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Private Governance in Climate Mitigation: A Global Comparison of Corporate Participation in Voluntary Carbon Markets

MENGYING XIE, & LING CHEN
School of Public Policy and Management, Tsinghua University, Beijing, Tsinghua, China

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ABSTRACT *Why do some firms participate in voluntary carbon markets (VCMs), whereas others do not? This research proposes a multilevel theoretical framework to explain corporate engagement in VCMs. The comparative cross-national empirical analysis of over 1,200 large-scale firms demonstrates that corporate sustainability governance structures, institutional complementarities between voluntary and compliance carbon markets, and transnational non-governmental organizations' climate shaming significantly drive corporate participation in VCMs. The causal mediation analysis further reveals how these multilevel factors interactively influence corporate engagement. These findings contribute to understanding the regime complex for global climate governance and highlight the interplay of multilevel factors in shaping voluntary climate responsibility.*

Keywords: global climate governance; voluntary carbon markets; private governance; corporate responsibility; comparative analysis

Introduction

Nonstate actors appear to be "global governors" in the global policy arena (Sending and Neumann 2006; Andonova et al. 2009; Avant et al. 2010; Abbott 2012; Bulkeley et al. 2014; Abbott et al. 2016; Hale 2020; Hale et al. 2021). As one of the key nonstate forces, firms increasingly establish net-zero targets and actively participate in voluntary carbon markets (VCMs) to reduce carbon emissions. In essence, VCMs are a form of voluntary regulation that encourages participants to go beyond existing legal requirements (Prakash and Potoski 2012). As a critical market-based policy tool to control greenhouse gas (GHG) emissions, VCMs enable nonstate entities, such as firms or individuals, based on

Mengying Xie is a PhD candidate in the School of Public Policy and Management at Tsinghua University, Beijing, China. Her research focuses on climate politics, private regulation, transnational governance, and the sustainability of China's overseas investments.
Ling Chen is Professor in the School of Public Policy and Management at Tsinghua University, and the Director of the Center for Industrial Development and Environmental Governance (CIDEG) of Tsinghua University, Beijing, China. Her research focuses on industrial development, industrial innovation policies, science and technology policies, and policy process studies.
Correspondence Address: Ling Chen, School of Public Policy and Management, Tsinghua University, Beijing 100084, China. Email: chenling@tsinghua.edu.cn

voluntary purposes to purchase carbon credits produced elsewhere to offset residual emissions that cannot be further reduced. Article 6 of the Paris Agreement further expands the potential for VCMs to assist countries in achieving nationally determined contributions and other voluntary climate commitments.

While firms are among the most predominant participants in VCMs, their engagement in VCMs varies significantly across regions and countries, with firms in the European Union and North America being the most active (Donofrio et al. 2021a). How do we explain the variations in corporate engagement in VCMs? Why do firms in some countries choose to participate in VCMs, whereas others do not? Existing research suggests that firms' determination to fulfill net-zero targets directly drives their participation in VCMs (Donofrio et al. 2021b). However, the decision to participate in VCMs is contingent upon a firm's assessment of potential costs and benefits (Prakash and Potoski 2012). Both macrolevel factors, such as the broader political and economic environment, and microlevel factors within individual firms can motivate firms to engage in VCMs.

To unify these factors, we propose a multilevel analytical framework to investigate corporate participation in VCMs, which integrates explanations at the firm, country, and transnational levels. We then employ multilevel mixed-effects logistic models to empirically examine these factors and find that firm-level environmental, social, and governance (ESG) structures, country-level carbon market complementarities, and transnational-level climate shaming by international non-governmental organizations (INGOs) drive corporate participation in VCMs. Additionally, we leverage a causal mediation analysis to show that INGOs' climate shaming can drive firms toward adopting more pro-climate behaviors by incentivizing governments to strengthen climate regulations. Furthermore, the impact of institutional complementarities between voluntary and compliance carbon markets on firms' engagement in VCMs operates through firm-level emissions reduction policies. Similarly, the effect of ESG structures on corporate participation in VCM is facilitated through firms' commitments to the United Nations Sustainable Development Goals (SDGs).

Our findings demonstrate three significant aspects of VCMs as an ideal case for observing the dynamics of voluntary programs. First, VCMs target reducing GHG emissions and allow participants to quantify their climate and environmental impacts. Unlike other vague voluntary commitments, VCMs offer clear and actionable solutions with strong operability, making them highly scalable and practical for broader implementation. Second, as a market-driven and voluntary scheme, VCMs attract participants motivated by internal drivers rather than externally mandated regulation. Studying VCMs can provide insights into developing incentive-compatible policy tools that align with participants' motivations and encourage greater engagement in tackling climate change. Third, VCMs exhibit institutional complementarities with compliance carbon markets (CCMs) in terms of participant demographics, market boundaries, and operational regulations (Chen and Xie 2023). Examining corporate participation motivations from a comparative perspective can help us better understand corporate climate mitigation behavior, thereby improving regulation and governance across both carbon markets.

This paper contributes to the existing studies in the following ways. Theoretically, we employ a multilevel analytical framework to advance the understanding of the multifaceted reasons behind corporate pro-climate voluntary behavior. Although the "regime complex" theory emphasizes the role of non-hierarchical institutions in managing

specific issues, it largely neglects the importance of nonstate actors in global politics (Keck and Sikkink 1998; Raustiala and Victor 2004). This article provides a new perspective to observe the dynamics of the regime complex for global climate governance and better understand how the complex interplay of cross-level factors can motivate corporate participation in VCMs. We provide insights into mechanisms by which factors at various levels affect corporate engagement in VCMs, thereby broadening the theoretical landscape of Hsueh (2019a) and offering a more nuanced perspective on the drivers of corporate participation in VCMs.

Methodologically, this article leverages a causal mediation analysis to elucidate the underlying mechanisms through which multilevel factors influence corporate participation in VCMs. Such analysis allows for a more detailed dissection of the causal pathways, contributing to a deeper understanding of VCM participation dynamics. We also conduct a cross-national analysis of corporate engagement in VCMs and employ quantitative analysis of over 1,200 firms worldwide. To mitigate the risk of potential selection bias, we use a newly developed panel matching method for causal inference (Imai et al. 2023).

Literature Review

Existing research on carbon markets has largely focused on CCMs, with limited attention to VCMs. Despite the growing importance of VCMs as a form of voluntary regulation, few studies have systematically examined why firms participate. Voluntary regulation complements traditional "command and control" approaches (Peters and Pierre 1998) by encouraging firms to exceed legal requirements and generate positive environmental externalities (Prakash 2000). However, participation often depends on a cost–benefit calculation, as engaging in VCMs can involve additional costs, such as third-party audits (Prakash and Potoski 2012). Therefore, additional incentives are needed to motivate firms to join VCMs (Gillenwater et al. 2007).

