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Climate Contracting and Carbon Performance: Does Climate Governance Matter?

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ABSTRACT

Research Question/Issue: Despite the growing integration of environmental, social, and governance (ESG)-linked incentives in executive compensation contracts, empirical evidence on their effectiveness in driving substantive ESG outcomes remains inconclusive. This paper examines whether climate contracting leads to substantive improvements in corporate carbon performance and how climate governance moderates this relationship.

Research Findings/Insights: Using actual firm-level carbon emissions, our findings reveal that climate contracting is associated with significant improvements in corporate carbon performance. This effect is more pronounced for direct (Scope 1) emissions, in carbon-intensive sectors, and among firms participating in emissions trading schemes (ETS). Moreover, the positive impact of climate contracting is amplified when supported by robust climate governance structures, underscoring the critical role of board oversight in ensuring the effectiveness of climate-linked incentives. These findings remain robust across alternative measurement and endogeneity tests.

Theoretical/Academic Implications: This paper reconciles the efficient contracting and managerial opportunism perspectives by showing that climate contracting can drive real environmental outcomes, particularly when reinforced by effective board-level climate oversight.

Practitioner/Policy Implications: Our findings offer practical insights for policymakers, boards, and investors, underscoring that both the design and governance of ESG-linked pay are critical for driving meaningful environmental outcomes. As global momentum builds around mandatory ESG-linked pay, this study highlights the value of outcome-specific climate metrics over broad, generic ESG targets in executive compensation arrangements.

1 | Introduction

The increasing urgency of climate change has positioned carbon performance at the forefront of contemporary corporate governance and accountability discourse (Amel-Zadeh and Tang 2025; Bui et al. 2020; Ott and Endrikat 2023). Defined as a firm's ability to monitor, manage, and reduce its carbon footprint, carbon performance has become a key indicator of organizational responsiveness to climate-related challenges. In light of rising stakeholder expectations, organizations have adopted a range of mechanisms aimed at managing climate-related risks and demonstrating environmental accountability. Among these, the integration of environmental, social, and governance (ESG) metrics into executive compensation (EC) plans—commonly referred to as ESG contracting—has gained traction as a means of aligning managerial incentives with corporate decarbonization goals. This shift has been driven by a confluence of regulatory developments, investor-led initiatives, and growing societal demand for meaningful corporate environmental action (Bebchuk and Tallarita 2022; Bose et al. 2023; Walker 2022).

Amid growing policy and academic interest in corporate climate accountability, recent studies have examined how EC structures influence firms' carbon performance (e.g., Berrone and Gomez-Mejia 2009; Haque and Ntim 2020; Ritz 2022). EC has long served as a key governance mechanism for aligning managerial behavior with shareholder interests, consistent with the agency theory's emphasis on incentive contracts as tools to mitigate managerial opportunism (Bebchuk et al. 2002, 2011; Jensen and Meckling 1976). Extending this logic, recent developments in sustainable corporate governance have advocated for the integration of sustainability metrics into executive pay structures (Bose et al. 2023; Cohen et al. 2023; Dsouza et al. 2025; Ott and Endrikat 2023; Walker 2022). ESG contracting, although relatively nascent, has gained particular traction in the UK, where a growing number of listed firms now incorporate ESG outcomes into EC plans, with environmental targets such as carbon emission reductions emerging as the most commonly used ESG category (KPMG 2021).

While the adoption of ESG-linked remuneration structures is well-documented, their effectiveness in driving substantive environmental outcomes remains contested. Proponents argue that ESG contracting can mitigate managerial short-termism, align executive incentives with stakeholder interests, and foster long-term commitment to decarbonization and sustainability strategies (Berrone and Gomez-Mejia 2009; Cohen et al. 2023). Conversely, a growing body of critical scholarship questions both the efficacy and structure of ESG-linked remuneration, framing such arrangements as potential instruments of managerial opportunism or symbolic compliance (Bebchuk and Tallarita 2022; Lu 2023; Walker 2022). Bebchuk and Tallarita (2022), for instance, challenge the normative appeal of ESG contracting, arguing that these mechanisms often rely on vague, non-verifiable ESG metrics, which executives can satisfy through superficial actions, thereby undermining their purported environmental benefits.

Empirical evidence on this issue remains mixed. Haque (2017) suggests that while ESG compensation policies may promote carbon reduction initiatives, they do not necessarily lead to actual reductions in emissions. Echoing this skepticism, Haque and Ntim (2020) and Lu and Wang (2021) report no significant relationship between ESG-based remuneration and greenhouse gas emissions, raising concerns that such arrangements may be symbolic. A notable limitation of these studies, however, is their reliance on aggregated ESG constructs, which obscure the distinct effects of ESG dimensions. Given ESG's multidimensional nature, the failure to disaggregate these components limits the ability to isolate the specific influence of climate-related incentives. A growing yet still limited body of literature has begun to explore climate contracting—a targeted form of ESG contracting focused on climate-related objectives—by examining executive incentives tied to climate-related targets (e.g., Bose et al. 2023; Ott and Endrikat 2023). These studies provide early evidence that climate-specific incentives for top management are modestly associated with reductions in firm-level carbon emissions, suggesting a potentially positive, albeit limited, effect. However, they rely on self-reported data, particularly disclosures submitted through the CDP survey. Given the voluntary nature of the CDP survey, prior research has raised concerns about the credibility of such self-reported data, citing tendencies towards greenwashing and other reporting issues (Boiral 2013). Moreover, a critical omission in the current literature is the absence of performance that captures carbon efficiency through carbon intensity metrics (Delmas et al. 2013). This is particularly important for robust cross-firm comparisons, where differences in firm size and industry may influence the interpretation of absolute emissions.

Furthermore, while EC arrangements have traditionally been effective in aligning shareholder and managerial interests, their success in achieving broader environmental objectives such as carbon performance often hinges on the presence of robust governance mechanisms that ensure accountability and strategic coherence (Agyei-Boapeah et al. 2019; Bebchuk et al. 2002). In this context, the efficacy of climate-related incentives may be contingent upon the strength and structure of a firm's climate governance framework. Climate governance can serve as a critical moderating mechanism by legitimizing carbon-linked incentives, instilling rigor in target-setting and verification, and enhancing the credibility and effectiveness of pay-for-performance arrangements aimed at emissions reduction. For instance, board-level oversight, formal climate committees, and directors with relevant expertise can strengthen monitoring, improve target credibility, and reduce the risk that climate-linked pay is used symbolically (e.g., Klettner et al. 2014; Al-Shaer and Zaman 2019). While the literature has examined a range of governance determinants of carbon performance, including board independence, gender diversity, director co-option, and sustainability committees (e.g., Bui et al. 2020; Gull et al. 2023; Hasan et al. 2024; Orazalin 2020; Orazalin and Baydauletov 2020; Orazalin et al. 2024), the potential moderating effect of climate governance on the relationship between climate contracting and carbon performance remains largely underexplored.

Building on these gaps, this study examines whether climate contracting drives substantive improvements in corporate carbon performance, and whether climate governance moderates this relationship. Using an unbalanced panel of UK FTSE 350 firms between 2014 and 2024, our analysis offers empirical insights into whether climate-linked incentives translate into tangible environmental outcomes. The UK presents a particularly suitable setting for this investigation, given its combination of mandatory climate-related disclosure requirements (such as the Streamlined Energy and Carbon Reporting [SECR] framework) and a growing market-driven adoption of ESG-linked remuneration schemes (KPMG 2021). This dual regulatory and market-led momentum provides an ideal environment to evaluate the extent to which climate contracting mechanisms contribute to improved carbon performance and how this relationship is shaped by board-level climate governance practices.

Consistent with the efficient incentive contracting and signaling to perform rationales (Cohen et al. 2023), our findings reveal that linking EC to explicit emission reduction targets is significantly associated with improved carbon performance, as reflected in lower firm-level carbon emission intensity. This effect is further strengthened by the presence of robust board-level oversight mechanisms, suggesting that governance structures play a facilitating role in enhancing the effectiveness of climate-related incentives. These results remain robust across multiple model specifications and sensitivity analyses. The observed effects are particularly pronounced for direct (Scope 1) emissions, firms operating in carbon-intensive industries, and those participating in an emissions trading scheme (ETS), where regulatory and reputational pressures are more salient. As an additional test, we examine the relationship between climate contracting and environmental ratings. While no significant association is observed for the full sample or carbon-intensive firms, we find a modest positive effect in low-emitting sectors, for both emissions and environmental sub-group ratings. This suggests that in such contexts, climate contracting may serve more of a symbolic or reputational function.

Our study makes several important contributions to the literature on ESG contracting and corporate climate accountability. First, we advance the emerging body of scholarship on ESG-linked remuneration by focusing specifically on climate contracting. While previous studies have yielded mixed findings regarding the efficacy of ESG-linked pay, much of this ambiguity stems from the conceptual and empirical conflation of distinct ESG dimensions. ESG is inherently multidimensional, and aggregated measures may obscure the distinct mechanisms through which incentives influence specific ESG outcomes. By isolating the climate-specific dimension of ESG contracting and linking it directly to carbon performance, we address an important conceptual shortcoming and respond to recent calls for more granular, outcome-specific analyses in ESG contracting research (Luo et al. 2021). Our findings provide empirical evidence that explicit emission reduction targets in executive pay are materially relevant to decarbonization efforts. This contributes to a more precise understanding of the mechanisms underpinning ESG contracting and supports the efficient contracting and signaling to perform rationales (Cohen et al. 2023), while also addressing prominent criticisms of ESG contracting as vague or symbolic (e.g., Bebchuk and Tallarita 2022; Dell'Erba and Gomtsyan 2024; Walker 2022).

Second, we contribute to the understanding of contextual heterogeneity in the relationship between climate contracting and carbon performance. Unlike many prior studies that treat firms as a homogenous group (e.g., Cordeiro and Sarkis 2008; Haque 2017; Haque and Ntim 2020), our sub-group analysis demonstrates that the impact of climate contracting is significantly amplified by firms' exposure to carbon-related risks, particularly whether they operate in carbon-intensive industries or participate in ETS. These findings extend legitimacy theory by showing that firms facing greater regulatory scrutiny and stakeholder pressure are more likely to respond substantively to climate-linked incentives. In doing so, we help reconcile prior contradictory findings in the literature and demonstrate that the effectiveness of ESG-linked remuneration is contingent on institutional and industry-specific factors. This nuance provides a more grounded understanding of when and why incentive structures succeed or fail in promoting environmental outcomes.

Third, the study highlights the enabling role of climate governance in strengthening the impact of climate contracting on carbon performance. Firms with structured climate governance mechanisms are more likely to translate incentive contracts into substantial and measurable outcomes, specifically for scope 1 emissions, which are directly under managerial control. This implies that climate governance acts as both a monitoring mechanism and a legitimacy-enhancing signal, ensuring that climate incentives are not only present but enforced effectively.

Finally, our study offers practical and policy-relevant insights at a time of growing regulatory and investor interest in ESG-linked compensation. As global debates on mandatory ESG contracting intensify (Dell'Erba and Gomtsyan 2024), our findings challenge the assumption of a uniform relationship between ESG-related incentives and sustainability outcomes. Specifically, we show that while climate contracting improves carbon performance in firms with material emissions risk, its impact in low-emitting sectors is more symbolic, with modest effects on ESG ratings but no substantive carbon performance improvements. These findings serve as a cautionary note against a one-size-fits-all approach to climate contracting and underscore the risk of symbolic adoption or managerial rent extraction in contexts lacking substantive environmental exposure. For corporate boards, our results highlight the need for strategic coherence between incentive design and material climate risks. For institutional investors and policymakers, the findings stress the importance of not only mandating climate-linked pay but also scrutinizing the specificity, materiality, and governance frameworks within which such incentives are embedded.

The remainder of the paper is structured as follows. Section 2 provides the theoretical framework, followed by a review of prior studies and hypotheses development in Section 3. Section 4 outlines the methodology, Section 5 presents results, and Section 6 discusses the implications and conclusions.

2 | Theoretical Framework

We draw on both legitimacy theory and agency theory to examine the role of climate contracting in shaping corporate carbon performance and how this relationship is moderated by climate governance mechanisms.

2.1 | Legitimacy Theory and Climate Contracting

Legitimacy theory offers a robust theoretical lens for understanding how firms respond to increasing societal and stakeholder expectations around environmental performance. It is premised on the notion that organizations operate within socially constructed systems of norms, values, and beliefs, and are thus compelled to align their behavior with prevailing societal expectations to sustain their social license to operate (Deegan 2002; Suchman 1995). At its core, legitimacy theory posits that organizational survival and success depend not only on economic performance but also on the extent to which corporate actions are perceived as appropriate, desirable, and congruent with societal norms and values. As Ashforth and Gibbs (1990) argue, legitimacy is a socially conferred resource that justifies a firm's existence within its broader social system. Thus, maintaining legitimacy requires organizations to demonstrate behavioral congruence with societal expectations, especially as these evolve in response to environmental crises such as climate change. In the climate context, these legitimacy concerns are particularly acute for firms with material carbon footprints and visible exposure to climate regulation.

