Market Masquerades? Corporate Climate Initiative Effects on Firm-Level Climate Performance

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Abstract

Climate performance in publicly traded companies has become an important focus for climate action. Non-state actor-led initiatives such as the CDP and the Science-Based Targets Initiative have emerged as influential governors in this arena, intended to plug gaps in public climate change regulation. This paper addresses the key question: are such bottom-up, non-state led climate initiatives exerting a positive influence on corporate climate performance? To answer this question, we empirically evaluate the effects of 18 non-state climate initiatives on corporate climate performance, distinguishing between "internal" and "external" initiatives. Based on an original dataset of corporate climate initiatives which prioritize climate performance in the private sector, we find that each additional climate initiative has little to no impact on climate performance, modelled as Scope 1 direct emissions, but does exert a positive influence on Scope 2 indirect emissions. Our findings have important implications for the trajectory of the private sectors' climate transition, as well as the regulatory potential of voluntary corporate initiatives to steward effective climate action.

Introduction

Despite more than 30 years of interstate negotiation under the umbrella of the United Nations Framework Convention on Climate Change (UNFCCC), global cumulative emissions are yet to peak. Reflecting growing alarm at this failure, the Paris Agreement was an inflection point for global climate governance and marked a concerted effort to enlist the private sector in "bottom-up," non-state actor-led climate action (Hale 2020).

Proponents of private sector participation argue that companies and investors are vital to accelerating emissions reduction, which the empirical record suggests will not be achieved

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within the necessary time frame through the traditional modality of intergovernmental, top-down climate regulation developed under the UNFCCC (Keohane and Victor 2011). Galvanized by this imperative, over the past decade, a nascent consensus has emerged that corporations have a (non-binding) duty to respond to the climate emergency (Vandenbergh and Gilligan 2017).

The argument for private sector participation in climate action is *prima facie* compelling, with large companies well-positioned to repurpose vast organisational and financial resources toward the goal of climate transitioning (Hahn et al 2017). Incentivizing the deployment of private capacities – technological, organisational, and financial – is often framed as an opportunity to create "win-wins" and "co-benefits" for the economy and the climate (Mayrhofer and Gupta 2016). The enthusiasm for private-led, bottom-up action is also reflected in a significant growth of non-state actors within UNFCCC activities, as well as support for the popular Environmental Social and Governance (ESG) investing agenda (UNFCCC 2021). But does this proliferation of non-state, bottom-up private sector climate initiatives contribute to or undermine firm-level climate performance?

We examine this question by conceptualizing non-state corporate climate initiatives (CCIs) as both "internal" and "external," and by evaluating their contribution to firm-level climate performance along these two dimensions. CCIs form a subset of the larger category of international cooperative initiatives (ICIs) which also monitor state and public governance bodies (Lui et al 2021). CCIs are predominantly voluntary private climate initiatives that help firms commit to climate transition strategies through either internal climate transition management mechanisms or externally-facing certification and disclosure schemes.

We distinguish CCIs into two groups: (1) "internal" CCIs (ICCIs), such as Climate Risk and Internal Carbon Price, which focus on firm-specific management activities such as carbon management strategies; and (2) "external" CCIs (ECCIs) such as the CDP (formerly the Carbon Disclosure Project) and the Science-Based Targets initiative (SBTi) that promote climate transitioning through public disclosure of carbon emissions and target-setting. Notwithstanding distinct causal logics of influence, all of these CCIs are motivated by the primary goal of moving corporations toward consistently improving climate performance and it is their effects on actual Scope 1 (direct emissions) and Scope 2 (indirect energy usage) performance which is the focus of this study. Specifically, our main research question centers on whether CCI membership, guidance and participation helps to improve corporate climate performance or, conversely, serves to conceal non-climate-aligned behaviour?

Guided by our two-dimensional "internal-external" framework, we develop a novel empirical model based on firm-level data of FTSE 100 companies from 2011 to 2021. We assess the possible effects of CCI participation, guidance, and strategic alignment with climate goals upon FTSE climate performance, defined here as the ratio of greenhouse gas emissions to net sales. Whereas recent scholarship has explored the emissions "mitigation potential" of climate actors for country-level greenhouse gas (GHGs) (Kuramochi et al 2020), our inquiry seeks to quantify the potential aggregate impact of CCIs on corporate climate performance.

We hypothesize that a firm's external and internal climate engagement is indicative of firm-level intentions to improve climate performance and, therefore, as ECCI and ICCI participation increases, climate performance is expected to improve. However, surprisingly, the results of our empirical analysis show that, in most cases, adoption of CCIs does not result in improvements in climate performance and, in some cases, firm-level climate performance actually declines. That said, an unexpected positive finding of the study is that, in a few select cases, CCIs can induce climate performance improvement when it comes to Scope 2 emissions.

These findings contribute to existing literature in several ways. First, they build on a large environmental politics literature that has produced valuable insights into the heightened role of private actors within the climate "regime complex" (Hale 2020), but has only just begun to empirically assess whether such bottom-up pressure is actually having its intended effect (Green et al 2021). We bridge this scholarship with a substantial business management literature on firm-level climate performance which, nevertheless, tends to examine the effects of internal or external CCIs separately (Moussa et al 2019; Hsueh 2019). Our approach highlights the value of analyzing these dimensions in tandem to arrive at a holistic view of CCI influence.

The paper begins by elucidating when and why CCIs are expected to incentivize corporate behavioral change. The study then develops its central hypothesis, which is tested on the 18 CCIs selected here, followed by a discussion of the empirical results. The paper concludes by examining what the analysis means for private-sector climate performance and environmental politics more generally.

Theoretical background: private governance "outside in"

The mobilization of corporate decarbonization initiatives is today a core theme in research on global climate governance (Widerberg and Pattberg 2017). This reflects a wider shift in global political scholarship toward understanding the causes and consequences of business as "global governors" (Avant et al 2010). This inquiry has proven particularly fertile in a highly fragmented and complex environmental domain, where competing authority claims result in non-state actors often having an outsized impact on environmental challenges (Green 2013).