Compared with non-participants, firms that go beyond compliance receive rewards from the government and market, often termed "club goods" (Buchanan 1965; Potoski and Prakash 2004, 2005, 2009; Prakash and Potoski 2012; Roger and Dauvergne 2016). These benefits, both intangible (such as enhanced reputation and goodwill) and tangible (such as access to technical knowledge and financial capital), provide valuable incentives (Coglianese and Nash 2006; Hsueh and Prakash 2012). Take certification schemes as an example. They help firms achieve effective self-management and signal their environmental efforts to consumers, which raises participants' reputation and gains wide market support. Such certification can reduce information asymmetry and provide external audiences, including consumers, shareholders, and environmental groups, with information about corporate overall environmental governance performance (Potoski and Prakash 2009), which allows for better product differentiation (Potoski and Prakash 2005; Green 2013).

Meanwhile, the domestic political and economic environment can provide incentives for participation in voluntary initiatives. Institutions can shape incentives and affect individual decision-making and collective outcomes (North 1990; Ostrom 1990). The development of voluntary regulation relies on institutional interactions with public regulators (Hall and Biersteker 2002; Héritier and Eckert 2008). For instance, Kollman and Prakash (2001) show that regulatory styles influence firms' voluntary adoption of environmental management systems based on how governments view these voluntary

programs. Potoski and Prakash (2004) also highlight how regulatory and economic contexts, including adversarialism, stringency, and flexibility, impact ISO 14001 adoption across 59 countries. Moreover, in anticipation of future regulatory pressure, some firms join voluntary programs to preempt stricter public regulations (Hsueh 2019b), aiming to shape future regulations. This argument has been further advocated by Malhotra et al. (2019), who quantify the causal effects of firm-level self-regulation on support for new government regulations.

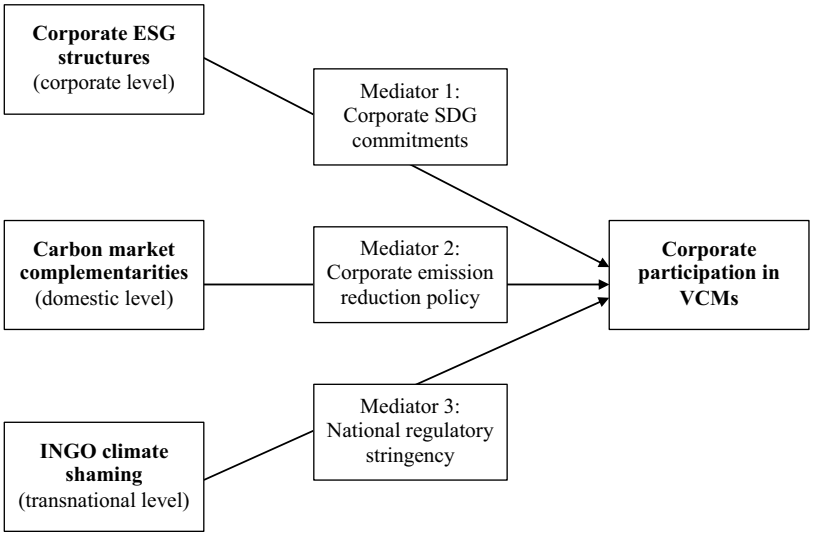
As the rise of voluntary regulation closely connects to globalization, the incentives from the international arena also account for the widespread adoption of voluntary environmental programs. Several studies emphasize the role of global economic ties. International trade and foreign direct investment (FDI) motivate countries to adopt environmental standards like ISO 14001, especially when trading with or receiving FDI from nations with high adoption rates (Prakash and Potoski 2006, 2007). Multinational corporations (MNCs) also spread voluntary regulation through their subsidiaries and global supply chains, using harmonized standards to address inconsistencies in legal systems across jurisdictions (Guler et al. 2002). Moreover, globalization accelerates the spread of norms (Kollman and Prakash 2001), with civil society pressuring firms to operate toward sustainability through international environmental movements (Newell 2008). Under public pressure, firms address climate change and respond to stakeholders' environmental concerns by participating in voluntary programs.

Overall, existing studies have investigated the determinants of voluntary program adoption (Guler et al. 2002; Prakash and Potoski 2006, 2007). However, with a few exceptions (Berliner and Prakash 2014; Hsueh 2019b), the majority still focus on countries rather than firm-level responses to voluntary environmental programs. Qualitative analyses of firms within specific national or sectoral contexts are susceptible to selection bias due to small sample sizes, thereby potentially compromising the validity of the findings. Meanwhile, only a few studies explored how interactions between macro- and microlevel factors affect firms' participation in VCMs (Hsueh 2019a). We address these gaps from two aspects. First, we leverage a panel dataset of over 1,200 large-scale firms across 48 countries from 2002 to 2022 to provide a more robust basis for comparative analysis. Second, we take one step further from Hsueh (2019a) by conducting a causal mediation analysis to unpack the mechanisms through which multilevel factors influence corporate participation in VCMs, highlighting more nuanced interactions among the mechanisms.

A Multilevel Analytical Framework for Corporate Participation in VCMs

We propose a multilevel theoretical framework to explain corporate participation in VCMs. Firms engage in VCMs because of complex factors at the firm, country, and transnational levels. In this light, we use the lens of *the level of analysis* to explore the determinants of corporate participation in VCMs. Specifically, we focus on the corporate ESG structures, domestic institutional complementarities of carbon markets, and transnational INGOs' climate shaming as three main driving forces (see Figure 1). This multilevel theoretical framework also allows for examining the interactions among these across-level factors.

Figure 1. The multilevel theoretical framework



Source: created by the authors.

This multilevel approach highlights the multidimensional pressures on firms and captures the complexity of a firm's decision-making in VCM participation. By examining both internal drivers and external pressures, this framework further offers a new lens for identifying the mechanisms through which firms decide to engage in VCMs.

Firm Level: The Impacts of Corporate ESG Structures

Existing studies have indicated that corporate governance structures closely connect with firms' environmental performance (Walls et al. 2012; Hsueh 2017). Establishing ESG structures can lead to business mode adjustments and motivate firms to pursue a sustainable development route voluntarily.

As the research on "policy supporters" demonstrates (for example, Prakash 2001; Strand 2013), executives and the board of directors within firms are critical to allocating resources and guiding firms to participate in voluntary environmental programs. Hsueh (2017, 2019a) highlights that internal management factors and leadership commitment to ESG principles drive Global 500 firms' participation in voluntary carbon disclosure initiatives. If the mindset of leaders and members of the organization does not integrate sustainable development, corporate sustainability efforts face higher risks of failure (Baumgartner 2009). Some scholars further indicate that firms are more likely to adopt pro-climate behaviors when they share board members with other firms that have already implemented similar actions (Lerner and Osgood 2023), which highlights the role of corporate boards in shaping firm-level ESG actions and policies.

Advancing sustainable business requires setting incentives within firms, including monetary or non-monetary rewards. In particular, firm-level sustainability compensation incentives play a pivotal role by rewarding executives who effectively integrate the

SDGs into business strategies. As reshaping business structures toward sustainable development may incur considerable organizational costs, the support from senior managers endowed with decision-making power is significant in enabling sustainable corporate transformation. Therefore, given the alignment between individuals and broader corporate long-term sustainable development goals, corporate ESG structures reflected in sustainability compensation incentives can drive firms to participate in VCMs to transform toward sustainable business modes. In light of this, we focus on the role of business leaders and argue that the provision of incentives to business executives may promote corporate participation in VCMs. We thus propose the following hypothesis:

H1: Firms with designed sustainability compensation incentives for executives are more likely to participate in VCMs.