As a result, legitimacy is continuously contested and negotiated, particularly under heightened public scrutiny and growing environmental awareness. In response, organizations engage in various forms of managerial legitimation to construct, maintain, or repair their legitimacy in the eyes of key stakeholders. However, it is unclear whether such legitimation approaches by the organizations are substantive or symbolic (Ashforth and Gibbs 1990). To take a substantive approach involves genuine and material organizational changes such as revisions to goals, structures, or processes aimed at meeting stakeholder expectations. Symbolic, on the other hand, refers to superficial or cosmetic actions that are intended to give the appearance of alignment with social values, without affecting meaningful changes in organizational behavior. Accordingly, climate-related initiatives, including climate-linked executive pay, may either drive real emissions reductions (substantive) or merely project an image of environmental responsibility (symbolic).

In the context of corporate carbon performance, this theoretical distinction is particularly salient. Firms may adopt carbon management practices either to drive actual improvements in carbon performance or to project an image of environmental responsibility decoupled from the underlying reality. These heterogeneous legitimacy pressures later help explain why the effects of climate contracting vary across sectors and regulatory regimes.

The path to achieving environmental legitimacy remains complex and costly. This is because meaningful reductions in carbon emissions often require sustained investment in low-carbon technologies, innovation, and long-term strategic planning, which may expose firms to financial risks, operational uncertainties, and short-term performance declines. These challenges are exacerbated by executive remuneration systems that continue to prioritize short-term financial performance metrics, potentially disincentivizing long-term investments in environmental initiatives. In this context, aligning managerial incentives with environmental objectives such as climate change becomes critical (Bebchuk and Tallarita 2022; Dell'Erba and Gomtsyan 2024; Haque and Ntim 2020; Lu and Wang 2021).

2.2 | Agency Theory and Climate Contracting

Agency theory offers a complementary perspective on the climate contracting and carbon performance nexus. In this context, agency theory (Bebchuk et al. 2002; Jensen and Meckling 1976) highlights the inherent tension between shareholder preferences for long-term value creation, which may include decarbonization, and managerial incentives that prioritize short-term financial performance. Investments in emission reduction initiatives are often characterized by high upfront costs, long payback periods, and uncertain outcomes (Adu et al. 2023; Cordeiro and Sarkis 2008). Consequently, executives may underinvest in emission reduction initiatives that jeopardize short-term financial outcomes and, by extension, their compensation, even when such investments enhance long-term shareholder value.

Linking executive pay to carbon performance offers a mechanism to resolve this misalignment. Proponents of climate contracting argue that such arrangements can mitigate short-termism and encourage executives to allocate resources towards emission reduction initiatives, knowing that potential financial losses may be offset by performance-based rewards (Berrone and Gomez-Mejia 2009; Ott and Endrikat 2023; Cohen et al. 2023). This aligns with the efficient contracting rationale, which suggests that these incentive structures can substitute for direct monitoring in complex domains where outcomes are difficult to observe or attribute (Cohen et al. 2023). By tying EC to carbon outcomes, shareholders may pre-empt these risks and promote long-term value creation.

Nonetheless, a critical body of literature challenges the practical efficacy of these incentives. Bebchuk and Tallarita (2022) argue that ESG-linked pay provisions often lack transparency and measurable benchmarks, allowing executives to appear responsive to climate concerns without driving real reductions. Others point to ambiguities in ESG metric design, inconsistent implementation, and limited verification mechanisms as structural weaknesses that undermine the efficacy of ESG contracting (Lu 2023; Dell'Erba and Gomtsyan 2024). From this standpoint, poorly specified climate contracting can become a vehicle for managerial rent extraction rather than a credible governance mechanism (Walker 2022).

2.3 | Integrating Legitimacy and Agency Perspectives

Taken together, legitimacy theory and agency theory offer a comprehensive framework for examining the dual functions—symbolic (managerial opportunism) and substantive (efficient contracting)—of climate contracting. This study leverages both perspectives to evaluate whether climate-related executive incentives function as substantive tools for improving carbon performance or primarily as symbolic gestures aimed at reputational management. Integrating legitimacy and agency perspectives highlights the dual nature of climate contracting as both a potential instrument of efficient incentive alignment and a device for symbolic legitimation. Under strong legitimacy pressures and robust governance oversight, climate-linked incentives are more likely to induce substantive carbon performance improvements. Conversely, weak oversight and low external scrutiny increase the risk that such incentives operate symbolically, facilitating rent extraction. These theoretical considerations directly inform our expectations about the relationship between climate contracting, carbon performance, and the moderating role of climate governance developed in Section 3.

3 | Literature Review and Hypotheses Development

3.1 | Climate Contracting and Carbon Performance

Growing concerns about the environmental and economic risks associated with carbon emissions have led to increased pressure on firms to demonstrate improved environmental performance (Amel-Zadeh and Tang 2025; Bui et al. 2020; Ott and Endrikat 2023). The extant literature highlights that enhanced environmental legitimacy is associated with a range of organizational benefits, including reduced cost of capital, improved firm valuations, access to new markets, long-term financial performance, increased customer trust, higher employee engagement, and stronger stakeholder relationships (Atif and Ali 2021; Berrone and Gomez-Mejia 2009; Dienes et al. 2016; Eliwa et al. 2021; Haque and Ntim 2020; Luo and Tang 2014). These benefits create economic incentives for firms to improve carbon performance, even when doing so is costly. Despite these benefits, achieving meaningful improvements in carbon performance remains uncertain. One mechanism for addressing this misalignment is by designing incentive structures that reward corporate executives for climate-related performance (Berrone and Gomez-Mejia 2009; Cohen et al. 2023).

Consistent with the agency-based arguments outlined in Section 2, climate contracting is intended to mitigate managerial myopia by directly rewarding decarbonization outcomes (Flammer et al. 2019; Ritz 2022; Cohen et al. 2023). As climate-related regulations and investor scrutiny intensify, firms face rising financial exposure through carbon pricing, litigation, and reputational sanctions (Cohen et al. 2023). In this context, climate contracting is viewed as a targeted mechanism within the broader ESG contracting paradigm, specifically addressing the "E" component by tying pay to quantifiable environmental performance metrics such as carbon performance (Gaia Soana 2024).

However, as emphasized by legitimacy and agency critiques, climate KPIs can also be adopted symbolically, serving impression management and entrenchment rather than genuine emissions reductions when metrics are vague or weakly monitored (Haque and Ntim 2020; Bebchuk and Tallarita 2022; Lu 2023).

Empirically, prior literature has produced conflicting findings between environmental incentives and carbon performance (Berrone and Gomez-Mejia 2009; Cohen et al. 2023; Cordeiro and Sarkis 2008; Haque 2017; Haque and Ntim 2020; Lu and Wang 2021). For example, Bose et al. (2023) and Ott and Endrikat (2023) show that firms with emission-specific KPIs in executive pay achieved modest improvements in carbon performance, particularly in regulated industries. Similarly, Cohen et al. (2023) demonstrated that climate-linked compensation is more effective than generic ESG incentives in driving carbon performance, as it reduces managerial opportunism by creating measurable accountability. In contrast, Cordeiro and Sarkis (2008) and Haque (2017) provide evidence that ESG-linked EC does not drive meaningful improvements in carbon performance. Similarly, Haque and Ntim (2020) and Lu and Wang (2021) document an insignificant association between ESG compensation and reductions in carbon emissions.

Building on the agency-based efficient contracting logic in Section 2 and evidence on emission-specific incentives, we expect climate contracting to be associated with improvements in carbon performance. Previous studies that isolate climate-specific incentives have shown modest and more consistent associations with improved carbon outcomes (Bose et al. 2023; Ott and Endrikat 2023). Cohen et al. (2023), for instance, find that generic ESG pay has no significant impact on carbon emissions, but that emissions-specific incentives are associated with reductions in carbon emissions. The reputational and financial penalties for poor carbon performance may discourage symbolic adoption, thereby mitigating greenwashing risks (Lu 2023; Walker 2022). Thus, we propose the following hypothesis:

Hypothesis 1. *Climate contracting positively improves corporate carbon performance.*

3.2 | The Moderating Role of Climate Governance

We contend that the mixed findings from prior empirical evidence may, in part, stem from insufficient attention to the governance context within which such incentives operate. Climate governance, broadly defined as the institutional structures, board-level oversight, and internal mechanisms that guide a firm's response to climate-related risks and opportunities, has become a central component of sustainable corporate strategy (Bui et al. 2020). It embeds climate accountability at the board and executive levels, ensuring that climate-related risks are monitored and addressed systematically (Al-Shaer et al. 2023; Klettner et al. 2014).

From an agency perspective, the efficacy of incentive-based mechanisms depends significantly on the strength of monitoring and enforcement systems (Jensen and Meckling 1976; Haque and Ntim 2020). Boards play a critical role in this context by ensuring that climate-related performance targets embedded in compensation contracts are specific, measurable, and aligned with long-term decarbonization goals (Berrone and Gomez-Mejia 2009). Prior studies have emphasized the role of dedicated board committees, climate-competent directors, and formal oversight protocols enhancing the credibility of climate-linked pay schemes (Al-Shaer and Zaman 2019; Orazalin et al. 2024). By institutionalizing stakeholder expectations through board-level mechanisms, firms can demonstrate accountability, reduce reputational risk, and align internal practices with broader societal goals (Cohen et al. 2023; Berrone and Gomez-Mejia 2009). Thus, in governance environments characterized by strong board oversight, climate contracting is more likely to lead to meaningful emissions reductions rather than symbolic disclosure (Lu 2023; He et al. 2022).

Along these lines, climate contracting may be insufficient on its own to drive improvements in carbon performance. For incentive alignment to translate into substantive decarbonization outcomes, firms must be supported by strong governance mechanisms that promote transparency, mandate third-party verification of emissions data (Dell'Erba and Gomtsyan 2024), prioritize investments in low-carbon technologies (Bose et al. 2023), and embed stakeholder expectations into decision-making structures (Haque and Ntim 2020). Recent empirical evidence underscores the positive influence of several board-level oversight mechanisms on environmental performance. Bui et al. (2020) demonstrate that board-level climate governance is associated with improved carbon disclosures and performance, mitigating the risk of overstated environmental achievements. Similarly, Orazalin (2020) finds that the presence of sustainability committees enhances social and environmental outcomes via more effective CSR strategies. Al-Shaer and Zaman (2019) show that sustainability reporting assurance and the presence of dedicated sustainability committees are positively associated with the inclusion of ESG metrics in executive pay structures. However, not all evidence is conclusive. For instance, Orazalin et al. (2024) report no significant relationship between board sustainability committees and carbon performance, suggesting that the mere presence of such structures may not be sufficient unless coupled with capacity, expertise, and enforcement.

Despite growing attention to governance-related factors, little attention has been devoted to examining the moderating role of climate governance in the climate contracting–carbon performance nexus. In line with the agency and legitimacy arguments outlined in Section 2, we expect climate governance to strengthen the performance effects of climate contracting by improving monitoring, reducing information asymmetries, and enhancing the credibility of climate commitments. When climate responsibilities are delegated to board subcommittees or named individuals with relevant expertise, boards are better positioned to monitor executive actions, evaluate performance rigorously, and reduce information asymmetries between managers and shareholders (Berrone and Gomez-Mejia 2009). These structures enable boards to design science-based emissions targets, enforce executive accountability, and improve transparency in performance evaluation processes. Thus, we expect the performance effects of climate contracting to be more pronounced in firms with dedicated board-level climate governance mechanisms. Accordingly, we propose the following hypothesis:

Hypothesis 2. *The positive effect of climate contracting on carbon performance is stronger for firms that have climate governance structures in place.*

4 | Research Methodology

4.1 | Sample Selection and Data

This study utilizes an unbalanced panel dataset comprising 1932 firm-year observations from 206 non-financial firms listed on the FTSE 350 index between 2014 and 2024. These firms are among the largest publicly traded companies on the London Stock Exchange and are subject to considerable public scrutiny and stakeholder expectations concerning their environmental performance.

The UK provides a relevant empirical setting for examining the use of climate contracting mechanisms in enhancing environmental performance due to its advanced regulatory environment and strong institutional pressure concerning climate and governance disclosures. As one of the first countries to adopt mandatory climate-related financial disclosures and a well-established ETS environment, the UK poses increased accountability on firms, particularly those within the FTSE 350, to manage and report carbon performance (Financial Reporting Council 2022). This is strengthened by the SECR requirements, which mandate large firms to disclose carbon emissions and climate-related risk. As such, the UK's governance environment is characterized by regulatory and investor scrutiny that calls for enhanced corporate climate governance. This makes it especially relevant to investigate the interplay of agency and legitimacy forces in the UK's context of climate contracting (Eccles and Klimenko 2019) and the impact on carbon performance.

