now turn to our dependent variable, 'climate walk', which we proxy by annually reported emissions. Changes to corporate emissions over time is a key indicator of whether climate management and strategy are taking effect (Busch & Schwarzkopf, 2013; Montabon et al., 2007); the logic being that 'firms need to permanently reduce the additional emissions stemming from growth' (Slawinski et al., 2017, p. 257), with the ultimate objective being absolute decoupling of emissions from revenues (Weinhofer & Hoffmann, 2010). Carbon emissions data, despite issues with consistency, indicate which companies are on track, or 'climate-aligned', to a 'net-zero' or carbon neutral economy (Busch et al., 2020).

To calculate emissions performance, guided by previous research (Haque, 2017; Luo et al., 2013; Qian & Schaltegger, 2017; Weinhofer & Hoffmann, 2010), researchers have specified a combination of Scope 1, 2 and 3 emissions.[4] For robustness, we include all four specifications (Scope 1, Scope 2, Scope 1 and 2, all Scope emissions). We obtained data on corporate emissions from Thomson Reuters Refinitiv platform.

Mathematically, we construct our dependent variable for each firm-year observation as follows:

$$Y = \ln(\text{Emissions}_x)$$

where x represents Scope 1, Scope 2, Scope 1 and 2 aggregated or all Scope emissions aggregated (Scope 1, 2 and 3); **ln** is the natural log.

3.3.2 | Explanatory variables

Marking an important methodological contribution to the scholarship, to construct our explanatory variables of interest, we first rely on the dictionary approach used in related literature (Cho et al., 2012; Lock & Seele, 2016; Radu et al., 2020). We then leverage statistics based on the rate of keywords mentioned within sustainability reports per 10,000 words (e.g., see Bonsón & Bednárová, 2015; Clarkson et al., 2013; Michelon, 2011). Therefore, our approach takes the extra step of regressing emissions performance on statistical data derived from the automated content analysis of sustainability reports.

Because firms often employ word 'repetition' as part of a strategy of 'excessive information through confusing language in order to obfuscate their poor performance' (Diouf & Boiral, 2017, p. 648), extraction of keyword rates within each category can reduce expected 'noise' and potential biases contained within the text of the sustainability reports. The graphical results of the categories and top keywords across all 725 sustainability reports are shown below (Figure 1).

3.3.3 | The model

After constructing emissions as the dependent variable, a lag can be incorporated into the model to capture delayed effects of climate 'talk' on climate 'walk'. Methodologically speaking, lagging the dependent variable can also 'mitigate potential concerns about the direction of impact between the dependent and independent variables' (Hsueh, 2019, p. 63). Our dependent variable, as described above, is the natural log of either Scope 1, Scope 2, Scope 1 and 2 emissions, or total Scope emissions. Our explanatory variables of interest are the 12 categories outlined in Section 2. Control variables are industry indicator; dummy variables are DJI membership and high GHG-emitting companies (top 20%). Below is our reduced form model specification:

$$Y_{ikt} = CAT_{i(t-x)} + Z_{it} + e$$

where

- Y is the dependent variable, the natural log of emissions, indexed by *i firm*, *k Scope Emissions*, and *t year*.
- CAT represents the string of 12 explanatory 'climate talk' variables indexed by *i firm* and *t year*. Each is expressed as the rate per 10,000 words of any keyword within the category appearing in the sustainability report, for each firm-year observation from 2010 to 2019.
- *Z* represents control variables including: DJI dummy variable, High GHG emissions variable (top 20% emitters get '1' or '0' otherwise), and Industry Indicator categorical variable.