Country Level: The Impacts of Domestic Institutional Complementarities of Carbon Markets

Firms may be driven to participate in voluntary environmental programs due to economic incentives, particularly when compliance costs are low. VCMs and CCMs are not entirely independent, and regime interactions exist between these two types of carbon markets (Chen and Xie 2023), which implies the interactions between public and private governance. Government-initiated carbon markets can interact with those governed by nonstate actors, blurring the lines between "public" and "private" (Green 2017). This intersection increases flexibility for firms to engage in both markets, potentially lowering compliance costs.

Specifically, the existing research suggests four distinct modalities of regime interactions between VCMs and CCMs, namely cognitive, rule, behavioral, and functional (Chen and Xie 2023). Cognitive interactions entail the flow of knowledge and information across different carbon market types, potentially reshaping the perspectives of decision-makers. Rule-based interactions involve the diffusion of regulatory experiences, where practices from one carbon market may be adopted and learned by another. For instance, VCMs can act as a testing ground for the government to establish CCMs in terms of procedures, methodology, and technologies (Kollmuss et al. 2008). For behavioral interaction, some countries and regions are beginning to accept carbon credits from VCMs certified by private standards for domestic mandatory or voluntary carbon neutrality programs. As illustrated by the case of the Climate Action Reserve (CAR) – a voluntary carbon offset program – part of the agreements of the CAR have been recognized by the state of California, which provides eligible carbon credits to California's Cap-and-Trade Program. Lastly, functional interactions refer to shifts in governance objectives within one carbon market influenced by another, reflecting an interplay in governance targets.

The interactions between VCMs and CCMs display diverse forms, with different levels of intensity. Whether the interactions can happen is contingent upon conditions such as the integrity of VCMs. However, once the connections have been established, more participants may be included and they face lower compliance costs. Therefore, we argue that the economic incentives provided by carbon market complementarities can facilitate corporate participation in VCMs. Our second hypothesis is as follows:

H2: Firms headquartered in countries with institutional complementarities between compliance and voluntary carbon markets are more likely to participate in VCMs.

Transnational Level: The Impacts of Climate Shaming by INGOs

Civil society has emerged as a powerful bottom-up force in global governance (Avant et al. 2010), and NGOs are actively shaping global and domestic environmental politics. They can influence international climate negotiations while also changing the behavior of countries (Betsill and Corell 2001; Gulbrandsen and Andresen 2004; Allan and Hadden 2017; Koliev et al. 2023). For issue areas such as climate change, INGOs are more capable of tackling these wicked and transnational challenges. Due to the wide geographic scope, the global presence of INGOs can enable access to substantial resources, bring together diverse stakeholders, and embody a high level of expertise in their work. As Lall (2025) suggests, INGOs can not only better identify performance problems by bringing them under the public spotlight but also mobilize resources and form coalitions to pressure countries to make policy reforms.

Although INGOs adopt various instruments to enhance their influence, such as using the framing power or transmitting information to negotiators, naming and shaming is a popular strategy to exercise their monitoring and enforcing power (Keck and Sikkink 1998; Hafner-Burton 2008; Murdie and Davis 2012; Koliev et al. 2023). In essence, climate shaming is information disclosure on environmental performance. The external audience can recognize entities that perform well and shame those that perform poorly through the information disseminated by INGOs (Kelley and Simmons 2015). Due to the substantial reputational costs incurred through the INGO's negative publicity, targeted actors may change their behaviors accordingly (Keck and Sikkink 1998).

We thus posit that INGO's climate shaming of countries can affect the behavior of firms headquartered in the corresponding countries. INGO's climate shaming of countries leads to changes in domestic regulatory stringency, prompting governments to enact stronger climate laws (Koliev et al. 2023). When a country creates pro-environmental advocacy, the firms headquartered in such a context may face substantial societal monitoring, thereby taking more voluntary eco-friendly measures through self-discipline as a preemptive response to anticipated regulatory changes. Purchasing carbon credits from VCMs can be feasible for firms to respond to regulatory and reputational pressures raised by INGOs.

Nonetheless, the governance of VCMs is highly fragmented, and the lack of market integrity may pose risks such as "greenwashing" and "carbon leakage" (Gillenwater et al. 2007). Participating in VCMs may be perceived as a lack of commitment to decarbonization, potentially drawing more criticism from civil society. In this sense, exposure to INGO scrutiny may also make firms more reluctant to participate in VCMs. Therefore, the above discussions yield the following hypotheses:

H3a: Firms headquartered in countries facing climate shaming from INGOs are more likely to participate in VCMs.

H3b: Firms headquartered in countries facing climate shaming from INGOs are less likely to participate in VCMs.

Research Design

The Data

To test our hypotheses, we use firm-level data from the Sustainable Leadership Monitor of the London Stock Exchange Group (hereinafter referred to as LSEG),[1] which was created in partnership with the World Economic Forum. The LSEG is a leading database delivering comprehensive ESG data. It includes more than 630 ESG metrics and covers over 15,500 publicly listed and private firms from 76 countries, representing 90 per cent of the global market cap (London Stock Exchange Group 2023). The data is collected based on available public sources, including company websites, annual reports, NGO websites, news sources, and Corporate Social Responsibility (CSR) reports (London Stock Exchange Group 2023). The values of common ESG criteria are also standardized to conduct comparative analysis across all firms. To ensure data validity and transparency, ESG specialists audit the data collection process, and each data point is linked back to the original sources. For the sector category, we follow the two-digit hierarchical ID (identification) of The Refinitiv Business Classification (TRBC), which comprises ten main economic sectors: energy, basic materials, industrials, consumer cyclicals, consumer non-cyclicals, financials, healthcare, technology, utilities, and real estate.

Specifically, we collected an original panel dataset from 2002 to 2022, covering 1,265 large-scale firms in ten economic sectors from 48 countries. As the list of large-scale firms is updated annually based on the changes in firms' market values, we select all firms that are classified as "large" in the Sustainable Leadership Monitor as of the fiscal year 2023. These firms have a market capitalization of $10 billion or more. As shown in Figure A1 in the Online Appendix, the selected large-scale firms significantly contributed to global CO_2 emissions, accounting for 15 per cent in 2017 and peaking at nearly 18 per cent in 2021. Figures A2–A6 in the Online Appendix further illustrate the geographic distribution and sectoral coverage of the selected firms.

We focus on large-scale firms primarily for three reasons. First, firms with greater financial strength can better bear the fixed costs of voluntary programs, including seeking third-party certifications and providing environmental training for their employees. Second, large-scale firms may face tremendous external monitoring pressure from regulators, competitors, and the public. This may motivate them to take voluntary actions to maintain a good public reputation. Third, large-scale firms, particularly MNCs, are more likely to resort to harmonized voluntary regulation to enhance common expectations among different actors and better coordinate regulations across borders (Andonova et al. 2017).