The sample selection process is shown in Table 1, Panel A. Our analysis draws on data from LSEG Refinitiv, a leading global ESG and financial database. Refinitiv offers comprehensive, independent, and standardized coverage of carbon emissions, executive remuneration structures (including climate contracting), corporate governance characteristics, and financial performance indicators, and has been widely adopted in recent carbon performance research (e.g., Haque 2017; Orazalin 2020; Orazalin et al. 2024). We use firm-level data spanning the years 2014–2024, which allows us to capture the evolution of climate contracting and carbon performance during a decade marked by significant policy and regulatory developments in the UK's corporate sustainability landscape.

Panel B of Table 1 presents the sectoral distribution of the sample. Consistent with prior carbon performance research, the industrials, consumer discretionary, and consumer staples sectors are the most represented, accounting for 494 (25.6%), 399 (20.7%), and 210 (10.9%) firm-year observations, respectively.

TABLE 1 | Sample selection and sector-wise distribution.

Panel A: Sample selection process	**Observations**
Initial sample	2343
Less:	
Observations with missing firm-level carbon emissions data	(411)
Final sample	1932

Panel B: Sample distribution by sector				
Sector	**Firms**	**Obs.**	**Percent**	**Cum. (%)**
Communication services	15	115	6.0	6.0
Consumer discretionary	46	399	20.7	26.6
Consumer staples	20	210	10.9	37.5
Energy	7	58	3.0	40.5
Health	9	79	4.1	44.6
Industrials	48	494	25.6	70.1
Information technology	12	111	5.8	75.9
Materials	19	188	9.7	85.6
Real estate	22	190	9.8	95.5
Utilities	8	88	4.6	100.0
Total	206	1932	100	

4.2 | Variable Measurement

4.2.1 | Carbon Performance

Carbon performance is measured using actual firm-level carbon emissions, expressed in metric tonnes of CO_2 equivalent (tCO_2e). This approach reflects the growing emphasis on outcome-based environmental performance metrics, especially given the proliferation of mandatory disclosure requirements for publicly listed firms across various jurisdictions. Elevated carbon emissions are widely recognized as a source of heightened regulatory and market risk exposure, including compliance costs, litigation risks, and reputational damage (Baboukardos 2017; Matsumura et al. 2014). By focusing on actual emissions rather than process-oriented proxies such as policies, disclosures, or strategies, this study offers a more direct and meaningful indicator of carbon performance.

Consistent with prior literature (Bose et al. 2023; Qian and Schaltegger 2017), we consider both direct (Scope 1)[1] and indirect (Scope 2)[2] CO_2 emissions. These emission categories are recognized as central to corporate carbon responsibility, as they represent the most immediate and managerially controllable aspects of an organization's carbon footprint. Drawing on previous studies (Bui et al. 2020; Qian and Schaltegger 2017), total carbon emissions (sum of Scope 1 and Scope 2 CO_2 emissions) are scaled by sales revenue (in thousands of GBP) to generate total carbon emission intensity. To reflect performance dynamics over time, we compute the change in carbon emission intensity (ΔCEI) as the difference between the current and previous year's total emission intensity values. This measure captures both the direction and extent of performance improvement (or deterioration) and serves as the main dependent variable in our empirical analysis. For ease of interpretation, lower values of carbon emission intensity and ΔCEI indicate superior carbon performance.

4.2.2 | Climate Contracting

Prior research suggests that firms with a stakeholder orientation and a commitment to addressing climate-related risks are more likely to embed climate-related metrics within executive pay structures (Berrone and Gomez-Mejia 2009; Cohen et al. 2023; Gaia Soana 2024). Despite the growing prevalence of ESG-linked EC policies, a persistent challenge in the literature lies in the conceptualization and measurement of ESG-linked executive pay (Bebchuk and Tallarita 2022; Dell'Erba and Gomtsyan 2024), particularly when assessing its implications for environmental performance. Because of limitations in data availability, particularly regarding the disaggregated monetary value assigned to climate-related components of executive pay, many empirical studies have adopted a binary indicator approach. These proxies typically capture the existence of an ESG-based compensation policy or sustainability-related incentives within EC structures (e.g., Adu et al. 2023; Haque 2017; Haque and Ntim 2020; Orazalin et al. 2024).

While informative, these broader ESG-linked compensation metrics may conflate distinct sustainability priorities and therefore fail to adequately capture the link between executive incentives and firm-level carbon outcomes. Indeed, empirical findings using such broad ESG pay indicators tend to show no association with improved carbon performance. We contend that this measurement approach, though valid in the broader ESG context, may be misaligned when assessing the efficacy of executive incentives specifically designed to improve carbon performance. ESG is a multidimensional concept encompassing a range of ESG factors, and as such, ESG-linked pay does not necessarily equate to carbon-specific incentive alignment. Supporting this view, Cohen et al. (2023) find no significant relationship between generic ESG pay and carbon performance (measured as changes in Scope 1 emissions). However, when they isolate emission-specific components of ESG pay, their findings reveal a significant negative relationship between emission-specific incentives and carbon emissions, reinforcing the argument that emission-specific incentives are more effective in driving carbon outcomes.

In line with this reasoning, we adopt a more focused approach by constructing a climate contracting measure based on the explicit inclusion of carbon reduction metrics in EC contracts. Following Cohen et al. (2023), we define a binary variable that equals 1 if the firm's remuneration arrangements for its CEO or the executive committee incorporate specific carbon emission reduction metrics in compensation contracts, and 0 otherwise. This binary variable is directly sourced from Refinitiv.

4.2.3 | Climate Governance

The integration of climate considerations into board-level oversight is increasingly recognized as a credible signal of a firm's strategic commitment to climate action (Bui et al. 2020). This includes embedding climate change within corporate governance frameworks through oversight committees, strategic planning, and the formal incorporation of climate-related risks into managerial decision-making processes (Berrone and Gomez-Mejia 2009; Bui et al. 2020). Firms may enhance their climate governance through a dedicated board-level committee or the designation of a named position at the board level with explicit responsibility for climate-related issues. Accordingly, we measure climate governance in two ways. First, we adopt a binary indicator (CLI_GOV) that equals 1 if the firm reports the presence of either (i) a designated board-level committee or (ii) a named board-level position with oversight responsibility for climate change, and 0 otherwise. Second, we construct a more substantive climate governance measure (CLI_GOV_{INDEX}) that extends beyond structural oversight. This measure combines the baseline binary indicator with two additional dimensions: (i) the integration of climate-related risks into corporate strategic planning and (ii) the independent verification of emissions data. These additional components capture the depth and credibility of firms' governance arrangements. Next, we load the three dimensions onto a single latent factor using factor analysis. The three items load onto a single dominant factor with an eigenvalue of 3.14, indicating strong unidimensionality. The internal consistency test further supports the reliability of the construct, with a Cronbach's alpha of 0.82. The predicted factor score, CLI_GOV_{INDEX}, ranges from −0.69 to 1.76, with higher values reflecting more substantive climate governance arrangements.

4.2.4 | Control Variables

We include a range of control variables to mitigate potential confounding effects arising from firm-specific characteristics that may influence carbon performance. Consistent with prior carbon performance literature (e.g., Adu et al. 2023; Cohen et al. 2023; Haque 2017; Haque and Ntim 2020; Orazalin 2020), we control for key corporate governance attributes, including board independence, board size, board gender diversity, the frequency of board meetings, and the presence of a sustainability/CSR committee. Gender diversity, for instance, is associated with greater stakeholder sensitivity and may shape firms' environmental responsiveness. Board activity (measured via meetings) and the presence of a sustainability committee may enhance oversight of environmental performance. We also include firm-specific controls such as firm size, profitability, capital intensity, slack resources, capital expenditure (CAPEX), and firms' emission rating, all of which have established associations with carbon performance outcomes. To capture leadership-level effects, we control for CEO gender and CEO age, reflecting the growing evidence that executive characteristics influence sustainability priorities (e.g., Awuah et al. 2024; Heubeck 2024). Finally, we include industry (two-digit SIC code) and year fixed effects in all models to control for unobserved heterogeneity across time and sectors. A detailed explanation of the measurement of these variables is provided in Appendix A.

4.3 | Empirical Model

To examine the relationship between climate contracting and carbon performance, as well as the moderating role of climate governance, we employ firm fixed effects estimation with heteroskedasticity-adjusted standard errors clustered at the firm level. The appropriateness of the fixed effects estimation for our unbalanced panel dataset is confirmed through the Hausman test ($p < 0.001$). Using the change in carbon emission intensity (ΔCEI) as the dependent variable, we specify the following models to test our hypotheses. Equation (1) captures the direct effect of climate contracting on carbon performance, whereas Equation (2) extends this model by introducing an interaction term to assess the moderating effect of climate governance in the climate contracting–carbon performance nexus.

$$\begin{aligned}\Delta CEI_{i,t} = {} & \beta_0 + \beta_1 CLI\_CON_{i,t} + \beta_2 CEO\_GEN_{i,t} + \beta_3 CEO\,AGE_{i,t} \\ & + \beta_4 B.\,SCOM_{i,t} + \beta_5 E\_RATING_{i,t} + \beta_6 NBM_{i,t} + \beta_7 B.\,SIZE_{i,t} \\ & + \beta_8 BGD_{i,t} + \beta_9 B.\,IND_{i,t} + \beta_{10} SIZE_{i,t} + B_{11} CAP.\,INT_{i,t} \\ & + \beta_{12} EC_{i,t} + \beta_{13} ROA_{i,t} + \beta_{14} SLACK_{i,t} + \beta_{15} CAPEX_{i,t} \\ & + Industry_{i,t} + Year_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{1}$$

$$\begin{aligned}\Delta CEI_{i,t} = {} & \beta_0 + \beta_1 CLI\_CON_{i,t} + \beta_2 CLI\_GOV_{i,t} + \beta_3 CLI\_CON * CLI\_GOV_{i,t} \\ & + \beta_4 CEO\_GEN_{i,t} + \beta_5 CEO\,AGE_{i,t} + \beta_6 B.\,SCOM_{i,t} + \beta_7 E\_RATING_{i,t} \\ & + \beta_8 NBM_{i,t} + \beta_9 B.\,SIZE_{i,t} + \beta_{10} BGD_{i,t} + \beta_{11} B.\,IND_{i,t} + \beta_{12} SIZE_{i,t} \\ & + B_{13} CAP.\,INT_{i,t} + \beta_{14} EC_{i,t} + \beta_{15} ROA_{i,t} + \beta_{16} SLACK_{i,t} + \beta_{17} CAPEX_{i,t} \\ & + Industry_{i,t} + Year_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{2}$$

where $\Delta CEI_{i,t}$ denotes the change in carbon emission intensity for firm i at time t, and CLI_CON * CLI_GOV is the interaction term between climate contracting and climate governance. All other variables are defined in Appendix A.

5 | Results

5.1 | Carbon Profile, Descriptive Statistics, and Correlation Analysis

We begin by presenting an overview of the carbon profile of our sampled firms over the sample period. As reported in Table 2, the average total emission intensity across the sample is 0.55, indicating that, on average, firms emit approximately 0.55 tCO_2e for every £1000 of revenue generated. As expected, Scope 1 emissions dominate the emissions profile with a mean intensity of 0.38, while Scope 2 emissions average 0.13 tCO_2e. This level of intensity is slightly higher than the 0.516 tCO_2e reported by Qian and Schaltegger (2017) for Global Fortune 500 firms, suggesting that UK-listed firms exhibit marginally higher emissions intensity in relative terms. These emission levels translate into non-trivial carbon liabilities. Applying the 2025 average carbon price of £41.85 per tonne, a firm emitting 0.55 tCO_2e per £1000 revenue would incur an implied carbon cost of £23 per £1000 revenue, equivalent to 2.3% of revenue, assuming comprehensive pricing coverage. This reinforces earlier findings (e.g., Adu et al. 2023; Baboukardos 2017; Matsumura et al. 2014; Orazalin et al. 2024) that capital markets respond negatively to elevated carbon emissions, translating into adverse valuation effects.

Table 3 presents sector-level averages of carbon emission intensity over the sample period, revealing significant and persistent sectoral heterogeneity. As expected, the Energy and Utilities sectors remain the most carbon-intensive, peaking at 2.76 and 2.77 tCO_2e/£1000 revenue, respectively, in 2014. Notably, both sectors exhibit downward trends in emissions intensity over time. For example, Utilities reduced their total emissions intensity from 2.77 in 2014 to 1.35 in 2024, largely driven by declines in Scope 1 emissions (from 2.24 to 0.99). The Materials sector also remains consistently carbon-intensive, declining only moderately from 1.79 to 1.25 over the period, highlighting the emissions embedded in core manufacturing and processing activities,

TABLE 2 | Summary of the overall carbon emission intensity profile.

Descriptive stats	Total emission intensity	Scope 1 emission intensity	Scope 2 emission intensity
Mean	0.55	0.38	0.13
Median	0.05	0.02	0.02
Std. dev	1.26	1.01	0.28
Min.	0.00	0.00	0.00
Max.	5.16	4.24	1.19
Q1	0.01	0.00	0.01
Q3	0.28	0.13	0.08

Note: $N = 206$; Observations = 1932.