Particular attention has focused on how nation states can cooperate with firms to pursue jointly-agreed climate goals, facilitated by voluntary private governance initiatives under the umbrella of corporate social responsibility (CSR) (Potoski and Prakash 2006). However, while this scholarship provides valuable insight into the origins and causes of transparency-based self-regulation regimes, it has only just begun to empirically test how firm characteristics and opportunity structures determine the correlates of firm behaviour (Green et al 2021).

We contribute to this scholarship by zeroing in on the effects of a particular class of private governance initiative: corporate climate initiatives or CCIs. This focus dovetails a shared concern among both environmental politics and business management scholarship to understand the effects of firm participation in CCIs as well as, more broadly, the politics of "governance by disclosure" under the UNFCCC and, crucially, whether such private governance initiatives enhance firm-level climate performance or instead camouflage the absence of behavioural change (Gupta 2008). On the latter point, this study directly broaches the longstanding faultline between those that view CCIs as little more than "climatewashing" where firms join such initiatives but do not honor their commitments (Ko and Prakash 2022), versus those who acknowledge these risks yet argue that, when properly designed and subject to the right conditions, such voluntary schemes can enhance climate performance (Overdevest and Zeitlin 2014).

Given the prominence afforded to decarbonization in the private sector, we single out those initiatives that prioritize climate performance for particular attention in this study. Among CCIs, we differentiate between "external" CCIs or ECCIs which have received the lion's share of attention in the environmental politics scholarship and a less emphasized set of "internal" CCIs or ICCIs which have been more empirically scrutinized in the business management literature. While we are interested in the aggregate effects of CCIs on firm-level behaviour, given that all of these initiatives share in common the goal of moving firms toward enhancing climate performance, our empirical model acknowledges the important distinction between external drivers of corporate climate action and factors and dynamics internal to the firm. As detailed further below, our models also differentiate among CCIs according to their scope, with more weight given to explicit climate transitioning and emissions reduction commitments as opposed to general environmental or sustainability efforts.

Assuming that a firm's external and internal climate engagement is indicative of its intention to improve climate performance our hypothesis is that, as cumulative ECCI and ICCI firm participation increases, climate performance should improve. But why make that assumption? Certainly, there is good reason to be skeptical, given countervailing market incentives and the resulting hazard of greenwashing. Building upon state-of-the-art scholarship, we identify a range of internal and external causal factors which at least establish the plausibility of this hypothesis, as presented in Table 1. Whereas external CCIs deploy information as tacit social pressure from the "outside-in" through disclosure, certification and target-setting programs (Auld and Gulbrandsen 2010), internal CCIs promote changes "inside-out" through firm-specific environmental management and operational activities, including explicit environmental performance KPIs (Radu et al. 2020: 15). While existing scholarship has tended to examine the effects of internal or external CCIs separately, in practice such distinctions are not so clear-cut. We advance a more holistic understanding of combined CCI effects, building upon recent scholarship which has begun to explore causal interaction effects across ECCI and ICCI schema. For example, Hsueh (2019) shows how higher levels of external carbon disclosure is contingent on the embeddedness of internal environmental strategy and complementary assets.

Table 1. Selected Mechanisms to Explain CCI Effects

External CCI mechanisms	**Internal CCI mechanisms**
Strong climate performance enhances corporate reputation (Berrone and Gomez-Mejia 2009).	Board independence has a positive association with climate performance (Haque 2017).

Enhanced climate performance opens new market opportunities and reduces environment-related liabilities (de Villiers et al 2011).	Explicit within-firm discussion of how the adoption of corporate management practices influence GHG emissions (Doda et al 2016).
Transparency-based self-regulation can be effective when coupled with public sanctions for non-compliance (Potoski and Prakash 2006).	Voluntary climate change disclosure increases with women percentage on boards (Ben-Amar et al 2015).
"Information as influence" contingent on credibility, salience and legitimacy (Gupta 2008)	Explicit firm carbon strategy coupled with proactive board environmental orientation (Moussa et al 2020).
Appropriate audit and verification of firm claims with provision of commensurable rating schemes (Callery and Perkins 2021).	"Leaders among leaders" within and among firm-level executive leadership and board of directors (Hsueh 2017; 2019).
Firm anticipation of CCI-type commitments becoming mandatory through public regulation (Hoffman 2005).	Internal operational improvements induce firms to go "above and beyond" in pursuing proactive climate strategy (Radu et al 2020).
Institutional investor expectations about the disclosure of climate information (Cotter and Najah 2012).	Executive management adopts internal verifiable and long-term environmental targets (Haque 2017).
Adoption of ISO 14001 increases likelihood of green supply chain management (Darnall et al 2008).	Presence of an environmental committee and a Chief Sustainability Officer increases likelihood of GHG disclosure (Peters and Romi 2014).

Table 1 provides an overview of the diverse logics of change which inform both ECCIs and ICCIs and confirms the plausibility of this study's hypothesis. By conducting analysis on all possible CCIs (subject to data constraints) this paper's core contribution is to advance the emergent empirical literature on the aggregate effects of private-led climate initiatives on firm-level climate performance, beyond inquiring into why firms participate in such initiatives in the first place. To the best of our knowledge, this is the first study to test the effects of such a large group of bottom-up and privately-driven CCIs on corporate climate performance. Closing the private sector "emissions gap" is vital and, as the next section details, the verdict is still out on the effects of CCIs on actual climate performance (e.g., GHG emissions) in the public and private sector, as opposed to process-oriented performance (i.e., sustainability initiatives).

Empirical Background: Closing the Emissions Gap

The impact of international climate initiatives (ICIs), many of which prioritize GHG reductions, is an urgent policy priority as we advance through this "critical decade" for climate action (Olhoff and Christensen 2020). In this section, we review the current state-of-knowledge on the effects of ICIs on closing the public and private sector emissions gap.