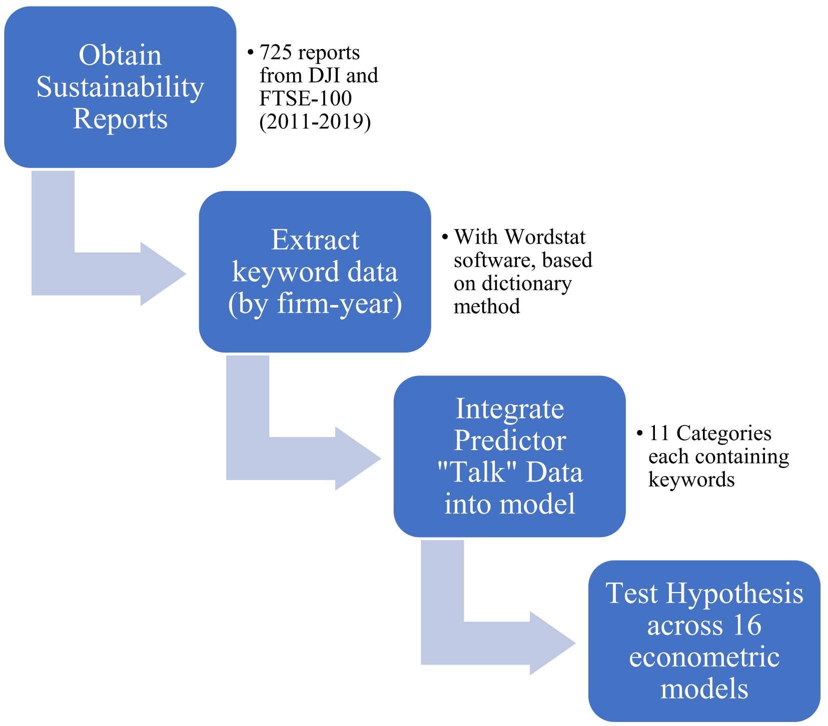
Our method is summarised in Figure 2.

4 | RESULTS

Overall, we find mixed results for the climate 'talk–walk' hypothesis. First, we provide a short summary of the findings, and then we go into

FIGURE 1 Automated extraction of top categories and keywords from dictionary method

FIGURE 2 Summary of methodological approach



more detail below (Section 4.1). With respect to the private-led climate actors—or CCIs such as the CDP, GRI, SBTi—we find that climate talk largely does not lead to climate walk. For other sustainability actors such as CERES, WWF and WBCSD, which we have labelled as climate change 'governors', the results are even more dispiriting. On a positive note, however, the results for the TCFD suggest that when firms 'talk' more about the TCFD and climate-aligning frameworks, emissions performance tends to improve. Separately, when firms disclose operational improvements (adopted from Radu et al., 2020, dictionary), they are highly likely to improve on emissions performance. These unexpectedly strong results should be investigated further. Below we report the regression results (16 total models) in Tables 2–5, , followed by a summary of the results in Tables 6 and 7.

4.1 | Results and discussion

We tested the talk–walk hypothesis on a total of 16 models. Four models for each type of emissions (Scope 1, Scope 2, Scope 1 plus Scope 2 and Scope 1, 2 and 3 combined), with four different lag structures (dependent variables lagged 0, 1, 2 and 3 years with respect to the explanatory variables) (Tables 2–5). Importantly, when interpreting the results, a *positive coefficient for the explanatory variables* suggests firms' climate talk *does not align* with emissions walk. Rather, in this instance, a positive coefficient indicates that more climate talk corresponds to an increase in GHG emissions over time. On the other hand, a negative coefficient for the 'talk' variables—which demonstrates these actors or initiatives are likely to lead to emissions performance improvements—confirms our hypothesis that climate talk aligns with climate walk.

We produce significant findings across nearly all explanatory 'talk' variables. We begin first with the variables which lend support to our hypothesis: climate talk is matched by walk. Among the most important findings is that TCFD talk is followed by climate walk: for this variable the tenth and fourteenth models show that the TCFD is significant at the 1% level; in the first, fourth and fifteenth models it is significant at the 5% level, while the third, ninth, eleventh, twelfth and sixteenth models exhibit significance at the 10% level. This shows that TCFD climate talk leads to statistically significant reductions in emissions, confirming that it is an important step forward for climate governance (Demaria & Rigot, 2021). We contend that this is because TCFD is likely to have 'regulatory teeth', as it is already incorporated into the EU's Taxonomy on Sustainable Investment.

Next, the explanatory variable we have designated the 'carbon actors'[5] also provides substantial evidence in favour of the talk–walk hypothesis: three models are significant at the 1% level (models 1, 3 and 4), four models are significant at the 5% level (models 2, 5, 7 and 11), and three models are significant at the 10% level (models 6, 8 and 10)—although model 6 exhibits a positive coefficient. This finding suggests that the 'carbon actor' climate talk does, more often than not, translate into climate walk.