TABLE 3 | Sector averages of carbon emission intensity over time.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Scope 1 emission intensity											
Energy	2.12	2.32	2.29	2.31	1.86	1.89	1.86	1.76	1.77	1.60	1.58
Materials	1.27	1.31	1.18	1.18	1.13	1.18	1.08	1.01	1.07	1.04	1.01
Industrials	0.34	0.22	0.21	0.21	0.21	0.24	0.23	0.24	0.23	0.32	0.33
Consumer discretionary	0.24	0.21	0.17	0.16	0.15	0.14	0.13	0.12	0.09	0.12	0.12
Consumer staples	0.31	0.45	0.28	0.28	0.35	0.36	0.35	0.33	0.32	0.27	0.25
Health	0.21	0.19	0.14	0.14	0.14	0.13	0.13	0.10	0.09	0.09	0.08
Information technology	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Communication services	0.06	0.05	0.05	0.05	0.04	0.03	0.04	0.04	0.03	0.04	0.03
Utilities	2.24	2.21	2.13	2.21	1.98	1.65	1.43	1.35	1.21	1.20	0.99
Real estate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scope 2 emission intensity											
Energy	0.60	0.60	0.60	0.60	0.49	0.49	0.40	0.40	0.40	0.35	0.35
Materials	0.46	0.46	0.47	0.48	0.44	0.41	0.37	0.34	0.33	0.30	0.28
Industrials	0.06	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.04	0.04	0.03
Consumer discretionary	0.10	0.09	0.08	0.08	0.07	0.06	0.06	0.05	0.04	0.05	0.05
Consumer staples	0.25	0.30	0.26	0.25	0.23	0.23	0.19	0.17	0.16	0.14	0.13
Health	0.18	0.17	0.12	0.13	0.11	0.10	0.10	0.07	0.06	0.06	0.06
Information technology	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Communication services	0.19	0.17	0.17	0.18	0.23	0.17	0.16	0.14	0.13	0.11	0.12
Utilities	0.24	0.24	0.24	0.34	0.32	0.29	0.28	0.27	0.26	0.25	0.25
Real estate	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01
Total emission intensity											
Energy	2.76	2.79	2.76	2.77	2.24	2.27	2.17	2.08	2.08	1.88	1.85
Materials	1.79	1.83	1.62	1.65	1.55	1.56	1.40	1.30	1.35	1.30	1.25
Industrials	0.42	0.42	0.40	0.41	0.45	0.43	0.42	0.30	0.28	0.39	0.40
Consumer discretionary	0.39	0.34	0.29	0.27	0.26	0.24	0.22	0.17	0.14	0.18	0.20
Consumer staples	0.81	0.81	0.78	0.76	0.65	0.64	0.55	0.50	0.47	0.41	0.38
Health	0.39	0.36	0.26	0.27	0.25	0.23	0.23	0.17	0.16	0.15	0.14
Information technology	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Communication services	0.30	0.27	0.33	0.24	0.34	0.26	0.24	0.21	0.18	0.17	0.17
Utilities	2.77	2.64	2.55	2.55	2.49	2.07	1.85	1.74	1.51	1.57	1.35
Real estate	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Note: Carbon emissions are scaled by total revenue in thousands of GBP. Variable definitions are provided in Appendix A.

particularly chemicals, metals, and cement production. While Scope 1 emissions account for the majority of total emissions in most sectors and remain subject to the greatest regulatory scrutiny, the pace of reductions varies. For instance, Scope 1 intensity in the Energy sector declined from 2.12 to 1.58 between 2014 and 2024, a slower rate than observed in the Utilities sector. This discrepancy may reflect underlying differences in structural rigidities, technological lock-in, or the degree of renewable energy adoption.

In contrast, low-carbon sectors such as Information Technology and Real Estate consistently report near-zero emissions intensity, reflecting minimal direct combustion and limited energy intensity. However, these sectors are increasingly scrutinized under Scope 3 disclosure expectations and investor-led net-zero commitments. Interestingly, some sectors—such as Industrials and Communication Services—exhibit signs of stagnation or modest rebound in emissions post-2020, suggesting that the pandemic-induced reductions may have been cyclical rather than structural.

Table 4 summarizes the descriptive statistics of the variables used in the main analyses. The carbon performance variable (ΔCEI), defined as the annual change in carbon emission intensity, has a negative mean of 0.01, indicating a modest average reduction of 10 kg CO_2e per £1000 of revenue across the sample. Our key independent variable, climate contracting (CLI_CON), has a mean of 0.09, suggesting that fewer than 10% of firms explicitly incorporate carbon emission reduction KPIs in executive remuneration arrangements. While adoption remains limited, it exceeds the 5% reported by Bui et al. (2020) for US-listed firms. In contrast, the climate governance variable (CLI_GOV) records a mean of 0.38, pointing to broader uptake of board-level climate oversight mechanisms. Table 4 further shows that approximately 82% of firms have established sustainability committees, board independence averages 62%, and boards are, on average, 29% gender-diverse. Firms typically hold eight board meetings annually (log of 2.10), with an average board size of approximately nine members (log of 2.19). CEO demographic characteristics reflect broader leadership patterns among FTSE-listed firms, with only 13% of CEOs being female and an average CEO age of 53.7 years.

TABLE 4 | Descriptive statistics.

Variables	Obs.	Mean	Std. dev.	Min.	Max.
1. ΔCEI	1932	−0.01	0.07	−0.24	0.15
2. CLI_CON	1932	0.09	0.29	0.00	1.00
3. CLI_GOV	1932	0.38	0.49	0.00	1.00
4. BS.COM	1932	0.82	0.38	0.00	1.00
5. E_RATING	1932	54.21	23.20	0.00	96.86
6. NBM (ln)	1932	2.10	0.38	0.00	4.01
7. B.SIZE (ln)	1932	2.19	0.27	0.00	2.83
8. BGD (%)	1932	29.17	12.33	0.00	75.00
9. B.IND (%)	1932	62.16	13.94	0.00	100.00
10. SIZE (ln)	1929	22.17	1.53	18.02	26.82
11. CAP.INT	1929	0.26	0.24	0.00	0.95
12. ROA	1932	0.07	0.17	−0.27	2.49
13. SLACK	1932	0.09	0.09	0.00	0.82
14. CAPEX	1930	0.12	0.28	0.00	2.01
15. EC (ln)	1917	8.05	1.46	0.50	13.62
16. CEO_GEN	1709	0.13	0.33	0.00	1.00
17. CEO AGE	1709	53.70	6.62	35.00	82.00

Note: This table reports descriptive statistics for the variables and observations used in our tests. The sample spans from 2014 to 2024 and includes 1932 observations for 206 unique firms. Variable definitions are provided in Appendix A.

The Pearson correlation coefficients presented in Table 5 offer preliminary insights into the relationships among climate contracting, carbon performance, corporate governance, and other firm-level variables. Consistent with expectations, carbon performance is negatively correlated with climate contracting, suggesting that firms with explicit climate-related incentives are more likely to demonstrate improvements in carbon performance. Climate governance is also negatively associated with carbon performance, implying that stronger board-level oversight may contribute to better emissions management. Additionally, climate governance is positively correlated with climate contracting, indicating that firms with board-level climate governance mechanisms are more likely to integrate climate reduction targets into executive remuneration. Importantly, none of the pairwise correlations among the independent variables exceeds the commonly accepted threshold of 0.80 (Gujarati 2003), indicating that multicollinearity does not appear to be a concern.[3] Nevertheless, it is important to analyze the multivariate regression results before drawing any statistical inferences.

5.2 | Multivariate Analysis

Table 6 presents the results of our multivariate regression analysis. Column 1 of Table 6 reports the baseline fixed effects regression estimates for Hypothesis 1. The results reveal a negative but statistically insignificant coefficient on CLI_CON. This suggests that firms incorporating emission reduction targets as KPIs in executive remuneration achieve, on average, a 0.013 tCO_2e reduction in emissions per £1000 of revenue. However, this effect is not significant, and thus we do not find empirical support for Hypothesis 1.

This notwithstanding, the relationship between climate contracting and carbon performance may be biased due to endogeneity concerns arising from unobserved firm characteristics, omitted variable bias, and potential reverse causality. To address these issues, we employ a two-stage least squares (2SLS) estimation with instrumental variables (IV), which is appropriate for identifying causal relationships when endogeneity is present. In the first stage of the 2SLS estimation, climate contracting is instrumented using two instruments, alongside all control variables used in the fixed effects specification. The first instrument is the sector-average ESG-linked compensation policy (ESG_INC_{sector}) computed as the annual mean ESG incentive score across all other firms within the same sector and year, excluding the focal firm. This variable captures industry norms and mimetic pressures related to ESG-related compensation practices. The underlying rationale is that firms operating in sectors where ESG-linked pay is more prevalent are more likely to adopt similar policies, including climate-specific incentives. However, because ESG incentives policies span multiple domains—environmental, social, and governance—the existence of a general ESG policy does not necessarily lead to specific reductions in carbon emissions. Moreover, this variable is unlikely to be correlated with the error term, and thus may not directly influence our dependent variable (Orazalin et al. 2024). Drawing on previous literature (e.g., Gaia Soana 2024; Konadu et al. 2022), the second instrument is the one-period lagged value of the climate contracting variable (CLI_CON_{t-1}). The lagged measure reflects

TABLE 5 | Pairwise correlation.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. ΔCEI	1																
2. CLI_CON	−0.099***	1															
3. CLI_GOV	−0.071**	0.411***	1														
4. B.SCOM	−0.101***	0.108***	0.185***	1													
5. E_RATING	−0.159***	0.150***	0.164***	0.385***	1												
6. NBM	−0.069**	0.004	0.034	−0.002	−0.020	1											
7. B.SIZE	−0.079**	0.110***	0.111***	0.191***	0.330***	−0.027	1										
8. BGD	−0.054*	0.312***	0.523***	0.149***	0.246***	0.060*	0.173***	1									
9. B.IND	−0.089***	0.153***	0.197***	0.217***	0.236***	0.0395	0.277***	0.352***	1								
10. SIZE	−0.203***	0.147***	0.098***	0.314***	0.574***	−0.025	0.483***	0.149***	0.302***	1							
11. CAP.INT	−0.101***	0.089***	0.060*	0.0943***	0.011	0.026	0.025	−0.026	−0.027	0.163***	1						
12. ROA	0.014	−0.010	−0.042	−0.120***	−0.040	−0.045	−0.009	0.101***	0.020	−0.226***	−0.107***	1					
13. SLACK	0.013	−0.060*	0.013	−0.116***	−0.168***	0.004	−0.119***	0.009	−0.003	−0.317***	−0.129***	0.179***	1				
14. CAPEX	0.008	−0.012	−0.035	0.007	0.038	−0.033	0.008	−0.057*	−0.056*	0.032	0.056*	−0.067**	−0.093***	1			
15. EC	0.157***	−0.052*	0.020	−0.149***	−0.212***	−0.006	−0.169***	−0.028	−0.133***	−0.538***	−0.258***	0.091***	0.063**	0.212***	1		
16. CEO_GEN	0.017	−0.017	−0.002	0.005	−0.028	0.032	−0.034	−0.033	0.047	−0.005	−0.008	−0.065**	−0.062*	0.028	0.045	1	
17. CEO AGE	0.003	0.043	0.024	−0.049*	−0.087***	0.001	−0.053*	−0.037	−0.081***	−0.056*	0.031	0.054*	0.043	−0.012	0.070**	−0.176***	1

Note: This table reports the Pearson correlation between climate contracting, climate governance, and the control variables. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Appendix A.

TABLE 6 | Fixed effects and 2SLS estimates.