Climate Initiatives and the Public Sector (Country-Level Performance)

An emerging body of empirical literature has begun to examine the impact in the aggregate of private-led climate initiatives. However, the focus generally falls on the mitigation potential of such initiatives at country-level rather than their effects on the private sector. Lui et al (2021) find that full implementation of private-led climate initiatives is likely to ensure that countries will align with emissions reductions in line with the Paris 2°C temperature target. Kuramochi et al (2020) also find that non-state actors, including cities, regions and firms, have a key role to play for achieving Paris-aligned emissions trajectories at country-level. These two studies, therefore, are largely supportive of the potential for such bottom-up, private-led climate initiatives to galvanize enhanced climate performance.

However, Hsu et al (2015), in an analysis of 29 private sector "action statements", are more circumspect in their conclusions. While they find that some initiatives might have a high emissions mitigation potential, many are likely to fail due to a conspicuous lack of effective monitoring protocols to track performance. This argument is echoed by Michaelowa and Michaelowa (2017) who attribute the failure of many climate initiatives – including the vast majority sampled in this study – to lack of appropriate monitoring, reporting and verification (MRV) mechanisms. In another study, Roelfsema et al (2018, 68) investigate the emission mitigation potential of "transnational emissions reduction initiatives" (TERIs), defined as "international activities outside the UNFCCC driven by non-state actors or coalitions of national governments that have committed to reduce greenhouse gas emissions." Based on their sample of public and private TERIs, Roelfsema et al conclude that these initiatives could reduce emissions but only if supported by appropriate public governance measures – a criteria which informs our selection of firms below. Notably, they also demonstrate a 70-80 percent duplication of pledges across public and private TERIs, indicating a potentially substantial waste of resources.

Climate Initiatives and the Private Sector (Firm-Level Performance)

In contrast to future projections for climate initiative impacts on country-level emissions, relatively few researchers have examined how private-led climate initiatives impact corporate emissions performance. Hsueh (2019) explores whether participation by firms in the CDP transparency and disclosure initiatives yields climate performance improvement and finds that this is indeed the outcome if the firm in question has already established internal climate management practices. In an earlier study, Hsueh (2017) also finds that firm participation in the CDP initiatives does result in a measurable reduction of GHG emissions at firm-level. However, Tang and Demeritt (2018), also drawing on CDP data, provide quite a different assessment, with climate performance reporting to CDP not translating into the hoped-for emissions reductions. As such, the verdict is still out on the effects of CCIs on private sector GHG emissions and climate performance.

We acknowledge that analyzing GHG reductions resulting from CCI participation involves some significant challenges, not least the lack of a globally standardized GHG accounting framework for non-state action, as well as ongoing concerns with data anomalies and inconsistencies (Callery and Perkins 2021). Given these limitations, our evaluation should be viewed as a first attempt to understand empirically the extent to which CCIs in the aggregate are affecting improvements in corporate climate performance, proxied by firm-level emissions performance improvements over time.

Methodology and Data

In this section we establish our selection of CCIs to be analyzed within the scope of this study, before detailing our sample of firms and modelling approach.

Selection of CCIs

At COP26 held in Glasgow in November 2021, the Global Climate Action Portal recorded 23,873 participants across 151 ICIs.[†] Of these 151 ICIs, 74 initiatives were comprised primarily of private sector participants. For this study, we screened CCIs to focus only on voluntary private CCIs that engage in climate action in the business sector, excluding CCIs with an unusually narrow sectoral focus (e.g. CEM: Global Lighting Challenge). The 10 ECCIs listed in Table 2 exemplify efforts by third parties to encourage and control information through climate disclosure, certification and target-setting programs (Auld and Gulbrandsen 2010). For example, CDP is a private initiative which encourages companies to commit to GHG emission reduction targets and publishes data on company commitments and emissions (data available subject to paywall). While our empirical study resembles Roelfsema et al (2018) we do not, importantly, include ICIs which are publicly-led or focus on public sector emissions such as C40 Cities or Cities Race to Net Zero. We also did not include initiatives like the Taskforce on Climate-related Financial Disclosures which is a G20 intergovernmental-led initiative.

Table 2. Selected External and Internal CCIs

CCI	Name	Criteria for inclusion	Information/Source
External Corporate Climate Initiatives (ECCIs)			
1.5 Degrees	Business Ambition for 1.5 degrees: Our	Commits firms to a target in line with a 1.5C and net-zero future.	https://www.unglobalcompact.org/take-action/events/climate-action-

[†] https://climateaction.unfccc.int/Initiatives (last accessed 23 August 2022).