Dependent Variable

Our dependent variable, "firm's participation in VCMs", is a binary indicator coded as 1 if a firm participated in VCMs in a given fiscal year, by purchasing and/or originating carbon credits, and 0 otherwise. Data on the dependent variable are mainly extracted

from the LSEG. Although the LSEG provides information on corporate engagement in carbon offset markets, whether firms voluntarily do so remains less studied. For instance, some cap-and-trade emissions trading initiatives allow regulated entities to purchase a certain proportion of carbon credits to balance the extra emissions if they exceed the limit. In this sense, to better differentiate whether firms participate in VCMs voluntarily, we complement the data from the LSEG by manually collecting the firm-level information from the Carbon Disclosure Project (CDP) Climate Change Questionnaires. As a prominent INGO, CDP provides the largest dataset on corporate and city reporting regarding the impact of climate and environmental change. In the CDP survey, firms self-report the details of their project-based carbon credits canceled in the reporting year and indicate whether it is voluntary or compliance offsetting, which helps to measure our dependent variable more precisely.

Specifically, we follow four principles when using these two databases. First, we keep the firms that only engage in carbon offset markets without participating in any emissions trading initiative (cap and trade) during the same fiscal year. In this way, we can ensure that firms do not purchase and/or produce carbon credits for compliance purposes. Second, for the firms participating in carbon offset markets and emissions trading initiatives in the same fiscal year, we use the data from the CDP to conduct further distinctions. If the CDP survey discloses that the corporate activity about carbon offsetting is voluntary, we code it as 1; otherwise, 0. Third, for a given firm, if there is no information about carbon offsetting from the LSEG, we use the available data from the CDP. If CDP data is reported for a voluntary purpose, we code it as 1; otherwise, 0. Fourth, if there is any inconsistency between the data from the LESG and CDP, we mainly rely on the information from the former. We believe employing these two databases can obtain a fine-grained measurement of our key dependent variable.

Independent and Control Variables

We include three key independent variables in this study. Specifically, our country- and transnational-level independent variables are based on the country where a firm is headquartered rather than the country of its operation. While large-scale firms often operate across multiple jurisdictions, their headquarters serve as the central node for decision-making and policy compliance. Therefore, the location of a firm's headquarters acts as a proxy for its primary regulatory and institutional environment.

At the firm level, we employ the variable "sustainability compensation incentives" to measure corporate ESG governance structures. This binary indicator is coded as 1 when the compensation of executive directors or senior executive officers is tied to firms' short-term or long-term sustainability targets, regardless of the market cap of firms; otherwise 0. The data is from the LSEG, which draws from firms' public filings, including annual and remuneration reports. However, due to data limitations, it is not feasible to incorporate the actual monetary value or the proportion of compensation tied to sustainability performance.

At the country level, we further discuss whether interactions exist between VCMs and CCMs and create a binary variable "carbon market complementarities". Specifically, we code it as 1 if the carbon credits issued by a given voluntary offset program are accepted for compliance by an emissions trading system and/or a carbon tax; otherwise 0. While

the interactions between VCMs and CCMs can be bidirectional, the dominant direction is from VCMs to CCMs rather than the reverse (Chen and Xie 2023). Meanwhile, the intensity of these interactions varies. The acceptance of one market's tradable asset by another represents the strongest form of linkage (Green 2017), but this occurs exclusively in the direction of VCMs to CCMs. If we find no evidence of the impact of carbon credit acceptance for compliance on corporate participation in VCMs, the second hypothesis will not apply to weaker institutional interactions. The data is collected from the World Bank's Carbon Pricing Dashboard (World Bank 2023), and either the voluntary or compliance carbon initiatives may come from a country or subnational level.

At the transnational level, our independent variable is "INGO climate shaming", which records the total number of shaming events by INGOs for a targeted country each year. We follow a newly published dataset on INGO's climate shaming (Koliev et al. 2023) based on the natural language processing method to extract shaming events from multiple media sources.

We control for a set of variables that potentially affect corporate participation in VCMs and the independent variables. First, we include "GDP per capita" and "total population" of the country where a firm is headquartered, measured by the World Development Indicators (World Bank 2022). To avoid the skewness of the distribution, we use the natural log of GDP per capita and total population. Second, we control for "regime type" using the electoral democracy index (*v2x_polyarchy*) from the Varieties of Democracy Project (Sundström et al. 2017) and "federalism" of a given country based on data from the Forum of Federations to account for variations in political and regulatory environments. Third, we control for two dummy variables, "ISO 14000 certification" and "UNGC membership" from the LSEG, coding each as 1 if applicable; otherwise 0. Lastly, we control for firm size variations by including the natural log of the "firm's revenue (log)" and "firm's CO_2 emissions (log)", both sourced from the LSEG. Table A1 in the Online Appendix shows descriptive statistics for all variables used in the analysis.

Modeling Strategies

Given that our dependent variable is binary, we employ multilevel mixed-effects logistic models to test our hypotheses. Such models consider the nested structures of the data. In this research, as firm-level variables are nested at the sector level, individual firms form the first level, whereas the sector to which the firm belongs forms the second level. Consequently, firm-level observations within sectors are correlated. The nested structure can result in inter-group differences between the higher-level data. The standard error of regression coefficients may be underestimated, leading to overestimated statistical significance.

Multilevel mixed-effects logistic models are used to estimate the effects among individual units and different sectors simultaneously. Furthermore, such models allow for incorporating both fixed and random effects. Fixed effects capture the overarching influences consistent across all units of analysis, while random effects account for the idiosyncrasies of individual firms. To avoid simultaneity bias, all independent and control variables are lagged by one year, ensuring that explanatory factors precede the dependent variable in the analysis.

As robustness checks, we employ alternative modeling strategies (Tables C1–C2 in the Online Appendix) and include additional control variables (Tables C3–C7 in the Online Appendix). Additionally, we employ a newly developed panel matching method for causal inference (Imai et al. 2023) to mitigate the potential endogeneity issue (Figures C1–C4 in the Online Appendix). Given space constraints, we present all the regression tables for the robustness checks in the Online Appendix.