Turning to more troubling findings, the CDP fails to demonstrate any significant effect apart from the fourth and eight models, where it is positive and significant at the 5% level, meaning that climate talk is actually related to rising emissions—climate walk in the wrong direction. Since only two of 16 models exhibit significance for the CDP, this finding deserves further investigation in future research. However, the picture is even more problematic for the other climate actors. The GRI is positive and significant at the 5% level in two (9 and 13), and positive at the 10% level in seven models (2, 5, 10, 11,

TABLE 2 Regressions results without lag (models 1–4)

VARIABLES	(1) scope1	(2) scope2	(3) scope12	(4) scope_all
Cdp	0.00536 (0.0233)	0.0277 (0.0392)	0.0591 (0.0561)	0.140** (0.0712)
Gri	0.00946 (0.00845)	0.0250* (0.0142)	0.0235 (0.0231)	−0.00437 (0.0323)
Sbti	−0.00550 (0.680)	−0.610 (0.459)	0.886 (1.417)	1.556 (1.193)
Tcfd	−0.247** (0.116)	−0.0717 (0.0960)	−0.428* (0.220)	−0.676** (0.310)
carbon_actors	−0.187*** (0.0474)	−0.107** (0.0436)	−0.306*** (0.0916)	−0.376*** (0.135)
climate_governors	0.119*** (0.0285)	0.0579*** (0.0219)	0.181*** (0.0450)	0.246*** (0.0666)
climate_initiatives	0.0263* (0.0150)	0.00882 (0.0142)	0.0475* (0.0276)	0.0632 (0.0434)
ghg_emissions_talk	−0.131 (0.0999)	−0.00275 (0.104)	−0.207 (0.191)	−0.616** (0.284)
env_partnership	−0.0300** (0.0129)	0.0371** (0.0167)	0.0164 (0.0278)	0.0545 (0.0452)
regulatory_reporting	0.242*** (0.0912)	0.0368 (0.106)	0.467*** (0.168)	0.529* (0.284)
operation_improve	−0.00837 (0.0103)	−0.00297 (0.0127)	−0.0129 (0.0225)	−0.0272 (0.0399)
reactive_strategy	0.0276** (0.0134)	0.0257** (0.0126)	0.0686*** (0.0256)	0.190*** (0.0495)
1.dji2	1.758*** (0.197)	1.848*** (0.330)	3.568*** (0.505)	3.965*** (0.711)
1.high_ghg	6.254*** (0.160)	3.601*** (0.245)	10.69*** (0.323)	17.24*** (0.602)
Industry	−0.00748 (0.0133)	0.0743*** (0.0175)	0.0541* (0.0283)	0.112** (0.0474)
Constant	4.040*** (0.306)	2.946*** (0.389)	6.763*** (0.651)	10.19*** (1.067)
Observations	499	474	462	388
R-squared	0.660	0.412	0.602	0.659

Note: Robust standard errors in parentheses.
***$p < .01$. **$p < .05$. *$p < .1$.

TABLE 3 Regression results lagged on year (models 5–8)

VARIABLES	(5) F1.scope1	(6) F1.scope2	(7) F1.scope12	(8) F1.scope_all
Cdp	0.0174 (0.0259)	0.0468 (0.0460)	0.0954 (0.0655)	0.185** (0.0831)
Gri	0.0286* (0.0149)	0.0270 (0.0182)	0.0477 (0.0331)	0.0253 (0.0424)
Sbti	0.911** (0.463)	−0.404 (0.473)	2.886*** (0.774)	2.299 (1.487)
Tcfd	−0.244 (0.254)	−0.167 (0.173)	−0.568 (0.406)	−0.578 (0.583)
carbon_actors	−0.105** (0.0504)	−0.0842* (0.0484)	−0.220** (0.0957)	−0.293* (0.155)
climate_governors	0.121*** (0.0314)	0.0560** (0.0229)	0.192*** (0.0481)	0.228*** (0.0799)
climate_initiatives	0.00969 (0.0274)	0.0227 (0.0230)	0.0471 (0.0450)	0.0281 (0.0767)
ghg_emissions_talk	−0.209* (0.124)	−0.111 (0.127)	−0.382 (0.239)	−0.870** (0.362)
env_partnership	−0.0311* (0.0168)	0.0363* (0.0203)	0.0228 (0.0360)	0.0430 (0.0568)
regulatory_reporting	−0.0606 (0.137)	−0.120 (0.115)	−0.0653 (0.249)	−0.416 (0.461)
operation_improve	−0.0385*** (0.0120)	−0.0218* (0.0121)	−0.0736*** (0.0226)	−0.107*** (0.0344)
reactive_strategy	0.0299* (0.0177)	0.0440*** (0.0152)	0.0880*** (0.0339)	0.212*** (0.0627)
1.dji2	1.522*** (0.269)	1.668*** (0.357)	3.069*** (0.613)	2.951*** (0.880)
1.high_ghg	4.320*** (0.326)	2.835*** (0.284)	7.694*** (0.608)	13.05*** (0.938)
Industry	0.0205 (0.0182)	0.0841*** (0.0196)	0.0942*** (0.0350)	0.177*** (0.0571)
Constant	4.282*** (0.396)	3.092*** (0.449)	7.271*** (0.805)	11.56*** (1.342)
Observations	405	380	370	314
R-squared	0.476	0.361	0.462	0.557