CCI	Name	Criteria for inclusion	Information/Source
Coalition	Only Future		summit-2019/business-ambition
CDP	Formerly Carbon Disclosure Project	Industry standard global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts.	https://www.cdp.net/en/
CPLC	Carbon Pricing Leadership Coalition	Includes 176 private sector organizations providing support for carbon pricing and targeted initiatives.	https://www.carbonpricingleadership.org/
EP100	Commitment to 100% Energy Efficiency	Supports business membership to measure and report on energy efficiency improvements.	https://www.theclimategroup.org/ep100
EV100	Commitment to 100% Electrical Vehicles	Participating business commit to switch their fleets to EVs and/or install EV charging by 2030.	https://www.theclimategroup.org/ev100-members
IETA	Inter-International Emissions Trading Association	Supports corporate members to develop an emissions trading regime that results in verifiable GHG emission reductions.	https://www.ieta.org/
ISO-EMAS	Environmental management standard certifications	ISO 14001 requires participating companies to identify environmental impacts. EMAS requires an environmental statement.	https://www.iso.org/iso-14001-environmental-management.html
RE100	Commitment to 100% Renewable Energy	Commits participating businesses to 100% renewable electricity (including Scope 2 emissions).	https://www.there100.org/re100-members
SBTi	Science Based Targets Initiative	Commits private sector organizations to science-based emissions reduction targets.	https://sciencebasedtargets.org/
WBCSD	World Business Coalition for Sustainable Development	Commits members to climate action in line with Sustainable Development Goals, the Paris Climate Agreement and Vision 2050.	https://www.wbcsd.org/
Internal Corporate Climate Initiatives (ICCIs)			
CR	Climate Risk	Climate risks are incorporated into a company's risk register and management programs.	Thomson-Reuters DataStream/Asset4, Refinitiv database
ECO	Eco/Environmental Products	Company produces eco-designed/environmental personal and household product innovation	Thomson-Reuters DataStream/Asset4, Refinitiv database
ET	Emissions Targets	Company has set internal emissions mitigation targets.	Thomson-Reuters DataStream/Asset4, Refinitiv database
EP	Emissions Policy	Company commits to a GHG emissions policy	Thomson-Reuters DataStream/Asset4, Refinitiv database
FFD	Fossil Fuel Divestment	Company/investor is divesting from fossil fuel stocks.	Thomson-Reuters DataStream/Asset4, Refinitiv database
ICP	Internal Carbon Price	Company has set an internal charge on the amount of carbon emitted from assets/investment projects.	Thomson-Reuters DataStream/Asset4, Refinitiv database
NOx SOx	Nitrous Oxide or Sulphur Oxide Reduction Plans	Company has put in place process modifications to minimize NOx SOx emissions.	Thomson-Reuters DataStream/Asset4, Refinitiv database
SDG_13	UN Sustainable Development Goal 13	Company commits to UN's Climate Action, SDG-13.	Thomson-Reuters DataStream/Asset4, Refinitiv database

While acknowledging important variation among CCIs (e.g., as Gupta (2008, 2) observes “who is pushing for disclosure, from whom, and to what end”), for our purposes all of these CCIs – whether ECCI or ICCIs – are motivated by the primary goal of moving corporations toward consistently improving their climate performance. The former seeks to secure this goal primarily through normalizing transparency and disclosure practices regarding climate risk and transitioning, while the latter promote internal targets, guidance and climate management practices (Jones and Levy 2007).

Beyond these criteria, CCIs aim to perform climate change mitigation efforts through commitments or target-setting, with some also advancing other climate performance objectives that go beyond direct emission reductions such as knowledge-sharing and commitment to renewable energy (RE100) or energy efficiency (EP100). This reflects an important dimension of variation among CCIs, namely that imperatives and scope are somewhat different. As discussed in more detail below, the focus of each CCI is captured in our models by weighting each index depending upon whether the dependent variable is constructed using Scope 1 (direct GHG emissions) or Scope 2 (indirect emissions from energy usage). This weighting schemes allows us to differentiate between CCIs which focus specifically on emissions versus climate change or, more broadly, ESG criteria.

Finally, we also required ECCIs to have a minimum of 50 members and to publish sufficient data on membership to make quantification possible, with ICCI data drawn from the Thompson Reuters database given that, unlike ECCIs, all of the ICCI data is not publicly available.[‡] Thomson Reuters present the data in binary form based on “yes/no” for the presence of ICCIs, which matches the data type obtained manually for “yes/no” participation in ECCIs.

[‡] Due to a lack of data we were also unable to include recently launched initiatives including Climate Action Accelerator; Business Declares; Exponential Roadmap Initiative; Net Zero Asset Managers Initiative; Net Zero by 2050; Under2 Coalition; Pledge to Net Zero; and Paris Aligned Investment Initiative.

Selection of Firms

In order to test our research question - does CCI membership, guidance and participation help to improve corporate climate performance or conversely serve to conceal non-climate-aligned behaviour? – we build a sample of FTSE 100 companies from 2011 to 2021.[§] We select these 100 companies for several reasons. First, it is estimated that FTSE companies account for 73 percent of all corporate-sector emissions in the UK equities market, resulting in an outsized impact on UK climate targets (Okereke 2007). Second, these firms are subject to some of the most stringent climate disclosure regulation in the world (Robertson and Samy 2015). Third, the UK was the first major economy to commit to carbon neutrality by 2050 and has pioneered several key pieces of climate and environmental regulation including (1) the Cadbury Code which established the first ESG governance framework, as well as the Carbon Reduction Commitment which requires firms to disclose Scope 1 GHG emissions. Lastly, given their revenue and operational size, FTSE 100 companies are not subject to the kinds of economic constraints which might deter smaller enterprises from taking costly climate action.

The Dependent Variable: Firm-Level Emissions Performance

Measurement and reporting of corporate emissions in this study follows the GHG Protocol which was spearheaded by two non-state actors, the World Resources Institute and the WBCSD (which is also included among our ECCIs). Emissions are divided into three categories: Scope 1 (direct emissions), Scope 2 (indirect emissions from energy usage) and Scope 3 (indirect emissions through a firm's value-chain). Much of the empirical research that employs emissions as a proxy for climate performance follows the specifications laid out

[§] Technically, the sample includes 101 companies due to Shell's data being split between Class A and B shares.

by Hoffmann and Busch (2008) and Weinhofer and Hoffmann (2010), namely, the ratio of reported emissions to some financial metric. Consistent with this approach, Griffin et al (2017) take the ratio of emissions to market value, while Luo and Tang (2014), and Cui and Qian (2017) take the log of total emissions as proxies for corporate climate performance.