		2SLS	
	Fixed effects	First stage	Second stage
	(1)	(2)	(3)
Variables	ΔCEI	CLI_CON	ΔCEI
CLI_CON	−0.013		−0.030**
	(0.010)		(0.014)
ESG_INC_{sector}		0.017*	
		(0.009)	
CLI_CON_{t-1}		0.707***	
		(0.038)	
CEO_GEN	0.007	0.006	0.006
	(0.004)	(0.017)	(0.005)
CEO AGE	0.003	0.009	0.002
	(0.004)	(0.011)	(0.004)
B.SCOM	−0.010**	−0.015	−0.001
	(0.004)	(0.014)	(0.003)
E_RATING	−0.000	0.000	−0.000
	(0.000)	(0.000)	(0.000)
NBM	−0.022**	0.011	−0.010
	(0.009)	(0.014)	(0.006)
B.SIZE	−0.007	0.001	0.003
	(0.007)	(0.021)	(0.010)
BGD	0.000	0.001*	0.000***
	(0.000)	(0.000)	(0.000)
B.IND	0.000	0.000	−0.000
	(0.000)	(0.000)	(0.000)
SIZE	0.005	0.013*	−0.004
	(0.006)	(0.007)	(0.002)
CAP.INT	−0.025	0.019	0.011
	(0.044)	(0.033)	(0.011)
EC	0.000	0.009*	0.004**
	(0.002)	(0.005)	(0.002)
ROA	0.019	0.029	−0.014**
	(0.030)	(0.054)	(0.006)
SLACK	−0.070**	−0.086	−0.032
	(0.034)	(0.066)	(0.021)
CAPEX	−0.004**	−0.000	0.003
	(0.002)	(0.005)	(0.002)

(Continues)

	Fixed effects	2SLS	
		First stage	Second stage
	(1)	(2)	(3)
Variables	ΔCEI	CLI_CON	ΔCEI
Constant	−0.045	−0.376**	0.038
	(0.121)	(0.174)	(0.072)
Observations	1698	1518	1518
R-squared	0.051	0.505	0.129
Year and sector FE	Yes	Yes	Yes
F-test of excluded instruments		172.63***	
Cragg–Donald Wald F statistic		343.36***	
Kleibergen–Paap rank LM statistic		99.87***	
Hansen (p-value)			0.774

Note: This table reports the results of fixed-effect regression (Column 1) and 2SLS estimation model (Columns 2 and 3), with changes in total emission intensity (ΔCEI) as the dependent variable in Columns 1 and 3, and climate contracting (CLI_CON) as the dependent variable in Column 2. ΔCEI is measured as the difference between the previous and current year total carbon emission intensity (the sum of Scope 1 and Scope 2 emissions scaled by sales revenue in thousand GBP) of firm i in year t. In the first stage of the 2SLS estimation (Column 2), climate contracting (CLI_CON) is regressed on all the firm-level controls and two instruments, i.e., the sector-average ESG compensation policy score (ESG_INC_{sector}) and one firm-year lag of the main independent test variable ($CLI\_CON_{t\text{-}1}$). In the second stage, ΔCEI is regressed on the instrumented measures of climate contracting and control variables. Robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Appendix A.

the persistence of climate-linked incentives over time and is assumed to be predetermined for current carbon emissions. To assess the validity and strength of our instruments, we conduct standard diagnostic tests, including the Cragg–Donald and Kleibergen–Paap weak instrument tests, and Hansen's J test for overidentification.

Table 6, Column 2 reports the results of the first-stage regression from the 2SLS estimation, where CLI_CON is the dependent variable. The Cragg–Donald Wald F statistic is 343.36, substantially above the Stock–Yogo critical value threshold of 19.93, indicating that the instruments are not weak. Additionally, the Kleibergen–Paap rank LM statistic ($\chi^2 = 99.87$, $p < 0.001$) confirms the model is not underidentified, while the Hansen J test ($p = 0.774$) indicates that the instruments are valid and uncorrelated with the error term. Table 6, Column 3, reports the results of the second-stage 2SLS estimation, where the predicted values of CLI_CON from the first-stage regression are used. The results indicate a statistically significant and negative relationship between CLI_CON and ΔCEI ($\beta = -0.030$, $p < 0.05$), suggesting that the adoption of climate-related incentive arrangements is associated with improvements in firms' carbon performance. Specifically, the results imply that firms with climate contracting exhibit a reduction in carbon emission intensity of approximately 0.030 tCO_2e per £1000 of revenue, relative to otherwise comparable firms. To contextualize this magnitude, given a standard deviation of ΔCEI of 0.07, the estimated effect represents a nontrivial improvement in carbon performance (approximately 43% of one standard deviation in ΔCEI) and is therefore economically meaningful.[4]

While the magnitude is modest in absolute terms, it is consistent with the incremental nature of operational and strategic adjustments required to reduce emissions. Overall, the findings suggest that incorporating emission-related metrics into EC is associated with economically meaningful improvements in carbon efficiency. This evidence supports Hypothesis 1 and aligns with prior literature highlighting the role of incentive design in shaping climate-related outcomes (e.g., Berrone and Gomez-Mejia 2009; Cohen et al. 2023; Gaia Soana 2024). In this context, the alternative view that climate contracting arrangements are adopted for managerial rent extraction and symbolic purposes (Bebchuk and Tallarita 2022; Cordeiro and Sarkis 2008; Lu 2023) is not supported by the data, particularly among UK-listed firms.

Several control variables are significantly associated with carbon performance in both the fixed effects and 2SLS results. The number of board meetings (NBM) is negatively related to carbon performance in the fixed effects model ($\beta = -0.022$, $p < 0.05$), suggesting that more frequent board engagement is associated with improved carbon performance. Similarly, CAPEX shows a negative and significant relationship with carbon performance, consistent with the view that investment in physical assets may contribute to emissions mitigation. In the 2SLS model, total EC is positively and significantly associated with carbon performance ($\beta = 0.009$, $p < 0.10$), possibly reflecting that higher pay without climate conditions may not incentivize emission reductions. Additionally, return on assets (ROA) is negatively associated with carbon performance in the 2SLS specification ($\beta = -0.014$, $p < 0.05$), indicating that more profitable firms tend to achieve better carbon performance. Finally, slack resources show a consistently negative coefficient across both models (FE: $\beta = -0.070$, $p < 0.05$), although the effect is not statistically significant in the 2SLS model, hinting at a potential role for resource availability in enabling climate-related investments.

5.3 | Robustness Checks

Before assessing the moderating role of climate governance in the relationship between climate contracting and carbon performance, we conduct a series of robustness checks on our baseline results to address potential endogeneity and model specification concerns. Although the 2SLS results indicate a statistically significant negative relationship between climate

TABLE 7 | Post-matching diagnostics: PSM and entropy balancing.

Panel A: Comparison of treated and control group: climate contracting					
	Mean			***t*-Test**	
	Treated	**Control**	**%Bias**	***t***	***p*>*t***
CEO_GEN	0.121	0.101	6.1	0.52	0.601
CEO AGE	0.510	0.508	0.5	0.05	0.964
B.SCOM	0.950	0.938	3.9	0.44	0.660
E_RATING	62.857	63.416	−2.6	−0.23	0.820
NBM	2.105	2.103	0.5	0.04	0.966
B.SIZE	2.262	2.259	1.4	0.13	0.897
BGD	39.453	39.971	−4.9	−0.51	0.608
B.IND	67.451	67.301	1.1	0.11	0.916
SIZE	22.628	22.624	0.2	0.02	0.985
CAP.INT	0.309	0.286	9.6	0.79	0.432
EC	7.997	7.998	−0.1	−0.01	0.995
ROA	0.069	0.077	−4.8	−0.46	0.644
SLACK	0.078	0.081	−3.2	−0.28	0.780
CAPEX	0.108	0.092	4.0	0.74	0.460

Panel B: Comparison of treated and control group: climate contracting				
	Before entropy balancing		**After entropy balancing**	
	Mean		**Mean**	
	Treated	**Control**	**Treated**	**Control**
CEO_GEN	0.107	0.127	0.107	0.107
CEO AGE	0.516	0.443	0.516	0.516
B.SCOM	0.956	0.817	0.956	0.955
E_RATING	64.89	53.09	64.89	64.87
NBM	2.096	2.091	2.096	2.096
B.SIZE	2.276	2.175	2.276	2.276
BGD	41.12	27.75	41.12	41.11
B.IND	68.28	61.06	68.28	68.28
SIZE	22.83	22.06	22.83	22.83
CAP.INT	0.323	0.252	0.323	0.323
EC	7.839	8.099	7.839	7.839
ROA	0.068	0.074	0.068	0.068
SLACK	0.076	0.095	0.076	0.076
CAPEX	0.113	0.136	0.113	0.113

Note: This table reports the post-matching diagnostics for PSM and entropy balancing. Panel A compares the mean values of the variables between the treated and control groups after PSM. Panel B compares the mean values of the variables between treated and control groups in the original sample and after entropy balancing. Variable definitions are provided in Appendix A.

contracting and carbon performance, this relationship may still be susceptible to endogeneity biases. For instance, the voluntary nature of climate contracting introduces the possibility of self-selection bias, where certain types of firms may be systematically more likely to incorporate carbon reduction targets as KPIs in executive remuneration arrangements.

Furthermore, our 2SLS approach relies on the assumption that the instruments affect carbon performance only through climate contracting (exclusion restriction). While industry-level climate practices and lagged contracting are widely used in the literature and supported by strong first-stage results, we cannot fully rule out the possibility that these instruments may be correlated with unobserved industry trends or firm characteristics that also influence carbon performance. To address these concerns, we complement these results by applying two common quasi-experimental techniques: propensity score matching (PSM) and entropy balancing.

The PSM approach facilitates a more credible identification of the causal effect of climate contracting by mitigating observable selection bias between treated firms (i.e., those adopting climate contracting arrangements) and control firms (i.e., those without such arrangements). To do this, we first estimate a logistic regression in which the probability of adopting climate contracting is modeled as a function of the control variables included in Equation (1). Based on the estimated propensity scores, each treated firm is matched to a control firm using one-to-one nearest neighbor matching within a 5% caliper and without replacement. Post-matching diagnostics, reported in Table 7, Panel A, confirm that covariate balance is achieved, with no statistically significant differences between treated and control firms across the matched variables. We then re-estimate Equation (1) using the matched sample, with results reported in Table 8, Column 1. The coefficient on CLI_CON remains negative and statistically significant ($\beta = -0.017$, $p < 0.05$), reinforcing the robustness of our baseline 2SLS findings and lending further support to the assertion that climate-related incentive mechanisms are associated with improved carbon performance.

To complement the PSM analysis, we employ entropy balancing as an additional robustness check to mitigate potential confounding biases arising from systematic differences in observable characteristics between treated and control firms (DeBoskey et al. 2025). Entropy balancing applies a reweighting procedure that assigns scalar weights to observations to ensure covariate balance across selected moments (e.g., means and variances), while maintaining minimal distortion from the original sample distribution (Hainmueller 2012; Wilde 2017). As reported in Table 7, Panel B, post-balancing diagnostics indicate that covariate means are statistically equivalent between treated and control groups, indicating effective balance. Using the entropy-balanced sample, we re-estimate Equation (1), with the results reported in Table 8, Column 2. The results show a statistically significant negative relationship between CLI_CON and ΔCEI ($\beta = -0.016$, $p < 0.05$). Taken together, these additional tests provide consistent support that our findings are robust and largely free from potential endogeneity bias.

Lastly, we employ three alternative proxies for climate contracting to address potential concerns regarding measurement

TABLE 8 | Robustness tests: PSM and entropy balancing.

Variables	Propensity matched sample (1) ΔCEI	Entropy balancing (2) ΔCEI
CLI_CON	−0.017**	−0.021**
	(0.008)	(0.010)
CEO_GEN	0.004	−0.011
	(0.011)	(0.015)
CEO AGE	−0.001	−0.010
	(0.007)	(0.011)
B.SCOM	−0.005	−0.003
	(0.008)	(0.008)
E_RATING	−0.000	−0.000
	(0.000)	(0.000)
NBM	−0.013	−0.014
	(0.012)	(0.019)
B.SIZE	0.007	0.031
	(0.023)	(0.033)
BGD	0.001	0.000
	(0.000)	(0.000)
B.IND	0.000	−0.000
	(0.000)	(0.000)
SIZE	0.001	−0.009
	(0.004)	(0.006)
CAP.INT	0.020	0.024
	(0.020)	(0.024)
EC	0.009**	0.004
	(0.004)	(0.007)
ROA	0.007	−0.016
	(0.010)	(0.017)
SLACK	−0.041	−0.048
	(0.037)	(0.064)
CAPEX	0.008	0.003
	(0.010)	(0.005)
Constant	−0.116	0.139
	(0.129)	(0.186)
Observations	553	1698
R-squared	0.148	0.212
Year and sector FE	Yes	Yes

Note: This table reports the regression results on the effect of climate contracting on carbon performance using a propensity matched sample (Column 1) and an entropy balanced sample (Column 2). In Columns 1 and 3, the dependent variable, ΔCEI, is measured as the difference between the previous and current year total carbon emission intensity (the sum of Scope 1 and Scope 2 emissions scaled by sales revenue in thousand GBP) of firm i in year t. Robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Appendix A.

TABLE 9 | Robustness tests: ESG-linked incentive policy and climate change performance incentives.