Note: Robust standard errors in parentheses.

TABLE 4 Regression results lagged 2 years (models 9–12)

VARIABLES	Regression Table 3 (9) F2.scope1	(10) F2.scope2	(11) F2.scope12	(12) F3.scope_all
Cdp	0.00742 (0.0270)	0.0594 (0.0492)	0.0982 (0.0666)	0.126 (0.0839)
Gri	0.0368** (0.0163)	0.0389* (0.0207)	0.0662* (0.0357)	0.0543 (0.0424)
Sbti	0.804* (0.463)	−0.288 (0.552)	3.000*** (0.824)	2.313** (1.128)
Tcfd	−0.309* (0.183)	−0.276*** (0.106)	−0.585* (0.328)	−1.022* (0.529)
carbon_actors	−0.0713 (0.0584)	−0.0866* (0.0508)	−0.207** (0.105)	−0.262 (0.166)
climate_governors	0.0782** (0.0391)	0.0319 (0.0263)	0.124** (0.0597)	0.0861 (0.104)
climate_initiatives	0.0150 (0.0238)	0.0208 (0.0172)	0.0434 (0.0414)	0.0564 (0.0668)
ghg_emissions_talk	−0.151 (0.136)	−0.118 (0.129)	−0.295 (0.254)	−0.757* (0.386)
env_partnership	−0.0356* (0.0185)	0.0458** (0.0218)	0.0276 (0.0393)	0.0549 (0.0626)
regulatory_reporting	−0.0354 (0.139)	−0.0696 (0.121)	−0.0597 (0.256)	−0.333 (0.469)
operation_improve	−0.037*** (0.0125)	−0.0291** (0.0134)	−0.0761*** (0.0252)	−0.0945** (0.0447)
reactive_strategy	0.0158 (0.0181)	0.0382** (0.0154)	0.0703** (0.0343)	0.182*** (0.0659)
1.dji2	1.409*** (0.282)	1.913*** (0.355)	3.085*** (0.622)	2.483*** (0.866)
1.high_ghg	3.435*** (0.324)	2.521*** (0.272)	6.266*** (0.601)	11.11*** (0.940)
Industry	0.0116 (0.0188)	0.0703*** (0.0205)	0.0774** (0.0365)	0.144** (0.0611)
Constant	4.470*** (0.424)	3.275*** (0.457)	7.596*** (0.859)	12.21*** (1.509)
Observations	414	389	380	323
R-squared	0.364	0.347	0.373	0.461

Note: Robust standard errors in parentheses.
***$p < .01$. **$p < .05$. *$p < .1$.

TABLE 5 Regression results lagged 3 years (models 13–16)