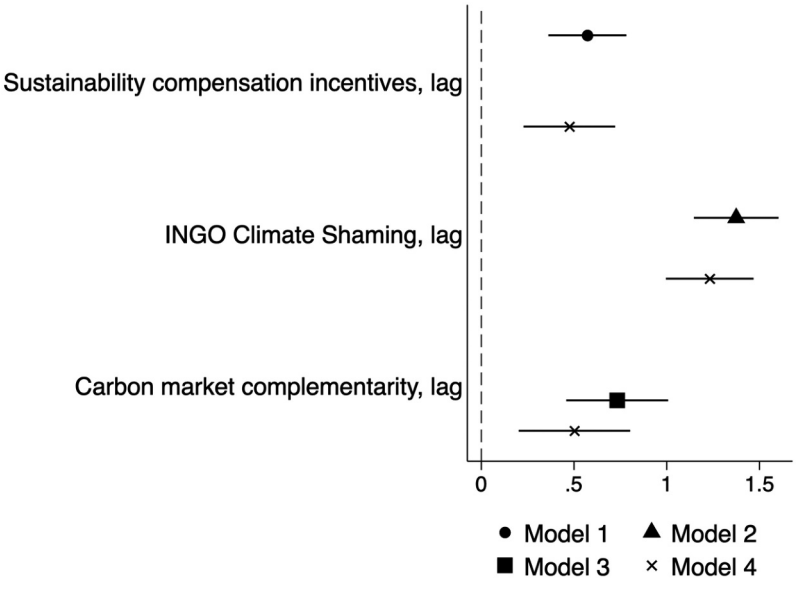
Empirical Results

Main Results

We present our findings using coefficient visualizations, while the results for full regression tables and the unconditional model are summarized in Tables B1 and B2 in the Online Appendix. Figure 2 displays the main regression findings from multilevel mixed-effects logistic models, with mixed effects included at the sector and firm levels. Models 1–3 contain independent variables at the firm, transnational, and country levels, respectively. As expected, the coefficients of sustainability compensation incentives, INGO climate shaming, and carbon market complementarities are all positive and statistically significant at the 99 per cent confidence interval.

Model 4 is a full model involving all independent variables. The results show that sustainability compensation incentives, INGO climate shaming, and carbon market complementarities variables are all positive and significant, providing supportive evidence for Hypotheses 1–3. In other words, the corporate ESG structures, the

Figure 2. Results of multilevel mixed-effects logistic models with 95 per cent confidence intervals



Note: Full results are shown in Table B1 in the Online Appendix.

complementarities between compliance and voluntary carbon markets, and the transnational pressure from INGOs are strongly associated with corporate involvement in VCMs.

Causal Mediation Analysis

One potential concern is that cross-level interactions may exist, but we do not know the mechanisms through which factors at different levels may affect corporate participation in VCMs. Therefore, we conduct a causal mediation analysis to investigate whether the effects of independent variables are mediated (Imai et al. 2011; Tingley et al. 2014). Specifically, causal mediation analysis is based on two statistical models, that is, the mediator model and the outcome model. We calculate the average causal mediation effects (ACME) and the average direct effects (ADE). ACME refers to how that total effect can be attributed to the mediator, whereas ADE measures the remaining total effect after excluding the mediation effect.

Compared with independent variables, mediators are supposed to be at the same or an even lower level. Following this principle, we propose three specific mechanisms and examine how influences at the transnational, country, and firm levels might impact corporate engagement in VCMs.

First, we suggest that corporate sustainability compensation incentives affect firms' participation in VCMs through the pathway of corporate commitments to SDGs. The design of sustainable compensation incentives may directly motivate executives to focus more on corporate long-term performance and invest in sustainability business. In this light, the alignment of personal and corporate goals makes firms more committed to achieving SDGs. Firms that integrate the SDGs into their business may value participating in VCMs as a way to achieve their SDG commitments. This is because purchasing carbon offsets can help offset firm-level carbon emissions, demonstrating their effort in addressing global climate change. Meanwhile, VCMs have a dual nature, encompassing both market and non-market elements. Carbon credits are tradable among different entities while the projects developed in VCMs can produce broad socio-economic co-benefits for local communities (Lovell 2010). To quantify this mechanism, we create a dummy variable "SDG commitments" using data from the LSEG and code it as 1 if a firm has made at least one SDG commitment out of 17 goals; otherwise 0.

Second, we argue that firm-level emissions reduction policies can serve as a pathway through which carbon market complementarities affect corporate involvement in VCMs. Establishing the institutional complementarities between compliance and voluntary carbon markets helps to reduce firms' compliance costs. In this sense, lower compliance costs may free up more financial resources and enable firms to set more ambitious emissions targets. As participating in VCMs will be cost-effective in complying with ambitious emissions targets, firms may become more active in VCMs. We therefore rely on data from the LSEG and code "firm-level emissions reduction policy" as 1 if a firm has a policy to improve emissions reduction; otherwise 0.

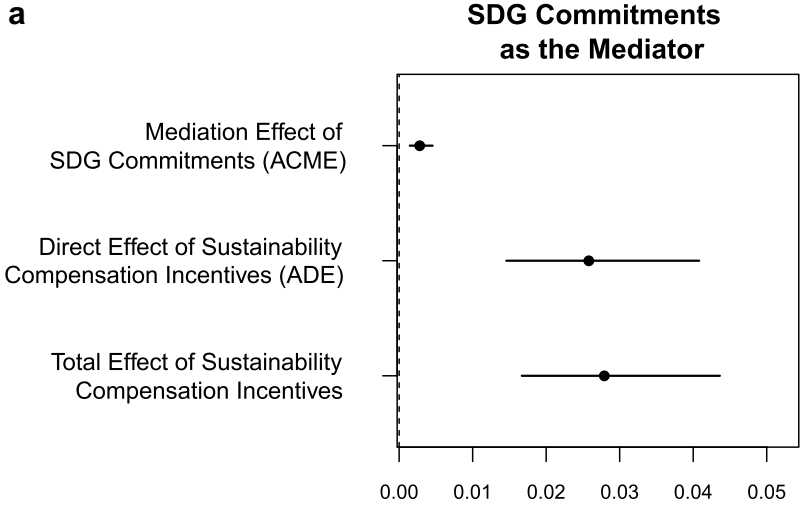
Third, we posit that country-level climate laws can serve as the pathway by which transnational climate shaming by INGOs affects corporate participation in VCMs. Existing studies indicate that INGO's climate shaming can pressure

governments to issue climate laws (Koliev et al. 2023). We argue that the improved domestic stringency in climate regulation may generate corporate transformation toward becoming more pro-climate, thereby affecting their behavior in VCMs. Following Koliev's studies (Koliev et al. 2023), we use a dummy variable "climate laws" to measure the domestic stringency on climate regulation based on the Climate Change Laws of the World database. We code "climate laws" as 1 if governments implement climate laws in a given year; otherwise 0.

In Figure 3(a), the dependent variable in the mediator model is the firm's SDG commitments. In the outcome model, we use multilevel mixed-effects logistic models with sector mixed-effects to obtain the ACME of the firm's SDG commitments. Figure 3(a) demonstrates that the positive coefficient for the firm's SDG commitments is statistically significant. It suggests that the design of corporate sustainability compensation incentives can encourage firms to commit more to SDGs, thereby increasing their VCM participation.