The reasons for the differing approaches are data availability, type of firms, and modelling approach. Because we examine an 11-year time-series, with a diverse set of companies, our dependent variable falls in line with Bolton and Kacperczyk (2021) which represents the current state-of-the-art, who take the ratio of emissions to sales. In line with Lewandowski (2017), we source the emissions data from Thomson Reuters' DataStream, widely regarded as a reliable corporate emissions repository, and consistent with data from Bloomberg and the CDP (Capasso et al 2020). Our dependent variable is therefore constructed as follows:

$$\boldsymbol{CCP_{it} = GHG_{xit}/netSALES_{it}}$$

- Corporate Climate Performance (CCP) where ***i*** indexes firm and ***t*** indexes year
- Where GHG signifies reported emissions, ***x*** indicates Scope 1 or Scope 2 emissions
- netSALES represents net sales for each firm-year observation.

Independent Variables: Corporate Climate Initiatives

Our approach to constructing the ECCI and ICCI indexes is consistent with emissions-reduction and climate performance indexes developed elsewhere. For example, Haque (2017, 355) creates a Carbon Reduction Initiatives Index (CRI) which measures "firm-specific activities to deal with climate change and GHG emissions, with higher CRI [index value] indicating greater climate-related activism of a firm." Going one step further, Moussa et al (2020) create a Carbon Strategy index which includes eight different actions firms can undertake to vocalize carbon commitment and reduce emissions.

In line with Moussa et al (2020), we apply the following procedure for to build the baseline ECCI and the ICCI indexes: starting from “0”, we add “1” to the CCI index to indicate the year a firm joins an initiative. If a firm joins two initiatives in the same year, the index is coded “2”, and so on. Hence, the index increases incrementally each time a firm joins an ECCI or adopts an ICCI. The maximum possible score for the external ECCI index is “10”, while the maximum score for the internal ICCI index is “7.[**] However, as mentioned above, CCIs can be more focused on either Scope 1 or Scope 2 emissions. Therefore, we develop four more indexes using a more fine-grained weighting technique, as portrayed in Table 3 below. The third and fourth indexes (ECCI_a, ICCI_a) are constructed to test Scope 1 emissions, with higher weights given to initiatives which focus predominantly on primary emissions reductions. The fifth and sixth indexes (ECCI_b, ICCI_b) test Scope 2 emissions, with a higher weight assigned to initiatives which work toward reduction of indirect emissions from energy usage. Our models use these four more robust indexes below, while the baseline index results are reported in the appendix. Descriptive statistics and weighting techniques are provided in Table 3 below.

Table 3: Descriptive statistics and weighting of the CCI indexes[1]

Vars	Obs	Mean	Std. dev.	Min	Max	Weighting Scheme
Scope1_ netsales	1,052	.000106	.000356	-1.12e-06	.004643	ecci_a and icci_a, below, are weighted to test this dependent variable.
Scope2_ netsales	1,052	.000047	.000129	-3.61e-06	.001489	ecci_b and icci_b, below, are weighted to test this dependent variable.
ecci	1,111	1.72637	1.51295	0	8	All CCIs are equally weighted by 1.
ecci_a	1,111	6.157516	3.981877	0	20	CDP, CPLC, IETA, SBTI=3; EP100, EV100, RE100, 1.5% =2; WBCSD, ISO/EMAS =1

[**] However, in our sample, the relative maximum index scores are “6” for the ICCI and “8” for the ECCI, since there are no cases where a firm has joined all of the CCIs, as of August 2022. As shown in Table 3, the maximum for the indexes increases, since we re-weight some initiatives with “3” or “2”.

ecci_b	1,111	3.462646	2.829733	0	17	EP100, EV100, RE100=3; CDP, SBTi=2; CPLC, IETA, 1.5%, WBCSD, ISO/EMAS =1
icci	1,111	2.626463	1.154694	0	6	All equal to 1
icci_a	1,111	7.886589	4.280872	0	23	internal carbon price, emissions target, emissions reduction policy =3; ff divestment, nox-sox reduction, climate risk=2; eco products, sdg_13=1
icci_b	1,111	4.667867	2.41326	0	13	climate risk, ff divestment, nox-sox reduction, internal carbon price, emissions target, emissions reduction policy=2; eco products, sdg_13=1

[1] Data obtained from CCI websites, corporate websites, and corporate sustainability reports. There are 1,111 observations due to Shell being split into Shell Class A and B shares until the beginning of 2022.

Control Variables

Firm size is a common control variable in studies of climate change and corporate environmental disclosure (Hsueh 2019). Size impacts net emissions, but also the accuracy of emissions data with larger firms under more scrutiny (Pinkse and Kolk 2012). As such, we include the number of employees to proxy for firm size. Companies which perform well financially are also more likely to join voluntary carbon initiatives (de Villiers and van Staden 2011). With respect to financial performance, beyond the integration of net sales into our dependent variable, and consistent with scholarship on firm-level environmental performance, we control for earnings per share (Qiu et al 2016). To avoid bias in our models, we further test to ensure no heteroskedasticity which could bias the estimation results (Baum et al 2012).

Table 4. Overview of Variables and Data Sources

Variables	Type	Data Source	Notes
Dependent Variables			
1. Log emissions to net sales ratio	Continuous	Thomson Reuters Refinitiv (ASSET4)	Scope 1 and 2 emissions, reported in CO2-equivalents.
Independent Variables			
2. Corporate Climate Initiative (CCI) Membership (ECCI, ICCI)	Categorical	CCI websites and corporate sustainability reports.	Add a "1", "2" or "3" the year a firm joins any CCI
Control Variables			
3. Employees	Continuous	Thomson Reuters Refinitiv (ASSET4)	
4. Earnings-Per-Share	Continuous		
5. GHG quartiles	Categorical		Our calculation
6. Sector/Industry	Categorical	Thomson Reuters Refinitiv (ASSET4)	Based on initial 44 industries reduced to 13

[1] Scope emissions are defined above.

Finally, we control for firms with excessively high emissions by creating a GHG quartile variable, which divides firms among the lowest 25%, the median (two middle quartiles), and the highest emitting 25% with respect to other firms in the FTSE-100 – assuming that these firms intrinsically have a more challenging path to emissions reductions (Kabir et al 2021).[††] Lastly, we also create a separate indicator variable for industry which consolidates the 44 industry types in the Thomson Reuters database down to 13, by matching

[††] We thank an anonymous reviewer for this suggestion.

closely related industry types (e.g. “Industrial Metals & Mining” with “Mining”). Above, in Table 4, we describe our data sources and type for all variables.