VARIABLES	(13) F3.scope1	(14) F3.scope2	(15) F3.scope12	(16) F3.scope_all
Cdp	−0.0124 (0.0343)	0.0498 (0.0484)	0.0699 (0.0731)	0.138 (0.0969)
Gri	0.0512** (0.0223)	0.0443* (0.0248)	0.0913* (0.0469)	0.105* (0.0544)
Sbti	−0.910 (0.935)	−0.528 (0.371)	−0.730 (1.947)	3.001*** (1.151)
Tcfd	−0.283 (0.182)	−0.330*** (0.0994)	−0.676** (0.322)	−0.973* (0.579)
carbon_actors	−0.0159 (0.101)	−0.0836 (0.0788)	−0.158 (0.171)	−0.326 (0.255)
climate_governors	0.0700 (0.0429)	0.0300 (0.0265)	0.110* (0.0629)	0.102 (0.101)
climate_initiatives	0.00488 (0.0319)	0.0211 (0.0236)	0.0319 (0.0527)	0.0380 (0.0828)
ghg_emissions_talk	−0.127 (0.140)	−0.169 (0.145)	−0.355 (0.274)	−0.870** (0.394)
env_partnership	−0.0150 (0.0199)	0.0604*** (0.0221)	0.0649 (0.0404)	0.113* (0.0600)
regulatory_reporting	−0.119 (0.130)	−0.0541 (0.120)	−0.140 (0.243)	−0.558 (0.442)
operation_improve	−0.046*** (0.0129)	−0.0359*** (0.0126)	−0.0852*** (0.0243)	−0.128*** (0.0386)
reactive_strategy	0.0290 (0.0199)	0.0415** (0.0167)	0.0817** (0.0369)	0.176** (0.0737)
1.dji2	1.397*** (0.288)	2.107*** (0.355)	3.157*** (0.624)	2.409*** (0.853)
1.high_ghg	2.644*** (0.322)	2.051*** (0.286)	4.817*** (0.608)	9.279*** (0.930)
Industry	0.0212 (0.0190)	0.0635*** (0.0215)	0.0798** (0.0371)	0.127** (0.0633)
Constant	4.292*** (0.449)	3.431*** (0.464)	7.572*** (0.885)	12.89*** (1.576)
Observations	380	353	347	299
R-squared	0.302	0.336	0.321	0.413

Note: Robust standard errors in parentheses.
***$p < .01$. **$p < .05$. *$p < .1$.

TABLE 6 Overview of the results in CCIs we have identified

Abbreviation	Name/description	Finding	Significant models/notes
Cdp	Carbon disclosure project	Null apart from models 2 models, talk no walk	Models 4, 8 only
Gri	Global reporting initiative	Talk does not comport with walk in 8 models (opposite direction).	Models 2, 5, 9–11; 13–16
Sbti	Science-based Targets initiative	Talk does not comport with walk in 6 models (opposite direction)	Models 5, 7, 9, 11, 12, 16
Tcfd	Taskforce on climate-related financial disclosures	Talk comports with walk in 10 models	1, 3, 4, 9–12, 14–16
carbon_actors	See appendices for full list of keywords	Talk comports with walk in 10 models	Models 1–8; 10, 11
climate_governors	See appendices for full list of keywords	Talk does comport with walk in 11 models (opposite direction)	Models 1–8, 9, 11, 15
climate_initiatives	See appendices for full list of keywords	Null apart from models 2 models, talk no walk	Models 1, 3

TABLE 7 Overview of the results of categories defined in prior literature

Abbreviation	Name/description	Finding	Significant models/notes
GHG emissions	Involves specific emissions reduction strategies. See appendices for a full list of keywords.	Talk comports with walk in 5 models	4, 5, 8, 12, 16
env_partnership	Environmental partnership 'talk'. See appendices for a full list of keywords.	Mixed…some models talk–walk, some models talk no walk	1,2, 5, 6, 9, 10, 14, 16
env_reporting	Environmental regulatory reporting 'talk' (see appendices x)	Largely null, 3 models show talk no walk	Models 1, 3, 4
Operation_improvent	Firms speak about operational improvements to tackle climate change	Most significant finding for talk–walk hypothesis, improvements in operations counts the most	Models 5–16 highly significant
reactive_strategy	Firms make excuses why they have not improved their climate efforts. They take a reactive rather than proactive climate strategy.	Most significant finding for talk–no-walk hypothesis for 14 models	Models 1–8, 10–12, 14–16

14, 15 and 16). We interpret this finding, therefore, to indicate that the GRI is providing cover for greenwashing activity; when firms talk more about GRI, their emissions performance tends to deteriorate. This finding supports the widespread contention that the GRI is principally used by firms for symbolic or branding purposes, leaving false positives unaccountable—firms that commit to climate transitioning with little intention of complying (Dingwerth & Eichinger, 2010; Marimon et al., 2012; Walker & Wan, 2012). More worryingly still is the implication that these bad faith actors are actively maintaining these voluntary elements of the carbon disclosure system to ward off the threat of more robust regulation. Again, this finding has important implications for the pending EU Taxonomy on Sustainable Investment.