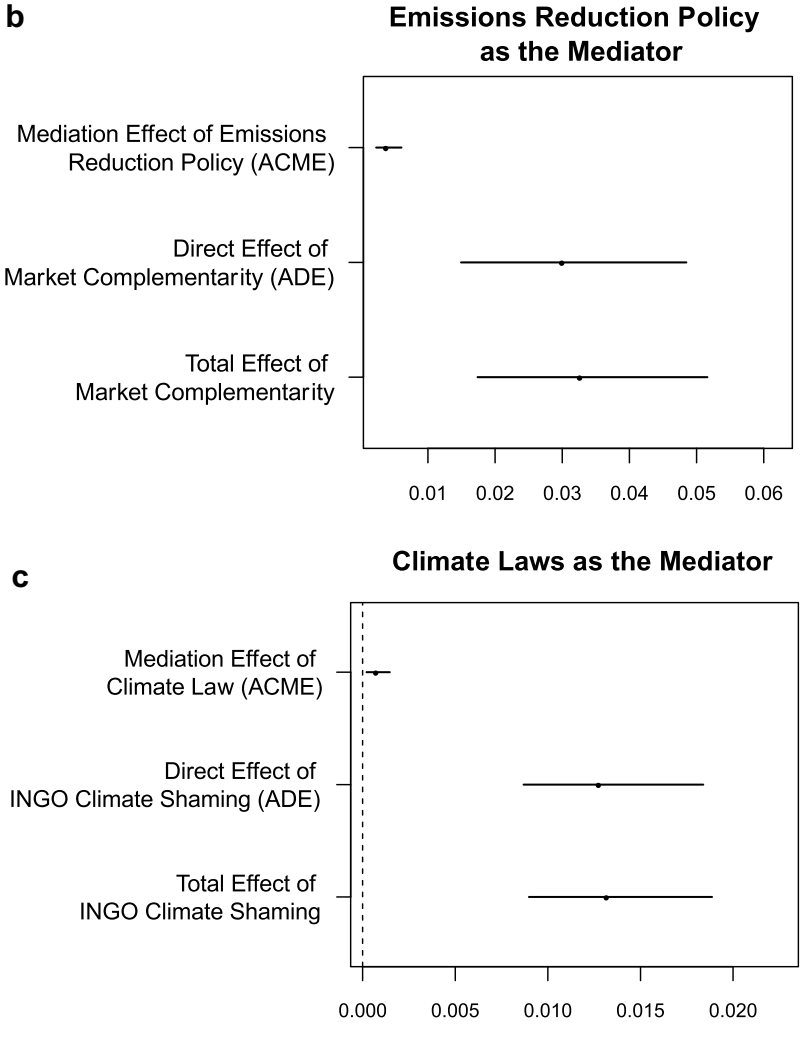
Likewise, Figure 3(b,c) show that the coefficients for firm-level emissions reduction policy and country-level climate laws are positive and statistically significant. The results demonstrate that carbon market complementarities affect firms' participation in VCMs through a firm-level emissions reduction policy. Meanwhile, INGOs employing climate shaming tactics can promote more pro-climate corporate behavior by prompting governments to enhance climate regulation stringency. Therefore, the above findings provide evidence of how these multilevel factors interactively influence corporate engagement in VCMs.

Figure 3. (a) Results for causal mediation analysis (SDG commitments as the mediator). (b) Results for causal mediation analysis (emissions reduction policy as the mediator). (c) Results for causal mediation analysis (climate laws as the mediator).



Note: Confidence intervals of Figures 3a–3c are estimated via 1,000 bootstrapping.

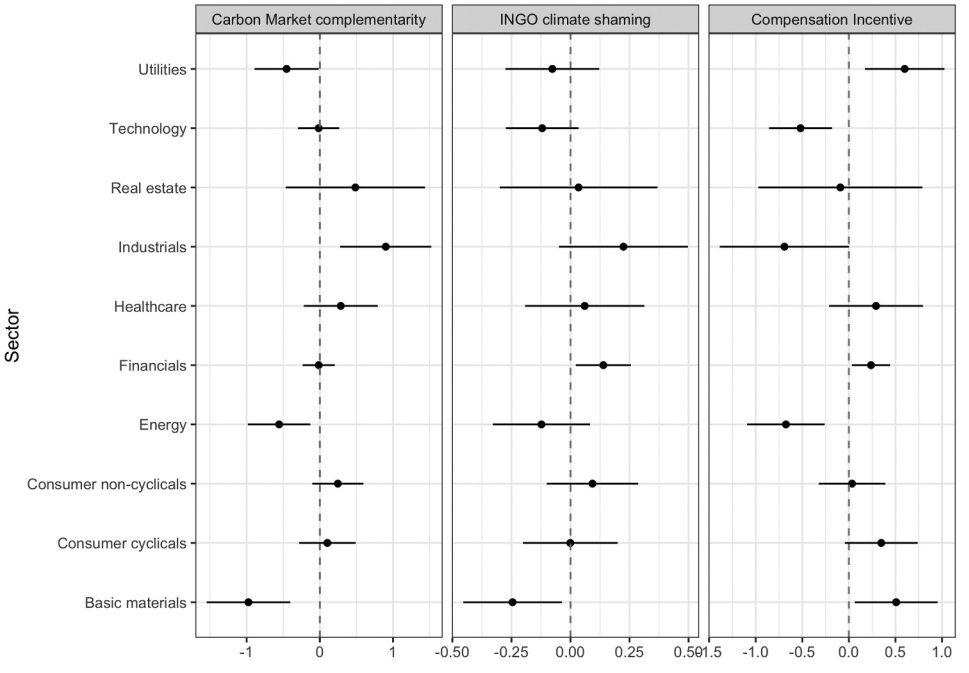
Figure 3. (Continued).



Sector Heterogeneity Analysis

We further assess whether the sector to which the firm belongs can lead to various reactions toward VCMs. Whether in the consumer-facing or carbon-intensive sectors, firms may face different pressures to transform toward pro-climate practices (Hsueh 2019a). As shown in Figures A5 and A6 in the Online Appendix, considerable variations exist for the firms affiliated with diverse sectors to be involved in VCMs. In this sense, we adopt multilevel linear models with varying slopes to analyze sector heterogeneity, allowing the relationship between the independent and dependent variables to vary across groups. Figure 4 is divided into three parts, with each representing our three key independent variables.

Figure 4. Estimated random effects by sector (varying slope models)



Note: The horizontal lines represent 95 per cent confidence intervals for these estimates.

Three main findings are worthy of highlighting. First, we find that consumer-facing sectors are not very active in participating in VCMs. This may be because firms do not disclose to consumers whether they have joined VCMs by labeling their products. Thus, compared to other eco-certification labels that appear on products, consumers may have little access to information about corporate participation in VCMs. Second, firms in the financial sector are more subject to the influence of compensation incentives and INGO's climate shaming. If firms in the financial sector have established sustainability compensation incentives and are headquartered in a country facing severe INGO's climate shaming, these firms are more likely to participate in VCMs. Third, the estimated random effects for both carbon market complementarities and compensation incentives in the energy sector are statistically significant and negative. Since the energy sector is carbon-intensive, firms may be more likely to be regulated by CCMs rather than VCMs, making participating in VCMs less beneficial. In addition, the negative effect of carbon market complementarities for the energy sector could be driven by variations in whether VCMs can be used for compliance or not, which has changed over time. Due to concerns about the integrity of VCMs, some CCMs are more cautious about establishing connections with VCMs and limit the use of voluntary carbon credits for compliance.