The Model

We specify a firm-level, time-series ordinal least square (OLS) regression model with firm-fixed effects in Stata (Baum 2006). We expect that a firm’s external and internal climate engagement with CCIs is indicative of intentions to improve climate performance and, therefore, as the ECCI or ICCI indexes grow, climate performance should improve. Since net sales is modelled in the denominator, with emissions in the numerator, as the dependent variable trends downward this would indicate a climate performance improvement. Because we do not know, *a priori*, the precise timing of climate performance improvements, the model includes time lags to account for delayed performance improvements after engaging with CCIs (Hsueh 2019). Alternatively, since firms may adopt CCIs *after* experiencing performance improvements, we also test the models with time leads (results supplied in the appendix). Therefore, we estimate models with lags between zero and five years to measure the potential effect of the CCIs within the five-year lag period.

Below is the model:

$$\boldsymbol{Y_{it}} = \boldsymbol{ECCI}_{\boldsymbol{i(t-x)}} + \boldsymbol{ICCI}_{\boldsymbol{i(t-x)}} + \boldsymbol{Z_{it}} + \boldsymbol{e}$$

- Where $\boldsymbol{Y}$ is the dependent variable, the natural log of Scope 1 or Scope 2 emissions divided by net sales, for each firm-year observation (2011-2021)
- Where ***ECCI*** and ***ICCI*** are the external and internal climate change initiative indexes, where $\boldsymbol{x}$ represents lag of 0, 1, 2, 3, 4, 5 years
- $\boldsymbol{Z}$ are firm-level control variables (employees, earnings-per-share, GHG quartiles, and industry indicator).

Results, Discussion and Limitations

Overall, we find some muted evidence that CCIs are galvanizing firms towards substantive climate performance improvements, but only for Scope 2 emissions. Scope 1 emissions, divided by net sales as a proxy for climate performance, does not improve through CCI participation. These findings are disappointing and point towards an undercurrent of climatewashing for Scope 1 emissions. Below, we unpack the results and discuss related empirical literature which comes to similar conclusions.

Interpretation of the Results

Importantly, because the ratio of emissions to net sales is our proxy for climate performance – and therefore this variable should trend *downwards* if firms are embarking on sincere climate transitioning– a positive coefficient would signify that firms engage with CCIs yet experience a deterioration in their climate performance. On the other hand, a negative coefficient indicates climate alignment – after firms engage with CCIs, they experience an improvement in climate performance.

Therefore, the mixed findings suggest that, for Scope 1 emissions, firms tend to engage with CCIs "to develop a positive corporate image due to their environmental responsibility to legitimize their existence and manage stakeholders' perceptions" (Moussa et al 2020, 82), rather than representing serious commitment and action to the climate transition. Yet for Scope 2 indirect emissions from energy usage, CCIs are beginning to exert a beneficial effect on climate performance.

Table 5: Results for Models 1-6 (Scope 1 ratio to net sales dependent variable)

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Ghg quartile	0.000161***	0.000162***	0.000126***	0.000141***	0.000155***	0.000156***
	-1.40E-05	-1.36E-05	-1.31E-05	-1.47E-05	-1.59E-05	-1.64E-05

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Employees	-7.79e-06***	-1.01e-05***	-1.00e-05***	-1.19e-05***	-1.66e-05***	-1.77e-05***
	-2.84E-06	-3.07E-06	-3.18E-06	-3.97E-06	-4.86E-06	-5.85E-06
EPS	-1.26e-05*	-1.45e-05**	-1.87e-05***	-2.12e-05***	-2.27e-05***	-2.62e-05***
	-6.72E-06	-6.83E-06	-6.48E-06	-7.05E-06	-7.67E-06	-8.89E-06
ICCI	6.67e-06**					
	-2.60E-06					
ECCI	7.93e-06***					
	-2.17E-06					
ICCI_lag1		3.29E-06				
		-2.86E-06				
ECCI_lag1		5.91e-06**				
		-2.51E-06				
ICCI_lag2			-2.03E-06			
			-2.76E-06			
ECCI_lag2			2.22E-06			
			-2.72E-06			
ICCI_lag3				-1.30E-06		
				-3.29E-06		
ECCI_lag3				1.88E-06		
				-3.38E-06		
ICCI_lag4					-7.03e-06*	
					-3.81E-06	
ECCI_lag4					-2.45E-07	
					-4.21E-06	
ICCI_lag5						-5.36E-06
						-4.26E-06
ECCI_lag5						-1.82E-06
						-5.44E-06
Constant	0.000367***	0.000323***	-0.000188	-0.000210*	-0.000177	-0.00016
	-0.000104	-0.000111	-0.00012	-0.000124	-0.000129	-0.000129
Observations	1,052	960	868	773	678	582
Number of firms	99	99	99	99	99	99

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1[‡‡]

On the particulars of each specific model in the first regression table (Table 5), the internal climate index (ICCI) is highly significant (and positive) with zero time lag, and significant (and negative) with lag of four years. This means that, because the coefficient is positive, as firms increase participation in any given ICCI initiative, climate performance deteriorates. However, there is some evidence that they may help after four years. With no time lag and one-year time lag, the ECCI is highly significant (and positive). This means that,

[‡‡] Fixed firm effects. Robust standard errors in parentheses. We remind the reader that we expect a negative sign for the indexes, as this would indicate that, as firms add internal or external initiatives, climate performance improves because emissions trend downwards, holding all else constant.

as firms add external climate management initiatives, their climate performance tends to become worse. But the other time lags for the ECCI exhibit no significance.