The SBTi, which is tasked with tracking corporate climate commitments, is also positive and significant at the 1% level in three models (7, 11 and 16); it is positive and significant at the 5% level in two models (5 and 12), and at the 10% level in model 9. Therefore, even though the SBTi has received much positive attention of late, we find that, based on the available data, it also appears to be doing more harm than good in concealing poor performance in firm-level emissions. However, we caution against drawing firm conclusions from this finding since, among the companies sampled, there has not been much 'SBTi talk' until relatively recently.

The 'climate governors' (e.g., WBCSD, CERES and WWF) perform poorly: this variable is highly significant and positive in the first four models (at 1%), at 5% statistical significance in three models (6, 7 and 11) and at 10% level in the fifteenth model. What this suggests is that large, well-known corporate environmental groups are not helping to drive emissions reductions in the corporate sector; indeed, they may even be helping companies to mask and camouflage their non-climate aligned behaviour. Finally, the 'climate initiatives' are only significant in three models. As such, while there is clearly room for improvement, the results are largely inconclusive for this group.

Moving on to the categories derived from the dictionary methods from prior literature (Dragomir, 2012; Huq & Carling, 2020; Lock & Seele, 2016; Radu et al., 2020), we provide consistent results which align with their findings. First, climate talk about GHG emissions strategies tracks with climate walk at the 5% level in three models (4, 8 and 16), and at the 10% level in two models (5 and 12). This suggests that getting firms to articulate precisely how they have improved their GHG performance, and related climate strategies, helps them to improve (Huq & Carling, 2020). However, when firms talk more about environmental partnerships, the findings are mixed; interestingly, this is the only 'talk' variable which shows several negative and positive coefficients; we cannot draw any concrete conclusion, therefore. In three models, talk tracks with walk (1, 5 and 9); yet in five separate models, talk is not matched with climate walk as it has a positive and significant coefficient (2, 6, 10, 14 and 16). Finally, regulatory reporting displays a talk without walk finding in three models (1, 3 and 4) but does not demonstrate any statistical significance elsewhere and is therefore inconclusive.

Perhaps the most interesting finding is that, across no less than nine models, when companies 'talk' about operational improvements, this talk tracks with climate walk (5, 7, 8, 9, 11, 13, 14, 15 and 16). This confirms the recent findings on sustainability reports using similar dictionaries in Radu et al. (2020). What is more, the coefficients for operational improvements largely exhibit statistical significance at 1% level, with the exception of three models (6, 10 and 12). This can be interpreted to mean that firms which change the way they operate—and indeed take structural actions for the climate transition—are much more likely to walk the climate walk. This contrasts with firms which talk about emissions reductions through climate initiatives such as the CDP, GRI and the SBTi, yet fail to improve on performance. Therefore, regulators and sustainably minded investors should pay closer attention to climate talk in relation to operational improvements, which show that substantive rather than rhetorical action is underway.

Finally, and in sharp contrast to the significant findings of operational improvement talk, when firms talk about 'reactive strategies' (keywords and categories adopted from Radu et al., 2020) they generally do not commit to climate walk. Indeed, the 'reactive strategies' variable is highly significant and positive at the 1% level in six models (3, 4, 6, 7, 8 and 12), significant at the 5% level in 6 models (1, 2, 10, 13, 14 and 15), and at the 10% level in model 5. These significant findings confirm Radu et al. (2020). These last two operations-linked climate talk variables demonstrate the highest overall statistical significance across all models. Certainly, these findings deserve more sustained attention in future research.

4.2 | Robustness

We conducted a series of further regression analyses to improve the robustness of this study. First, we specified emissions performance as emissions to sales, a normalisation based on a financial metric, as specified by Weinhofer and Hoffmann (2010). We also tested absolute emissions instead of natural logarithm. Finally, we constructed models with categories from related research. The findings are largely consistent with those reported above, providing further support to our conclusions.