Conclusion

This article advances the understanding of complex corporate motivations for participating in VCMs. We argue that corporate ESG structures, carbon market complementarities, and transnational INGO's climate shaming are strongly associated with corporate engagement in VCMs. Our findings are robust across alternative modeling strategies and additional control variables. Moreover, findings from the sector heterogeneity analysis suggest that firms in different sectors react differently to VCMs. Financial sector firms are subject to the influence of compensation incentives and climate shaming by INGOs, while consumer-facing sectors are not very active in participating in VCMs. Meanwhile, in the energy sector, carbon market complementarities and compensation incentives are negatively associated with firms' participation in VCMs.

We further find that cross-level interactions mediate corporate participation in VCMs. Specifically, INGOs employing climate shaming tactics can promote more pro-climate corporate behavior by prompting governments to strengthen climate regulation. The effects of carbon market complementarities are mediated by firm-level emissions reduction policies, while corporate ESG structures affect firms' participation in VCMs through the pathway of corporate commitments to SDGs. Examining these causal mediation effects can better identify the causal mechanisms through which firms are motivated to participate in VCMs.

The role of nonstate actors in global climate governance demands further exploration (Andonova et al. 2009; Avant et al. 2010; Bulkeley et al. 2014; Green 2014; Abbott et al. 2016; Hale 2020). As the motivations behind firms' participation in VCMs are complex and influenced by multiple factors at different levels, economic incentives alone may be insufficient to drive corporate engagement. Consequently, it highlights the need for more incentive-compatible policy tools to encourage broader participation in climate action. For instance, as the institutional complementarities between VCMs and CCMs can shape corporate engagement in VCMs, policymakers should strengthen synergies between public and private governance by integrating greater compliance flexibility within mandatory regulatory frameworks, thereby better motivating firms to take voluntary action.

Our paper has several important implications for future studies. First, this study does not intend to provide comprehensive explanations for corporate engagement in VCMs, and alternative explanations at various levels may exist. For instance, the supply chain dynamics may drive corporate climate action (Cory et al. 2021). Firms that serve as suppliers to customers with ambitious climate goals may have stronger incentives to engage in voluntary carbon markets, as aligning with these expectations can bring financial benefits. Therefore, incorporating firm-level data on supply chains would enable a more fine-grained analysis of corporate participation in VCMs.

Second, the role of small and medium-sized enterprises (SMEs) in VCMs warrants more attention in future research. Our sample primarily focuses on large-scale firms due to the significant challenges associated with collecting ESG data on SMEs. While large firms are often the pioneers, this selection may limit the generalization of our findings. Given that SMEs constitute a considerable share of businesses and employment worldwide and an increasing number of SMEs commit to voluntary climate action, understanding their motivations and barriers to participation in VCMs may unlock new pathways for promoting climate action.

Third, future research can further explore alternative mechanisms influencing corporate engagement in VCMs. While we conduct causal mediation analysis to quantify the mechanisms through which factors at different levels may affect corporate participation in VCMs, qualitative analysis, such as in-depth case studies, could provide further insights into the potential pathways that are not captured in our study.

Lastly, there is still room for further refinement of the measurement of independent variables. Although this study focuses on firms' headquarters, large MNCs operate across multiple jurisdictions, making it essential to consider subnational or operational-level determinants. Since subsidiaries are often located in different regions with varying regulatory and institutional environments, future studies could capture such dynamics by examining how local contexts shape firm-level climate actions. Meanwhile, a more precise measurement of sustainability compensation incentives that incorporates the actual monetary value or the proportion of compensation tied to sustainability performance would provide deeper insights into the relationship between executive incentives and corporate climate commitments. Additionally, measuring carbon market complementarities has limitations. In countries without national carbon trading, we rely on subnational complementarities between CCMs and VCMs. When multiple subnational schemes exist, we use the earliest complementarity as the starting year. The lack of data on carbon crediting standards prevents identifying which firms purchase specific types of carbon credits from VCMs in a given year, which poses a risk of overestimating the effects of carbon market complementarities. Addressing these challenges in future research can shed light on a better understanding of corporate participation in VCMs.

Note

1. As Refinitiv's data and analytics services have been acquired by LSEG Data & Analytics, Refinitiv is rebranding as LSEG.

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Supplementary Material

Supplemental data for this article can be accessed online at https://doi.org/10.1080/13876988.2025.2510596.

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ORCID

Mengying Xie http://orcid.org/0009-0007-4724-4028
Ling Chen http://orcid.org/0000-0002-9929-3610

References

Abbott, K. W., 2012, The transnational regime complex for climate change. *Environment and Planning C: Government and Policy*, **30**(4), pp. 571–590. doi:10.1068/c11127

Abbott, K. W., Green, J. F., and Keohane, R. O., 2016, Organizational ecology and institutional change in global governance. *International Organization*, **70**(2), pp. 247–277. doi:10.1017/S0020818315000338

Allan, J. I. and Hadden, J., 2017, Exploring the framing power of NGOs in global climate politics. *Environmental Politics*, **26**(4), pp. 600–620. doi:10.1080/09644016.2017.1319017

Andonova, L. B., Betsill, M. M., and Bulkeley, H., 2009, Transnational climate governance. *Global Environmental Politics*, **9**(2), pp. 52–73. doi:10.1162/glep.2009.9.2.52

Andonova, L. B., Hale, T. N., and Roger, C. B., 2017, National policy and transnational governance of climate change: Substitutes or complements? *International Studies Quarterly*, **61**(2), pp. 253–268. doi:10.1093/isq/sqx014

Avant, D. D., Finnemore, M., and Sell, S. K., 2010, *Who Governs the Globe?* (New York: Cambridge University Press)

Baumgartner, R. J., 2009, Organizational culture and leadership: Preconditions for the development of a sustainable corporation. *Sustainable Development*, **17**(2), pp. 102–113. doi:10.1002/sd.405

Berliner, D. and Prakash, A., 2014, Public authority and private rules: How domestic regulatory institutions shape the adoption of global private regimes. *International Studies Quarterly*, **58**(4), pp. 793–803. doi:10.1111/isqu.12166

Betsill, M. M. and Corell, E., 2001, NGO Influence in international environmental negotiations: A framework for analysis. *Global Environmental Politics*, **1**(4), pp. 65–85. doi:10.1162/152638001317146372

Buchanan, J. M., 1965, An economic theory of clubs. *Economica*, **32**(125), 1. doi:10.2307/2552442

Bulkeley, H., Andonova, L., Betsill, M. M., Compagnon, D., Hale, T., Hoffmann, M. J., Newell, P., Paterson, M., Roger, C., and VanDeveer, S. D., 2014, *Transnational Climate Change Governance*, (Cambridge: Cambridge University Press)

Chen, L. and Xie, M., 2023, How do hard regimes absorb, overlap, and squeeze out soft regimes? Insights from global carbon markets. *Global Public Policy and Governance*, **3**(1), pp. 60–85. doi:10.1007/s43508-023-00064-3

Coglianese, C. and Nash, J., 2006, *Leveraging the Private Sector: Management-based Strategies for Improving Environmental Performance*, (New York: Routledge)

Cory, J., Lerner, M., and Osgood, I., 2021, Supply chain linkages and the extended carbon coalition. *American Journal of Political Science*, **65**(1), pp. 69–87. doi:10.1111/ajps.12525

Donofrio, S., Maguira, P., and Myers, M., 2021a, *Buyers of Voluntary Carbon Offsets, A Regional Analysis. Third Installment of the State of the Voluntary Carbon Markets 2020, Featuring European & North American Buyers Offsets Prices, Volumes, and Insights* (Washington, DC: Forest Trends' Ecosystem Marketplace).