With regard to the control variables, the GHG control (GHG quartile) is highly significant and positive across all models, which is expected. Employees, on the other hand, is highly significant and negative which suggests, interestingly, that as firms grow, they tend to experience an improvement in climate performance even if net emissions continue to trend upwards (de Villiers and van Staden 2011). Earnings per share (EPS) is significant and negative across all models, suggesting a negative relationship between climate performance and EPS, which should raise some red flags for ESG investors.

We now turn to the second set of models which replace Scope 1 with Scope 2 emissions in the dependent variable, with the revised CCIs given a higher weighting according to alignment with Scope 2 emissions (emissions from a firm's energy usage) as shown in Table 3. Here we find somewhat more promising results. In model 7 (Table 6), the ICCI index is statistically significant (and positive) at the 1% level, which indicates ICCI with no time results in deteriorating climate performance. However, in models 9 through 12, the signs reverse, which suggests that, given a time lag, the ICCIs are having a beneficial effect on firm's climate performance. In addition, the ECCI is significant and negative in each model except the 7^{th}, which also demonstrates that ECCIs are helping firms improve climate performance with respect to Scope 2 indirect emissions. Turning to the control variables, the GHG control variable is highly significant and positive across all six models. Mirroring the first six models, employees and earnings per share are highly significant and negative across models 7-12.

Table 6: Results for Models 7-12 (Scope 2 ratio to net sales dependent variable)

Variables	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Ghg quartile	3.42e-05***	3.71e-05***	3.05e-05***	3.53e-05***	3.68e-05***	3.50e-05***

Variables	(7)	(8)	(9)	(10)	(11)	(12)
	-3.52E-06	-3.59E-06	-3.75E-06	-4.16E-06	-4.38E-06	-4.52E-06
Employees	-2.35e-08***	-3.04e-08***	-4.01e-08***	-5.16e-08***	-5.02e-08***	-4.75e-08***
	-8.98E-09	-9.75E-09	-1.09E-08	-1.29E-08	-1.53E-08	-1.76E-08
EPS	-1.25e-05***	-1.48e-05***	-1.64e-05***	-1.67e-05***	-1.71e-05***	-1.65e-05***
	-1.55E-06	-1.62E-06	-1.68E-06	-1.78E-06	-1.88E-06	-2.13E-06
ICCI	4.13e-06***					
	-1.14E-06					
ECCI	4.99E-07					
	-7.96E-07					
ICCI_lag1		2.53E-07				
		-1.25E-06				
ECCI_lag1		-1.28E-07				
		-8.81E-07				
ICCI_lag2			-2.26e-06*			
			-1.28E-06			
ECCI_lag2			-2.35e-06**			
			-1.02E-06			
ICCI_lag3				-3.98e-06***		
				-1.46E-06		
ECCI_lag3				-2.62e-06**		
				-1.23E-06		
ICCI_lag4					-6.68e-06***	
					-1.66E-06	
ECCI_lag4					-2.92e-06*	
					-1.57E-06	
ICCI_lag5						-6.78e-06***
						-1.84E-06
ECCI_lag5						-4.12e-06*
						-2.30E-06
Constant	-4.36e-05***	-3.12e-05***	9.82E-06	9.99E-06	2.69e-05*	3.39e-05**
	-1.09E-05	-1.15E-05	-1.21E-05	-1.35E-05	-1.46E-05	-1.68E-05
Observations	1,052	960	868	773	678	582
Number of firms	99	99	99	99	99	99

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1[§§]

The second set of six models reveal an important finding and, at least to some extent, suggests that climate performance, as proxied by Scope 2 indirect emissions, is not as shallow as with Scope 1 emissions. Since Scope 2 emissions are from energy usage, future research might profitably scrutinize in more depth those CCIs that specifically deal with the integration renewable energies and energy efficiency (EP-100, EV-100, RE-100), rather than

[§§] Fixed firm effects. Robust standard errors in parentheses. We remind the reader that we expect a negative sign for the indexes, as this would indicate that, as firms add internal or external initiatives, climate performance improves because emissions trend downwards, holding all else constant.

CCIs that are focused on GHG emissions (CDP, CPLC, IETA, SBTi). The implications for climate governance are discussed below, highlighting in particular the potential pitfalls of focusing narrowly on emissions, rather than production of energy more broadly.

Discussion of Results

In general, even though concerted efforts by CCIs like the CDP and the SBTi have improved corporate transparency and disclosure around climate and emissions *reporting* – and have helped to improve data quality, availability and comparison – our results largely confirm prior studies which are critical of the ability of bottom-up climate efforts to significantly improve firm-level climate performance (Delmas and Montes-Sancho 2010; Hsueh 2022).

With respect to Scope 1 emissions, we concur with Capasso et al (2020, 9) in terms of the CCIs we analyzed, the “initiatives may fall short of the required effort needed for large-scale private sector climate transitioning.” As Callery and Perkins (2021) make clear, it will take more than transparency to move the dial forward for private-sector climate transitions. In light of our findings, and building upon longstanding climate regulation scholarship (Potoski and Prakash 2006), governments and supervising authorities should at the very least consider enforcing mandatory disclosure on climate transition data, paying particular attention to consistency of firm-level climate data.

On the other hand, we offer some surprisingly promising results for Scope 2 indirect emissions. As shown in Table 6, CCIs that are oriented toward reducing emissions from energy usage, including EP100, EV100 and RE100, appear to exert a positive impact on climate performance, particularly with a time lag of 2 to 5 years after joining. This finding potentially lends support to Radu et al (2020) and their claim that when firms focus their climate efforts on operational improvements material to the bottom line they outperform. It also suggests – following Hsueh (2019) – the potential for positive interaction and sequential effects across ICCIs and ECCIs. With more data becoming available and CCIs assuming a greater role in the private sectors' climate transition, these initiatives offer a potential point of leverage for mandatory regulation of emissions disclosures across Scope 1, Scope 2, and, potentially, also the challenging but vital Scope 3 emissions (upstream supply chain emissions), which have been described as "the fatal flaw in GHG reporting" (Kaplan and Ramanna 2021, 124).