4.3 | Limitations and future research

We highlight several limitations of this study. First, using the natural log of emissions for the dependent variable carries with it certain challenges. As others have highlighted, carbon emissions data at the firm level remains problematic and sometimes unreliable (Busch et al., 2018; Callery & Perkins, 2021). As Talbot and Boiral (2018, p. 377) note, 'the comparison of data over time and between companies in the same sector becomes an arduous and approximate task. Companies' tendency to underestimate their emissions and to provide incomplete information helps create an idealised image of their situation'. We sought to ameliorate these issues by drawing on a larger sample of companies and using a relatively long time-series model, but it is not yet possible to entirely eliminate such concerns (Busch et al., 2020).

Moreover, while emissions performance constitutes an important metric for corporate climate strategies (Hoffman, 2007)—and, hence, climate talk—scholars have found fault in empirical analyses using these modelling specifications (Delmas & Nairn-Birch, 2011; Downie & Stubbs, 2012; Lee, 2012). Because firms tend to practice 'selective disclosure' of Scope emissions, this implies that the data can be inconsistent (Callery & Perkins, 2021; Marquis et al., 2016). More efforts should be made to construct stronger emissions performance metrics in the future.

The present study could be extended in several directions. First, the occurrence of greenwashing in corporate climate 'talk' remains an important research focus, especially as corporate climate disclosure receives greater attention in regulatory debates worldwide. The capture of the corporate climate disclosure system, which seems to favour corporate interests at the expense of the environment, seems very likely (Cho et al., 2012; Hummel et al., 2019; Moneva et al., 2006; Talbot & Boiral, 2015). In addition, future empirical research could expand on the idea of corporate political activity (Hillman & Hitt, 1999), and how this relates to the corporate climate disclosure system. There is also the question of what institutional redesign of corporate disclosure systems is required to prevent 'dirty firms' from laundering their image through virtually costless climate 'talk' (Lyon & Maxwell, 2011; Pinkse & Kolk, 2009; Clark & Crawford, 2012). Finally, future research could explore other metrics for climate competitiveness, such as the development of new products, process innovations, and other efforts which otherwise might result in emissions improvements, such as energy efficiency and renewable energy. Our highly significant statistical findings for the positive relationship between operational improvements and emissions performance support this conjecture.

5 | CONCLUSIONS AND POLICY RECOMMENDATIONS

This study joins a growing chorus of empirical scholars who detect serious weaknesses in bottom-up and voluntary corporate climate governance systems (Boiral, 2013; Boiral et al., 2020; Damert et al., 2017; Doda et al., 2016; Dragomir, 2012). These weaknesses include the exploitation of schemes such as the GRI for impression management (Dragomir, 2012; Gupta & Mason, 2016; Talbot & Boiral, 2018), the institutionalisation of corporate sustainability (Boiral & Gendron, 2011), compounded by a lack of clear 'scientific' guidance coming from actors such as the SBTi (Walenta, 2020). While schemes such as CDP and GRI may be well-intentioned and could—subject to system redesign—play an important role, the empirical evidence suggests that they are not having their intended effect on corporate climate transitions and emissions performance. From a systems perspective, such voluntary schemes do not appear to move corporations towards a race to low carbon or Paris-aligned emissions trajectories. Worse still, such private actors may actually reinforce private sector inertia and impede exit from the 'carbon trap' (Dahlmann et al., 2019; Unruh, 2002). This suggests that the voluntary climate governance systems offer ample opportunities for greenwashing, and such ulterior actions remain difficult to detect (Bowen, 2014).

Our empirical analysis addressed the important and salient research issue of corporate climate transitioning. Our findings largely confounded our expectations: much of the time, climate talk by companies does not translate into substantive climate walk. One explanation for this gap is that many of these bottom-up climate initiatives are not sufficiently impact-oriented (Doda et al., 2016). Another general conclusion of this study is that prominent 'governors' within the private climate ecosystem, such as the business sustainability trade groups (CERES and the WBCSD), appear to have done little to move the needle forward with respect to climate performance. The reasons underlying this lack of compliance are beyond the scope of this study. However, one possibility is that the technical challenge of policing discrete cases of corporate greenwashing exceeds the capacities of these organisations. In addition, political economy factors, including misaligned incentives, are also likely to play a role (Newell & Paterson, 1998). Either way, our findings point to the unsettling possibility that these climate 'governors' have not only enabled companies to talk the climate talk without walking but also served to shield companies, which are walking in the wrong direction, from reputational damage.