Variables	ESG-linked incentive policy (1) ΔCEI	Climate change performance (2) ΔCEI	Substantive climate contracting (2) ΔCEI
CLI_CON	−0.002	−0.014**	
	(0.003)	(0.007)	
CLI_CON_{INDEX}			−0.009**
			(0.004)
CEO_GEN	0.004	0.004	0.006
	(0.004)	(0.004)	(0.005)
CEO AGE	0.001	0.001	0.002
	(0.004)	(0.004)	(0.004)
B.SCOM	−0.004	−0.005	−0.002
	(0.004)	(0.004)	(0.003)
E_RATING	−0.000**	−0.000*	−0.000
	(0.000)	(0.000)	(0.000)
NBM	−0.016**	−0.016**	−0.010
	(0.007)	(0.007)	(0.006)
B.SIZE	−0.002	−0.002	0.003
	(0.006)	(0.006)	(0.010)
BGD	0.000*	0.000*	0.001***
	(0.000)	(0.000)	(0.000)
B.IND	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)
SIZE	−0.004*	−0.003	−0.004*
	(0.002)	(0.002)	(0.002)
CAP.INT	0.012	0.012	0.012
	(0.013)	(0.013)	(0.011)
EC	0.003	0.003	0.004*
	(0.002)	(0.002)	(0.002)
ROA	−0.013**	−0.012**	−0.014**
	(0.006)	(0.006)	(0.006)
SLACK	−0.044**	−0.043**	−0.034
	(0.018)	(0.018)	(0.021)
CAPEX	0.000	0.001	0.003
	(0.001)	(0.001)	(0.002)
Constant	0.092	0.077	0.039
	(0.067)	(0.066)	(0.072)
Observations	1698	1698	1698

(Continues)

	ESG-linked incentive policy	Climate change performance	Substantive climate contracting
	(1)	(2)	(2)
Variables	**ΔCEI**	**ΔCEI**	**ΔCEI**
R-squared	0.121	0.124	0.123
Year and sector FE	Yes	Yes	Yes

Note: This table reports the regression results on the effect of climate contracting on carbon performance using alternative measures of climate-related compensation. Columns (1) and (2) employ, respectively, an indicator for generic ESG-linked compensation policies and a measure capturing climate change–specific performance incentives. Column (3) reports results using a substantive climate contracting index constructed through factor analysis of three climate-related contracting components. In Columns 1–3, the dependent variable, ΔCEI, is measured as the difference between the previous and current year total carbon emission intensity (the sum of Scope 1 and Scope 2 emissions scaled by sales revenue in thousand GBP) of firm i in year t. Robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Appendix A.

error or the omission of relevant dimensions in our original specification. The first proxy captures generic ESG-linked compensation, operationalized as a binary indicator that equals 1 if the firm has adopted an ESG/sustainability-related incentive policy, and 0 otherwise. The second proxy is a binary variable that captures whether the CEO or executive committee members' compensation includes climate change performance as a formal KPI. This specification enables an assessment of whether the specificity of climate-focused incentives is critical for influencing carbon performance outcomes. Re-estimating our baseline model using the generic ESG-linked compensation proxy (Table 9, Column 1) shows a negative but insignificant association with carbon performance, suggesting that broad ESG incentives may lack the precision needed to drive meaningful carbon reductions. In contrast, substituting the climate change performance incentives proxy (Table 9, Column 2) shows a negative and significant coefficient ($\beta = -0.014$, $p < 0.05$), aligning closely with our main 2SLS findings. These additional tests underscore the robustness of our results and point to the importance of incentive specificity. That is, climate contracting mechanisms that explicitly link executive pay to climate-related performance appear to be more effective in improving carbon outcomes than general ESG incentive structures, consistent with the findings of Cohen et al. (2023).

Our third proxy for climate contracting is constructed as an index designed to capture the substantive features of climate-related incentive arrangements. Following Qin and Yang (2022), we manually collect information from firms' annual reports on three dimensions: (i) the relative weight assigned to climate-related incentives within EC plans (WEIGHT),[5] (ii) the number of distinct climate-related performance metrics included (METRICS), and (iii) whether the climate measures are quantitative in nature (QUAN).[6] This approach offers a more granular assessment of the extent to which climate considerations are meaningfully embedded in EC structures. To capture the underlying construct of substantive climate contracting, we conduct a factor analysis combining these three items with our baseline binary climate contracting indicator. The results suggest that the number of climate-related performance metrics does not load meaningfully on the latent construct and is therefore excluded from the final specification. The retained items load onto a single dominant factor with an eigenvalue of 1.76 and a Cronbach alpha of 0.768, supporting the internal consistency of the composite measure. Factor loadings are strongest for the weight and quantification dimensions, indicating that substantive climate contracting is primarily characterized by the prominence and measurability of climate-related metrics in CEO compensation. The average communality across variables is approximately 0.59, suggesting that the latent factor explains a substantial proportion of the shared variance in climate contracting design. Our predicted factor score, CLI_CON_{INDEX}, ranges from −0.31 to 3.79, with higher values reflecting more substantive climate contracting arrangements.

Next, we re-estimate our baseline model, replacing CLI_CON with CLI_CON_{INDEX} as the independent variable. The results in Table 9, Column 3, show a negative and significant coefficient ($\beta = -0.009$, $p < 0.05$). This finding is closely aligned with our baseline results and suggests that firms adopting more substantive climate-related incentive structures exhibit greater improvements in carbon performance. To ensure that these results are not driven by the inclusion of the baseline binary climate contracting indicator in the index construction, we re-estimate the model using only the two substantive components, namely, the relative weight assigned to climate incentives and the presence of quantitative climate measures. The results remain qualitatively unchanged.[7] Overall, the evidence reinforces our main inference that embedding climate considerations more meaningfully within EC arrangements is associated with reductions in carbon emission intensity.

5.4 | Additional Analysis: Subsector, ETS Participation, and Emission Category

To further examine the effectiveness of climate contracting, we extend the baseline 2SLS analysis by exploring whether the effect varies by sectoral carbon intensity, participation in ETS, and emissions category. Table 10 presents the findings from these sub-sample estimations.

First, we examine whether climate contracting is more effective in sectors with inherently high emissions. Drawing on Konadu et al. (2022), firms operating in the energy, industrials, materials, and utilities sectors are classified as carbon-intensive, while those in communication services, consumer discretionary, consumer staples, health care, information technology, and real estate are grouped as non-carbon-intensive. A binary indicator is

TABLE 10 | Subsample analysis: 2SLS–Carbon intensity, ETS participation, and emissions category.

Variables	Carbon intensive (1) ΔCEI	Non-intensive (2) ΔCEI	ETS (3) ΔCEI	Non-ETS (4) ΔCEI	Scope 1 (5) ΔS1_EI	Scope 2 (6) ΔS2_EI
CLI_CON	−0.066**	−0.003	−0.113**	−0.021*	−0.028***	−0.001
	(0.026)	(0.011)	(0.056)	(0.012)	(0.010)	(0.004)
CEO_GEN	0.002	0.009***	0.049	0.001	0.006*	0.002
	(0.009)	(0.003)	(0.031)	(0.004)	(0.003)	(0.002)
CEO AGE	0.001	0.004*	0.032	−0.000	−0.001	−0.000
	(0.007)	(0.002)	(0.024)	(0.003)	(0.002)	(0.001)
B.SCOM	−0.006	0.001	−0.065	0.000	0.003	0.000
	(0.007)	(0.002)	(0.046)	(0.002)	(0.002)	(0.001)
E_RATING	−0.000	−0.000	−0.000	0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
NBM	−0.010	−0.010**	0.003	−0.011**	−0.007	−0.001
	(0.014)	(0.005)	(0.025)	(0.005)	(0.004)	(0.002)
B.SIZE	0.011	−0.000	0.000	−0.002	−0.001	−0.000
	(0.019)	(0.010)	(0.032)	(0.011)	(0.007)	(0.002)
BGD	0.001***	0.000	0.001	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
B.IND	0.000	−0.000**	0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
SIZE	−0.009**	−0.001	−0.003	−0.005**	−0.002	−0.003***
	(0.004)	(0.002)	(0.011)	(0.002)	(0.002)	(0.001)
CAP.INT	0.048**	−0.010	0.041	−0.013	0.008	−0.008***
	(0.021)	(0.010)	(0.055)	(0.009)	(0.007)	(0.002)
EC	0.004	0.002	0.006	0.001	0.002	0.001*
	(0.004)	(0.002)	(0.012)	(0.002)	(0.001)	(0.001)
ROA	−0.062	−0.005	0.101	−0.010**	−0.003	−0.006***
	(0.065)	(0.003)	(0.199)	(0.005)	(0.004)	(0.002)
SLACK	−0.026	−0.022	−0.090	−0.043***	−0.025*	−0.009
	(0.043)	(0.014)	(0.217)	(0.016)	(0.013)	(0.006)
CAPEX	0.003	−0.006	0.028	0.001	0.002*	0.001
	(0.003)	(0.004)	(0.030)	(0.002)	(0.001)	(0.000)
Constant	0.131	0.051	0.010	0.124*	0.001	0.069***
	(0.128)	(0.063)	(0.338)	(0.066)	(0.051)	(0.017)
Observations	659	859	202	1316	1518	1518
R-squared	0.161	0.090	0.278	0.073	0.112	0.177
Year and sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Cragg–Donald Wald F statistic	147.210***	176.862***	29.831***	290.918***	343.363***	343.363***

(Continues)

TABLE 10 | (Continued)

	Carbon intensive	Non-intensive	ETS	Non-ETS	Scope 1	Scope 2
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	**ΔCEI**	**ΔCEI**	**ΔCEI**	**ΔCEI**	**ΔS1_EI**	**ΔS2_EI**
Kleibergen–Paap rank LM statistic	57.929***	45.170***	19.819***	81.056***	99.874***	99.874***
Hansen (*p*-value)	0.998	0.510	0.791	0.858	0.796	0.288

Note: This table reports the regression results on the effect of climate contracting on carbon performance across subsamples defined by carbon intensity, Emissions Trading System (ETS) participation, and emission scope. Columns (1) and (2) present results for carbon-intensive and non-carbon-intensive firms, respectively. Columns (3) and (4) report results for firms participating and not participating in the EU ETS. Columns (5) and (6) distinguish between Scope 1 and Scope 2 emission intensity, respectively. The dependent variable in Columns (1)–(4), ΔCEI, is measured as the difference between the previous and current year total carbon emission intensity (the sum of Scope 1 and Scope 2 emissions scaled by sales revenue in thousand GBP) of firm i in year t. ΔS1_EI is measured as the difference between the previous and current year Scope 1 emission intensity (total Scope 1 emissions scaled by sales revenue in thousand GBP) of firm i in year t. ΔS2_EI is measured as the difference between the previous and current year Scope 2 emission intensity (total Scope 2 emissions scaled by sales revenue in thousand GBP) of firm i in year t. In the first stage of the 2SLS estimation (not reported), Cli_con is regressed on all the firm-level controls and two instruments, i.e., the sector-average ESG compensation policy score (ESG_INC_{sector}) and one firm-year lag of the main independent test variable ($CLI\_CON_{t\text{-}1}$). In the second stage, ΔCEI is regressed on the instrumented measures of CLI_CON and control variables. Robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Appendix A.

used to distinguish between the two groups, where a value of 1 is assigned to firms operating in carbon-intensive sectors and 0 otherwise. The results in Table 10, Column 1 reveal a statistically significant and negative relationship between CLI_CON and ΔCEI in carbon-intensive sectors ($\beta = -0.066$, $p < 0.05$). In contrast, the coefficient on CLI_CON for non-intensive sectors (Column 2) is statistically insignificant. This suggests that the presence of emission–reduction metrics in compensation contracts is particularly effective in driving substantive carbon performance in sectors with higher baseline emissions, but has limited salience where emissions pressures are relatively lower.

Second, we investigate whether the impact of climate contracting is conditioned by regulatory context by splitting the sample based on firm participation in an ETS. Table 10, Column 3 shows that for firms participating in an ETS, the coefficient on CLI_CON is negative and significant ($\beta = -0.113$, $p < 0.05$), supporting the view that climate-aligned incentives are more effective when combined with external regulatory pressure. For non-ETS firms (Column 4), a relatively smaller negative effect is observed and weakly significant ($\beta = -0.021$, $p < 0.10$), highlighting a more modest but still relevant influence of incentive structures in voluntary settings.

Third, we disaggregate total emission intensity by emissions scope to compare the effect of climate contracting on direct and indirect emissions. Table 10, Column 5 reports a statistically significant reduction in Scope 1 emission intensity ($\beta = -0.028$, $p < 0.01$), while Column 6 shows no significant effect on Scope 2 emission intensity. This contrast underscores the role of managerial discretion and operational autonomy. Climate-related incentives appear to be more effective when managers have direct influence over emission sources than in cases involving externally determined inputs like electricity consumption, consistent with the findings of Bose et al. (2023).

Taken together, these additional results reinforce the baseline finding that climate contracting is associated with improved carbon performance. However, they also illuminate important contextual dependencies. The impact of executive incentives is amplified in sectors with higher emissions exposure, in firms subject to regulatory constraints, and for emissions that fall squarely within the remit of managerial control. These insights offer a more nuanced understanding of climate contracting arrangements, suggesting that the success of climate-aligned remuneration is contingent not only on internal governance design but also on sectoral characteristics and regulatory environments.

5.5 | Moderating Effect of Climate Governance

To test Hypothesis 2, we introduce an interaction term between climate contracting and climate governance in Equation (2) to test whether climate governance moderates the climate contracting and carbon performance nexus. First, we interact our binary climate contracting measure with the climate governance indicator (CLI_CON*CLI_GOV). The results reported in Table 11, Column 1, show that the interaction term is negative and statistically significant ($\beta = -0.033$, $p < 0.05$). This finding indicates that the effectiveness of climate-related incentives in improving carbon performance is strengthened when firms exhibit stronger climate oversight structures. Second, we replace the binary climate contracting indicator with the factor-based climate governance measure derived from the factor analysis (CLI_GOV_{INDEX}). The results presented in Table 11, Column 2, show that the interaction term ($CLI\_CON*CLI\_GOV_{INDEX}$) remains negative and statistically significant ($\beta = -0.018$, $p < 0.05$). For robustness, we further interact the factor-based measures for climate contracting and climate governance derived from the factor analysis. The results, reported in Table 11, Column 3, remain qualitatively unchanged. Collectively, the evidence suggests a complementary relationship between formal incentive mechanisms and broader governance arrangements, whereby climate-related compensation is more effective in reducing carbon emission intensity when supported by substantive board-level climate oversight.