Robustness

We have developed several alternative models to enhance the robustness of our findings. First, we tested alternative lag structures for the CCI indexes by leading rather than lagging the indexes (reported in the appendix). For Scope 1 emissions, again we found dispiriting results: all ECCI and ICCI leads (rather than lags) exhibit a positive and significant effect on climate performance. The results are largely similar for Scope 2 indirect emissions, with the exception of a five-year time lead, which provides some evidence of improved climate performance five years after adding or joining CCIs.

It is also possible that emissions improvements are cancelled out by a higher increase in sales (Jones and Levy 2007). Accordingly, we ran the models with absolute emissions as the dependent variable, without including net sales in the dependent variable, and obtained similar results. In addition, we have run models in line with Trumpp and Guenther (2017) who aggregate Scope 1 and 2 emissions together to construct their dependent variable. The results still largely hold. In sum, with a number of alternative specifications, we confirmed that firm participation in CCIs results in a deterioration of climate performance for FTSE companies for Scope 1 emissions but is having a beneficial impact for Scope 2 indirect emissions.

Limitations and Future Research

Our research presents an original approach to assessing the effect of corporate climate initiatives (CCIs) and the consequent impact on firm-level climate performance in FTSE 100 companies. Prior research mainly tests the effect of individual CCIs, without capturing the effects of a growing array of bottom-up and private-led initiatives. As such, our ECCI/ICCI index makes an important contribution to the scholarship by analyzing their aggregate effects over time. However, we acknowledge that there are several limitations with our empirical approach.

First, firms are not "isolated units" operating outside the macro-structural political economy (Green et al 2021). It is challenging to capture such macro-shocks in our models. Similarly, several extraneous factors can influence corporate climate performance, such as geographical dispersion of operations, technological sophistication, industry type and the time it takes for the effects to take hold. While time is captured by our lag models, due to data constraints we were unable to specify some of these factors, although we do account for industry type.

Second, our approach also reflects general limitations in construction of private sector climate indexes. Future research could experiment with different weighting schemes, as well as adding CCIs not included here due to data availability. Specifically, where the question pertains to climate-transitioning rather than a more narrow focus on emissions, researchers could give more weight to CCIs such as RE-100 and EP-100. Researchers could also impute missing data on climate initiatives and expand the analysis to publicly traded firms in other jurisdictions.

Third, we recognize that the action of adopting ICCIs or joining ECCIs might not be entirely independent, with firms choosing to join or adopt several CCIs in the same year at little marginal cost. We also cannot control for how demanding CCI membership is on firms given that only two of the selected initiatives (CDP and SBTi) involve explicit verification by third-party auditing and the methodological challenge of capturing individual firm motivation for joining. To address this important issue, future research could potentially employ Principal Component Analysis and other index transformation techniques to account for the motivation of firm executives in adopting CCIs.

Fourth, the proxy we use for climate performance – the ratio of emissions to net sales – could be improved upon. Indeed, focusing too much on emissions can obscure the complex conditions required to move the private sector toward decarbonization which might be better captured by Scope 2 results. Equally, detecting climate performance improvements, especially in hard-to-abate sectors such as oil and gas, is likely to take significant time. As of now, Refinitiv's data does not supply reliable time-series for other climate-related data, which restricted our analysis of climate performance to emissions only.

Finally, considering our earlier discussion of climatewashing, corporate emissions data is an imperfect measure given industry incentives to mislead and potential biases in the reporting processes (Callery and Perkins 2021). Notwithstanding these limitations, there is no perfect measure for climate performance in the corporate sector and, until or unless these data become more widely available, we rely on corporate emissions data as reported. Future research could also expand upon our sample of UK FTSE-100 companies to test whether our claims can be extrapolated to the global corporate sector.

Conclusion

Through a comparative empirical analysis of CCIs and climate performance in FTSE-100 companies, we find that that there are significant problems with transparency-based self-regulation, especially for CCIs focused on Scope 1 emissions. Nevertheless, it is not all bad news. While the first six models suggest that CCIs have not produced their intended effect, models 7 to 12 offer some hope for private sector climate transitioning. These latter models indicate performance improvement for Scope 2 indirect emissions, suggestive of different arrays of incentives acting across different emissions disclosure types. The recent mandating through legislation of Scope 2 emissions disclosures by large, publicly traded firms in the UK is therefore a noteworthy addition to private sector climate transitioning regulation which merits further scrutiny.

Our findings also highlight the value of dialogue across environmental politics and business management scholarship, dovetailing a concern for a new arena within the climate regulatory ecosystem with close attention to the incentive structures required to make it work. Our findings lend further credence to the claim that robust market regulation will be required to counteract climatewashing strategies, especially in situations where the benefits of externalizing harm in the form of Scope 1 emissions outweigh the costs. However, our findings also provide important nuance to this claim. As a new regulatory architecture for emissions comes into view (The Economist 2022), it will be important to ensure standardized and auditable measurement across different emission scope types, as well as clarity on how different types of emissions disclosures, be it Scope 1, 2 or 3, respond to different kinds of regulatory incentives. Our research raises the intriguing possibility that different types of ICCIs might be more or less suited to monitoring different types of emissions. Perhaps an altogether new CCI will be required to attend to the distinct incentive challenges of securing Scope 3 indirect emissions disclosures across supply chains (Kaplan and Ramanna 2021).

In sum our study confirms the potential for CCIs to play an important role in emissions disclosure as mandatory reporting requirements come online in the UK, EU and elsewhere. In turn, increasing precision on the types of emissions to be reported represents a new stage in the institutionalization of climate performance governance. Future research could further illuminate the compliance opportunities and constraints posed by this development for both public and private climate initiatives intent on closing the emissions gap.

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