Several policy insights stem from our analyses. First, regulators should pay greater attention to preventing private-led climate disclosure systems from mistaking climate talk for walk. Second, sustainable investors could be encouraged to undertake greater due diligence to 'read between the lines' and scrutinise corporate climate actions beyond emissions reductions. Our novel methodology could prove fruitful in this regard. Third, the proposed directive from the EU—the Taxonomy on Sustainable Investment—is a promising regulatory development. However, to fulfil its potential, the legislation will need to integrate a systemic understanding of how climate 'talk', including private-led actors and apparatuses, interrelate and in some ways overlap one another, which may undermine the overarching goals of the system.

There is a glimmer of hope, however, in the TCFD and the Carbon Actors (VER, Gold Standard, VOS, etc.). Our findings suggest that this class of climate actor appears to be positively influencing emissions performance: more talk about these actors, and making use of their frameworks, leads to climate performance improvements. This makes sense since Carbon Actors, which include third-party carbon emissions verification, take pains to ensure companies measure, disclose, verify and claim carbon credits consistently and accurately.

Are firms ready for the energy transition? The results of decades of CSR and now ESG are disappointing, highlighting longstanding problems with transparency-based self-regulation in the absence of explicit sanctions for non-compliance (King & Lenox, 2000). The narrative tropes used by corporations describing sustainability as a 'journey' have too often served as a pretext for not providing concrete data, metrics or 'quantifiable boundaries' and concrete climate actions taken today (Milne et al., 2006, p. 821). However, as such contradictions multiply, motivated actors are seizing upon new opportunities to push for change. Moves towards standardisation across the array of sustainability reporting frameworks, combined with renewed efforts towards international public regulation of corporations, are perhaps indicative of a more positive direction of travel.

Perhaps the most significant finding of this study is the observation that operational improvement talk does lead to climate walk. Firms which publicly commit to undertaking concrete operational improvements—as opposed to open-ended emissions reduction pledges—demonstrate a higher likelihood of reducing GHGs through increased energy efficiency. Future research should be conducted to confirm these results. Nevertheless, this suggests that more fine-grained indicators of corporate climate walk in the form of operational improvements can yield important and verifiable insights which have often been overlooked in more general emissions or climate strategy auditing. The designers of the EU Taxonomy may wish to take note.

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ENDNOTES

[1] The EU has also proposed a Corporate Sustainability Reporting Directive (CSRD) with the aim to make private sector sustainability reporting consistent to drive financial firms and investors. Such legislative initiatives are largely consistent with the recently approved EU Green Deal, with the overall aim to draw in non-state actors such as the TCFD, and to a lesser extent, the SBTi (Science-based Targets Initiative) (COM/2021/188 final). https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

[2] A first delegated act on sustainable activities for climate change adaptation and mitigation objectives was approved in principle on 21 April

2021, and formally adopted on 4 June 2021 for scrutiny by the co-legislators. A second delegated act for the remaining objectives will be published in 2022. The publication of the first delegated act was accompanied by the adoption of a Commission Communication on 'EU taxonomy, corporate sustainability reporting, sustainability preferences and fiduciary duties: Directing finance towards the European green deal' that aimed at delivering key messages on how the sustainable finance toolbox facilitates access to finance for the transition. This Communication builds on the transition finance report adopted by the Platform on Sustainable Finance in March 2021 (https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en).

[3] https://www.globe-project.eu/en/carbon-governance-regime_10461

[4] To remedy this deficit, ESG investors are increasingly relying on Hoffmann and Busch's (2008) breakthrough proposal to estimate corporate carbon performance (CCP) using a combination of Scope 1, 2, and 3 emissions, as outlined by the Greenhouse Gas Protocol Initiative. Scope 1 are 'direct on-site' emissions, Scope 2 are indirect emissions from energy purchases and Scope 3 are emissions from contracted activities upstream. Scope 1, 2 and 3 emission data increasingly inform ESG analytics and are now a mainstay of many companies' sustainability reporting.

[5] Carbon Tracker, CDM, DEFRA, EU-ETS, FSB, GHG-P, GHGP, GHG_PROTOCOL, Gold Standard, IPCC, IRENA, Joint Implementation, Kyoto, OECD, Plan Vivo, UNEP, UNEP-FI, UNFCCC, UN-REDD, VCS VER+, Verra, World Bank, VOS

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