Table 12 reports the moderating effect of climate contracting across carbon intensity and ETS participation sub-samples. Similar to the baseline results, the moderating effect is

TABLE 11 | Additional analysis—moderating effect of climate governance.

Variables	Climate governance (binary) (1) ΔCEI	Substantive climate governance (2) ΔCEI	Substantive contracting and governance (3) ΔCEI
CLI_CON	0.012	0.009	
	(0.009)	(0.013)	
CLI_GOV	0.002		
	(0.005)		
CLI_GOV_{INDEX}		−0.001	−0.003
		(0.003)	(0.003)
CLI_CON_{INDEX}			0.003
			(0.004)
Moderating effect			
CLI_CON*CLI_GOV	−0.033**		
	(0.014)		
$CLI\_CON*CLI\_GOV_{INDEX}$		−0.018**	
		(0.008)	
$CLI\_CON_{INDEX}*CLI\_GOV_{INDEX}$			−0.005**
			(0.002)
CEO_GEN	0.007	0.005	0.005
	(0.004)	(0.005)	(0.005)
CEO AGE	0.004	0.001	0.001
	(0.004)	(0.003)	(0.003)
B.SCOM	−0.009**	−0.004	−0.004
	(0.004)	(0.005)	(0.005)
E_RATING	−0.000	−0.000*	−0.000*
	(0.000)	(0.000)	(0.000)
NBM	−0.022**	−0.013***	−0.013***
	(0.009)	(0.004)	(0.004)
B.SIZE	−0.008	−0.002	−0.001
	(0.007)	(0.007)	(0.007)
BGD	0.000	0.000*	0.000*
	(0.000)	(0.000)	(0.000)
B.IND	0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)
SIZE	0.005	−0.003*	−0.003*
	(0.005)	(0.002)	(0.002)
CAP.INT	−0.023	0.013	0.013
	(0.044)	(0.009)	(0.009)

(Continues)

TABLE 11 | (Continued)

Variables	Climate governance (binary) (1) ΔCEI	Substantive climate governance (2) ΔCEI	Substantive contracting and governance (3) ΔCEI
EC	−0.000	0.004**	0.004**
	(0.002)	(0.002)	(0.002)
ROA	0.017	−0.014	−0.014
	(0.030)	(0.011)	(0.011)
SLACK	−0.072**	−0.035*	−0.036*
	(0.034)	(0.021)	(0.021)
CAPEX	−0.005***	0.002	0.002
	(0.002)	(0.003)	(0.003)
Constant	−0.033	0.059	0.061
	(0.117)	(0.053)	(0.053)
Observations	1698	1698	1698
R-squared	0.054	0.128	0.127
Year and sector FE	Yes	Yes	Yes

Note: This table reports the regression results of the moderating effect of climate governance on the climate contracting and carbon performance nexus. Column (1) includes individual measures of climate contracting (CLI_CON) and climate governance (CLI_GOV), along with their interaction term. Column (2) replaces CLI_GOV with a composite climate governance index (CLI_GOV_{INDEX}) constructed through factor analysis of three climate governance-related components, and includes its interaction with CLI_CON. Column (3) employs factor-based indices for both climate contracting (CLI_CON_{INDEX}) and climate governance (CLI_GOV_{INDEX}) and reports their interaction effect. The dependent variable, ΔCEI, is measured as the difference between the previous and current year total carbon emission intensity (the sum of Scope 1 and Scope 2 emissions scaled by sales revenue in thousand GBP) of firm i in year t. Robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Appendix A.

particularly pronounced in carbon-intensive sectors (Table 12, Column 1: $\beta = -0.062$, $p < 0.05$) and among ETS participating firms (Table 12, Column 3: $\beta = -0.171$, $p < 0.01$). These findings suggest that governance mechanisms are most effective in reinforcing the carbon mitigation effects of incentive structures when firms operate under heightened emissions pressure, whether due to the nature of their sector or the presence of regulatory constraints. In contrast, no significant moderating effect is observed for non-carbon-intensive or non-ETS firms, implying that in the absence of structural or regulatory imperatives, climate governance has a limited role in enhancing the efficacy of incentive-based mechanisms. This may reflect a weaker organizational imperative to prioritize carbon reduction or a lower salience of climate risks in those settings. This evidence supports Hypothesis 2 and corroborates previous findings (e.g., Al-Shaer and Zaman 2019; Berrone and Gomez-Mejia 2009; Haque 2017; Orazalin 2020) that a broader climate governance infrastructure (i.e., board-level attention to climate issues and dedicated oversight mechanisms) strengthens the effectiveness of carbon-reduction initiatives such as climate contracting.

5.6 | Additional Analysis: Climate Contracting and ESG Ratings

To further explore the implications of climate contracting, we examine whether such arrangements enhance firms' external validation through ESG performance ratings. In particular, we investigate whether the integration of emission reduction targets into executive remuneration structures translates into favorable assessments by third-party ESG rating agencies, thus influencing how firms are perceived in terms of environmental responsibility and accountability.

To this end, we re-estimate Equation (1), substituting the dependent variable (ΔCEI) with two alternative measures of ESG performance: the change in Emission Score[8] (ΔEmission Score) and the change in Environmental Pillar Score[9] (ΔEnvironment Score). Both measures reflect the year-on-year change in third-party ESG evaluations. Data for the emission and environmental pillar scores are sourced from LSEG Refinitiv. Table 13 presents the results across the full sample and by carbon intensity subgroup. For the full sample, the coefficient on CLI_CON is positive but statistically insignificant for both ΔEmission Score (Column 1) and ΔEnvironment Score (Column 2), suggesting no significant link between climate contracting and improvements in external ESG ratings, consistent with the findings of Cohen et al. (2023). Similar patterns emerge for carbon-intensive firms, where the coefficient on CLI_CON remains insignificant and even turns negative (albeit insignificant) in the case of ΔEnvironment Score (Column 4).

In contrast, the results for firms in low carbon-intensity sectors reveal a modest but noteworthy pattern. The coefficients on CLI_CON are positive and weakly significant for

TABLE 12 | Additional sub-sample analysis—moderating effect of climate governance.

Variables	Carbon intensive (1) ΔCEI	Non-intensive (2) ΔCEI	ETS (3) ΔCEI	Non-ETS (4) ΔCEI
CLI_CON	0.015	0.003	−0.009	0.005
	(0.021)	(0.008)	(0.033)	(0.011)
CLI_GOV	0.012	−0.002	0.060*	−0.001
	(0.012)	(0.004)	(0.032)	(0.005)
Moderating effect				
CLI_CON*CLI_GOV	−0.062**	−0.001	−0.171***	−0.012
	(0.026)	(0.013)	(0.060)	(0.015)
CEO_GEN	0.009	0.006	0.030	0.005
	(0.008)	(0.004)	(0.024)	(0.004)
CEO AGE	0.008	0.001	0.036*	0.001
	(0.008)	(0.002)	(0.021)	(0.003)
B.SCOM	−0.021**	−0.005*	−0.064	−0.001
	(0.010)	(0.003)	(0.058)	(0.003)
E_RATING	−0.000	−0.000	0.003*	−0.000
	(0.000)	(0.000)	(0.002)	(0.000)
NBM	−0.038*	−0.011	−0.023	−0.017**
	(0.021)	(0.007)	(0.039)	(0.007)
B.SIZE	−0.008	−0.007	0.013	−0.007
	(0.013)	(0.005)	(0.030)	(0.008)
BGD	0.001	0.000*	0.003	0.000
	(0.001)	(0.000)	(0.002)	(0.000)
B.IND	0.000	−0.000	0.001	−0.000
	(0.000)	(0.000)	(0.001)	(0.000)
SIZE	0.006	0.004	−0.041	0.006
	(0.012)	(0.005)	(0.065)	(0.005)
CAP.INT	−0.024	−0.012	−0.223	−0.010
	(0.085)	(0.030)	(0.232)	(0.035)
EC	−0.002	0.001	−0.002	−0.000
	(0.005)	(0.002)	(0.015)	(0.002)
ROA	0.070	0.010	0.037	0.004
	(0.099)	(0.019)	(0.192)	(0.022)
SLACK	−0.136**	−0.013	−0.629*	−0.055*
	(0.066)	(0.025)	(0.330)	(0.028)
CAPEX	−0.004***	−0.007	−0.017	−0.005**
	(0.002)	(0.005)	(0.030)	(0.002)

(Continues)

TABLE 12 | (Continued)

Variables	Carbon intensive (1) ΔCEI	Non-intensive (2) ΔCEI	ETS (3) ΔCEI	Non-ETS (4) ΔCEI
Constant	−0.020	−0.033	0.790	−0.062
	(0.271)	(0.103)	(1.374)	(0.099)
Observations	733	965	233	1465
R-squared	0.091	0.050	0.205	0.056
Year and sector FE	Yes	Yes	Yes	Yes

Note: This table reports the regression results of the moderating effect of climate governance on the climate contracting and carbon performance nexus across subsamples defined by carbon intensity and Emissions Trading System (ETS) participation. The dependent variable, ΔCEI, is measured as the difference between the previous and current year total carbon emission intensity (the sum of Scope 1 and Scope 2 emissions scaled by sales revenue in thousand GBP) of firm i in year t. Robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Appendix A.

TABLE 13 | Additional analysis: Climate contracting and ESG ratings.

	Full sample		Carbon-intensive		Non-intensive	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	ΔEmission Score	ΔEnvironment Score	ΔEmission Score	ΔEnvironment Score	ΔEmission Score	ΔEnvironment Score
CLI_CON	0.016	0.005	0.004	−0.011	0.023*	0.020*
	(0.010)	(0.007)	(0.014)	(0.010)	(0.013)	(0.010)
CEO_GEN	−0.000	0.015	−0.024*	0.001	0.021	0.025*
	(0.011)	(0.010)	(0.013)	(0.012)	(0.016)	(0.014)
CEO AGE	−0.006	−0.001	−0.006	0.005	−0.005	−0.003
	(0.007)	(0.005)	(0.008)	(0.007)	(0.010)	(0.008)
B.SCOM	0.038**	0.030***	0.071***	0.025	0.023	0.034**
	(0.017)	(0.010)	(0.022)	(0.016)	(0.022)	(0.014)
NBM	−0.003	−0.016**	0.007	−0.007	−0.006	−0.019*
	(0.009)	(0.008)	(0.013)	(0.014)	(0.012)	(0.010)
B.SIZE	−0.001	0.005	−0.024	−0.003	0.026	0.016
	(0.022)	(0.010)	(0.022)	(0.012)	(0.018)	(0.013)
BGD	0.000	0.000	−0.001	−0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
B.IND	−0.000	−0.000	−0.000	−0.000	0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
SIZE	−0.003	0.004	−0.019	−0.008	0.004	0.007
	(0.013)	(0.009)	(0.019)	(0.013)	(0.018)	(0.013)
CAP.INT	0.055	−0.024	0.018	−0.114	0.104	0.092
	(0.059)	(0.049)	(0.086)	(0.069)	(0.089)	(0.068)
EC	0.003	0.004	−0.002	0.003	0.007	0.004
	(0.004)	(0.003)	(0.005)	(0.004)	(0.007)	(0.004)

(Continues)

TABLE 13 | (Continued)

Variables	Full sample (1) ΔEmission Score	(2) ΔEnvironment Score	Carbon-intensive (3) ΔEmission Score	(4) ΔEnvironment Score	Non-intensive (5) ΔEmission Score	(6) ΔEnvironment Score
SLACK	0.064	0.033	0.010	0.009	0.100	0.056
	(0.056)	(0.047)	(0.064)	(0.067)	(0.093)	(0.061)
ROA	0.043	0.060	0.127	0.147*	0.012	0.028
	(0.055)	(0.037)	(0.103)	(0.088)	(0.057)	(0.030)
CAPEX	0.002	0.000	0.004**	0.001	−0.009	−0.003
	(0.002)	(0.002)	(0.001)	(0.001)	(0.009)	(0.008)
Constant	0.006	−0.109	0.420	0.187	−0.235	−0.213
	(0.288)	(0.209)	(0.431)	(0.285)	(0.401)	(0.293)
Observations	1518	1518	659	659	859	859
R-squared	0.037	0.046	0.065	0.065	0.049	0.063
Year and sector FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the regression results of the effect of climate contracting on two measures of ESG performance: Δ Emission Score and ΔEnvironment Score. In Columns 1, 3, and 5, the dependent variable Δ Emission Score is measured as the difference between the current and previous year's emission scores (provided by LSEG Refinitiv) for firm i in year t. In Columns 2, 4, and 6, the dependent variable ΔEnvironment Score is measured as the difference between the current and previous year's environmental pillar scores (provided by LSEG Refinitiv) for firm i in year t. Robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. Variable definitions are Appendix A.

both ΔEmission Score (Column 5: $\beta = 0.023$, $p < 0.10$) and ΔEnvironment Score (Column 6: $\beta = 0.020$, $p < 0.10$). This suggests that in less carbon-intensive sectors, the adoption of climate-linked pay arrangements is associated with modest improvements in external ESG ratings. When considered alongside earlier findings (Table 10, Column 2), which indicate no significant association between climate contracting and carbon performance in these low-emitting sectors, this result is instructive. It implies that such arrangements may serve a symbolic or reputational function, aimed at enhancing external perceptions rather than driving operational change. In these settings, climate contracting may be better understood as a signaling mechanism, consistent with the managerial opportunism (symbolic) perspective (Bebchuk and Tallarita 2022; Lu 2023), rather than a reflection of efficient contracting (Cohen et al. 2023).

On the other hand, in carbon-intensive sectors, where firms are subject to greater regulatory scrutiny and external accountability, climate contracting appears to function more effectively as a performance-aligned governance mechanism. Although no significant ESG rating improvements are observed in these sectors, earlier results suggest such arrangements are associated with reductions in carbon emissions, consistent with the efficient contracting (substantive) rationale (Cohen et al. 2023). Taken together, these findings highlight the sectoral contingencies in the design and effectiveness of climate-related incentive mechanisms. While such arrangements may function as effective governance tools in high-emitting sectors, their application in low-emission contexts may be more strategic or opportunistic, reflecting symbolic adoption rather than substantive commitment.

6 | Discussion and Concluding Remarks

Drawing on agency and legitimacy theories, this study investigates the relationship between climate contracting and corporate carbon performance. Our findings offer several insights and evidence that clarify the relevance and context-effectiveness of climate contracting.

Consistent with the agency-theoretic arguments discussed in Section 2, the 2SLS estimation indicates a statistically significant negative association between climate contracting and changes in emission intensity. This supports the assertion that climate-linked incentives can effectively align managerial interests with long-term environmental goals. In doing so, they mitigate the classical agency problem of managerial myopia, as posited by Jensen and Meckling (1976) and later echoed by Berrone and Gomez-Mejia (2009). Importantly, the results contradict the "symbolic gesture" perspective (Ashforth and Gibbs 1990; Bebchuk and Tallarita 2022), which characterizes ESG-linked compensation as reputational or opportunistic window dressing. Our results demonstrate that when climate contracting is underpinned by measurable and specific outcomes, it becomes a credible mechanism to improve carbon performance (Cohen et al. 2023; Gaia Soana 2024). The validity of this assertion is reinforced by the matching techniques employed, which consistently show that firms adopting climate contracting outperform matched control firms in reducing carbon intensity.

Our supplementary analyses provide further theoretical depth by showing that the nature of climate contracting is contingent on other conditional contexts. Specifically, the positive association between climate contracting and carbon performance is more pronounced in carbon-intensive sectors and those subject to ETS. These findings underscore the contingent model embedded in legitimacy theory (Suchman 1995), which posits that firms face different levels of external scrutiny based on the sector of their operating and regulatory environment. As such, in high-pressure contexts, where greenwashing poses reputational and regulatory risks, firms are more likely to adopt and implement climate contracts substantively (Zhang 2024). These results suggest that stakeholder expectations and institutional pressure act as important boundary conditions shaping the effectiveness and authenticity of climate contracting mechanisms. Moreover, the disaggregated analysis of emissions by scope further extends our theoretical understanding. We find that emissions reductions under direct managerial control (i.e., Scope 1) are more prevalent than those dependent on third-party energy suppliers (i.e., Scope 2). This corroborates the agency-based perspective that the efficacy of climate incentive mechanisms is more pronounced in circumstances where managerial control is strongest (Flammer et al. 2019).

Regarding Hypothesis 2, our findings affirm the enabling role of climate governance in translating climate-linked incentive contracts into actual, measurable outcomes. Consistent with prior research (Al-Shaer and Zaman 2019; Haque 2017), we observe that robust climate governance enhances the monitoring of emissions-related KPIs embedded in incentive contracts. From an agency theory perspective, climate governance serves to reduce management discretion and opportunism while enforcing compliance with climate targets (Berrone and Gomez-Mejia 2009). Complementing this, legitimacy theory provides an understanding of how climate governance serves as a signal that elevates stakeholder confidence in the authenticity of climate commitments (Ashforth and Gibbs 1990). This moderating effect of climate governance is particularly strong in carbon-intensive sectors and ETS-regulated firms, suggesting that governance structures are most impactful in the presence of high regulatory and external scrutiny mechanisms.

Finally, our exploratory analysis of the ESG ratings offers additional insight into the symbolic tags associated with climate contracting. The results demonstrate that in sectors characterized by low emissions intensity, stakeholder monitoring may be less rigorous and therefore render climate contracts as symbolic functions (Lu 2023; Bebchuk and Tallarita 2022). Conversely, in carbon-intensive sectors, symbolic adoption is less tenable (Zhang 2024), and therefore, performance-linked incentives are expected to deliver substantive results to maintain or enhance legitimacy.

6.1 | Theoretical Implications

This study advances the literature on climate contracting from a dual-theoretical perspective to explain how executive incentives shape corporate carbon performance. First, we contribute to agency theory by demonstrating that climate contracting helps to mitigate managerial short-termism. In contrast to symbolic arguments of ESG-linked pay (Bebchuk and Tallarita 2022; Walker 2022), our findings affirm that climate incentive contracts under conditions of managerial control (i.e., Scope 1 emissions) matter significantly for carbon performance. This highlights the theoretical relevance of contract specificity in resolving agency problems in environmental governance (Jensen and Meckling 1976; Berrone and Gomez-Mejia 2009).

Second, our study enriches our understanding of climate contracting from a legitimacy theory lens by emphasizing its effectiveness within sectoral and institutional regulatory contexts. In line with Suchman (1995) and Zhang (2024), we show that in highly scrutinized environments such as carbon-intensive industries or ETS jurisdictions, firms move away from symbolic legitimacy representation to substantive legitimacy implementation of climate contracts. Moreover, climate governance serves as a critical monitoring mechanism for legitimacy-enhancing signals to stakeholders.

6.2 | Practical Implications

The findings offer several important implications for corporate leaders, board members, and sustainability professionals. First, our results suggest that climate-linked compensation (i.e., climate contracts) must be designed to align with direct emissions sources to yield effective results. Also, firms in carbon-intensive sectors or operating within the UK ETS, for instance, must adopt more rigorous governance mechanisms to reinforce the credibility of climate incentives.

Moreover, the key role played by climate governance indicates that boards should move beyond mere adoption of climate targets to institutionalize mechanisms such as transparent reporting, climate oversight roles, and committees. These structures will enhance legitimacy in settings where perceptions of symbolism and greenwashing are high.

6.3 | Limitations and Future Research

While our study provides novel insights into climate contracting and carbon performance, it has some limitations. First, our sample size is limited to only FTSE 350-listed firms in the UK that publicly disclosed compensation data. This may bias the findings towards more sustainability-conscious firms. Future research should expand the sample to include SMEs and firms in less-regulated contexts. Second, although our analysis disaggregates emissions by scope, future studies could investigate how climate contracting interacts with other organizational factors, such as technology and supply chain management, to reduce Scope 2 and Scope 3 emissions. Third, we operationalize climate governance in its structured official forms; further work is needed to explore more informal governance processes such as organizational culture, leadership style, and environmental teams. Lastly, while our instrumental variables strategy using industry averages and lagged values of climate contracting addresses concerns related to reverse causality and omitted variable bias, it cannot fully rule out all potential endogeneity. In particular, the estimates rely on the exclusion restriction, which assumes that the instruments affect carbon performance solely through climate contracting. Although our instruments are theoretically and empirically justified, we cannot fully rule out the possibility of residual endogeneity. Future studies could explore alternative regulatory or policy shocks that generate clear treatment and control groups to strengthen causal identification. Additionally, expanding the sample to include firms outside the UK or across multiple regulatory regimes may provide opportunities for natural experiments that better isolate the effects of climate contracting on carbon performance.

Author Contributions

Hany Elbardan: conceptualization, writing – original draft, writing – review and editing, project administration, supervision. **Benjamin Awuah:** conceptualization, methodology, formal analysis, writing – original draft, writing – review and editing. **Renata Konadu:** visualization, writing – review and editing, validation, data curation.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] Scope 1 emissions refer to those arising from sources owned or controlled by the firm. For example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, emissions from chemical production in owned or controlled process equipment (World Business Council for Sustainable Development and World Resources Institute 2004).

[2] Scope 2 emissions capture indirect emissions from the generation of purchased electricity, steam, heating, or cooling consumed by the reporting company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company (World Business Council for Sustainable Development and World Resources Institute 2004).

[3] We assessed multicollinearity by estimating the variance inflation factor (VIF) for each independent variable. The results (not reported) reveal that no variable exceeds the commonly accepted VIF threshold of 10 (Chatterjee et al. 2000), with the highest VIF recorded at 3.40 and an average VIF of 2.58. These values suggest that multicollinearity is unlikely to pose a concern in our analysis.

[4] Following Li and Srinivasan (2011) and Mitton (2024), we assess economic significance by scaling the estimated effect of a change in the explanatory variable from zero to one by the standard deviation of the dependent variable.

[5] For example, in 2024, BP Plc allocated 30% of its short-term incentive plan (STIP) to safety and sustainability measures, of which 15% was specifically linked to operated carbon emissions. Similarly, in 2024, Bakkavor Group plc assigned 15% of its long-term incentive plan (LTIP) to carbon emissions reduction targets, focusing on Scope 1 and Scope 2 emissions. Threshold vesting (25% of that component) requires a reduction of 14,250 t, while a reduction of 15,675 t is necessary to achieve maximum vesting.

[6] We assign a score of 1 if the climate-related performance metrics are quantitative in nature, 0.5 if they are qualitative, and 0 if no climate-related metrics are disclosed in the compensation scheme.

[7] For reasons of brevity, the results are not reported but available on request.

[8] LSEG Refinitiv's Emission Score measures a company's commitment and effectiveness towards reducing environmental emissions in the production and operational processes. Values range from 0 to 100, with a higher score indicative of better emission performance.

[9] LSEG Refinitiv's Environmental Pillar Score measures a company's impact on living and non-living natural systems, including the air, land, and water, as well as complete ecosystems. Values range from 0 to 100, with a higher score indicative of better emission performance.

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Appendix A

Variable Definitions

Variables	Symbol	Measurement
Carbon emission intensity	ΔCEI	Carbon emission intensity is calculated as the sum of total direct (Scope 1) and indirect (Scope 2) carbon emissions scaled by total revenue in thousands of GBP. Change in carbon emission intensity (ΔCEI) is the difference between the previous and current year emission intensity of firm *i* in year *t*
Climate contracting	CLI_CON	A dummy variable that equals 1 if the firm's remuneration arrangements for its CEO or other members of the executive committee incorporate specific carbon emission reduction metrics in compensation contracts, and 0 otherwise.
Climate governance		Climate governance is measured in two ways. First, a dummy variable (CLI_GOV) that equals 1 if the firm reports the presence of either (i) a designated board-level committee or (ii) a named board-level position with oversight responsibility for climate change, and 0 otherwise. Second, a predicted variable (CLI_GOV_{INDEX}) based on a factor analyses of (i) the presence of a designated board-level committee or a named board-level position with oversight responsibility for climate change, (ii) the integration of climate-related risks into corporate strategic planning and (iii) the independent verification of emissions data.
Firm size	SIZE	The natural log of total assets
ROA	ROA	Return on assets is measured as earnings before interest and tax divided by total assets.
Capital expenditure	CAPEX	Capital expenditure divided by total revenue
Capital intensity	CAP.INT	Property, plant and equipment divided by total assets
Slack	SLACK	Cash and cash equivalents divided by total assets
Board size	B.SIZE	The natural log of the number of board members
Board gender diversity	BGD	Percentage of female directors on the board
Board independence	B.IND	Percentage of independent directors on the board
Board sustainability committee	B.SCOM	An indicator variable of 1 if a sustainability committee is present, and 0 otherwise
Number of board meetings	NMB	Natural logarithm of the number of board meetings each year
Emission rating	E_RATING	A measure of a company's commitment and effectiveness towards reducing environmental emissions in the production and operational processes (LSEG emission score)
CEO gender	CEO_GEN	A dummy variable that equals 1 for female CEOs, and 0 for otherwise
CEO age	CEO AGE	CEO age each year, mean-centered. A dummy variable that equals 1 for CEOs above the mean age, and 0 for otherwise
Executive compensation	EC	The natural log of total fixed and variable compensation paid to all senior executives (in GBP) as is disclosed by the firm