Donofrio, S., Maguire, P., Myers, K., Daley, C., and Lin, K., 2021b, *State of the Voluntary Carbon Markets 2021, Installment 1: Markets in Motion*, (Washington, DC: Forest Trends' Ecosystem Marketplace).

Gillenwater, M., Broekhoff, D., Trexler, M., Hyman, J., and Fowler, R., 2007, Policing the voluntary carbon market. *Nature Climate Change*, **1**(711), pp. 85–87. doi:10.1038/climate.2007.58

Green, J. F., 2013, Order out of chaos: Public and private rules for managing carbon. *Global Environmental Politics*, **13**(2), pp. 1–25. doi:10.1162/GLEP_a_00164

Green, J. F., 2014, *Rethinking Private Authority: Agents and Entrepreneurs in Global Environmental Governance* (Princeton, NJ: Princeton University Press)

Green, J. F., 2017, Blurred lines: Public-Private interactions in carbon regulations. *International Interactions*, **43**(1), pp. 103–128. doi:10.1080/03050629.2016.1210943

Gulbrandsen, L. H. and Andresen, S., 2004, NGO influence in the implementation of the Kyoto Protocol: Compliance, flexibility mechanisms, and sinks. *Global Environmental Politics*, **4**(4), pp. 54–75. doi:10.1162/glep.2004.4.4.54

Guler, I., Guillén, M. F., and Macpherson, J. M., 2002, Global competition, institutions, and the diffusion of organizational practices: The international spread of ISO 9000 quality certificates. *Administrative Science Quarterly*, **47**(2), pp. 207–232. doi:10.2307/3094804

Hafner-Burton, E. M., 2008, Sticks and stones: Naming and shaming the human rights enforcement problem. *International Organization*, **62**(4), pp. 689–716. doi:10.1017/S0020818308080247

Hale, T., 2020, Transnational actors and transnational governance in global environmental politics. *Annual Review of Political Science*, **23**(1), pp. 203–220. doi:10.1146/annurev-polisci-050718-032644

Hale, T. N., Chan, S., Hsu, A., Clapper, A., Elliott, C., Faria, P., Kuramochi, T., McDaniel, S., Morgado, M., Roelfsema, M., Santaella, M., Singh, N., Tout, I., Weber, C., Weinfurter, A., and Widerberg, O., 2021, Sub- and non-state climate action: A framework to assess progress, implementation and impact. *Climate Policy*, **21**(3), pp.406–420. doi:10.1080/14693062.2020.1828796

Hall, R. B. and Biersteker, T. J. (Eds), 2002, *The Emergence of Private Authority in Global Governance*, (New York: Cambridge University Press).

Héritier, A. and Eckert, S., 2008, New modes of governance in the shadow of hierarchy: Self-Regulation by industry in Europe. *Journal of Public Policy*, **28**(1), pp. 113–138. doi:10.1017/S0143814X08000809

Hsueh, L., 2017, Transnational climate governance and the global 500: Examining private actor participation by firm-level factors and dynamics. *International Interactions*, **43**(1), pp. 48–75. doi:10.1080/03050629.2016.1223929

Hsueh, L., 2019a, Corporations at a crossroads: How multilevel governance interactions shape participation and effort in private governance regimes. *Governance*, **32**(4), pp. 715–760. doi:10.1111/gove.12406

Hsueh, L., 2019b, Voluntary climate action and credible regulatory threat: Evidence from the carbon disclosure project. *Journal of Regulatory Economics*, **56**(2–3), pp. 188–225. doi:10.1007/s11149-019-09390-z

Hsueh, L. and Prakash, A., 2012, Incentivizing self-regulation: Federal vs. state-level voluntary programs in US climate change policies. *Regulation & Governance*, **6**(4), pp. 445–473. doi:10.1111/j.1748-5991.2012.01140.x

Imai, K., Keele, L., Tingley, D., and Yamamoto, T., 2011, Unpacking the Black box of causality: Learning about causal mechanisms from experimental and observational studies. *American Political Science Review*, **105**(4), 765–789. doi:10.1017/S0003055411000414

Imai, K., Kim, I. S., and Wang, E. H., 2023, Matching methods for causal inference with time-series cross-sectional data. *American Journal of Political Science*, **67**(3), pp. 587–605. doi:10.1111/ajps.12685

Keck, M. E. and Sikkink, K., 1998, *Activists beyond Borders: Advocacy Networks in International Politics*, (Ithaca, N.Y: Cornell University Press)

Kelley, J. G. and Simmons, B. A., 2015, Politics by number: Indicators as social pressure in international relations. *American Journal of Political Science*, **59**(1), 55–70. doi:10.1111/ajps.12119

Koliev, F., Duit, A., and Park, B., 2023, The impact of INGO climate shaming on national laws. *International Interactions*, **50**(1), pp. 1–27.

Kollman, K. and Prakash, A., 2001, Green by choice? cross-national variations in firms' responses to EMS-based environmental regimes. *World Politics*, **53**(3), pp. 399–430. doi:10.1353/wp.2001.0010

Kollmuss, A., Zink, H., and Polycarp, C., 2008, *Making Sense of the Voluntary Carbon Market: A Comparison of Carbon Offset Standards*. WWF Germany. https://wwf.panda.org/wwf_news/?126700/A-Comparison-of-Carbon-Offset-Standards-Making-Sense-of-the-Voluntary-Carbon-Market.

Lall, R., 2025, Making global governance accountable: Civil society, states, and the politics of reform. *American Journal of Political Science*, **69**(1), 96–117. doi:10.1111/ajps.12824

Lerner, M. and Osgood, I., 2023, Across the boards: Explaining firm support for climate policy. *British Journal of Political Science*, **53**(3), pp. 934–957. doi:10.1017/S0007123422000497

London Stock Exchange Group, 2023, Environmental, social and governance scores from LSEG [online]. Available at: https://www.lseg.com/content/dam/data-analytics/en_us/documents/methodology/lseg-esg-scores-methodology.pdf.

Lovell, H. C., 2010, Governing the carbon offset market: Governing the carbon offset market. *Wiley Interdisciplinary Reviews: Climate Change*, **1**(3), pp. 353–362.

Malhotra, N., Monin, B., and Tomz, M., 2019, Does private regulation preempt public regulation? *American Political Science Review*, **113**(1), pp. 19–37. doi:10.1017/S0003055418000679

Murdie, A. M. and Davis, D. R., 2012, Shaming and blaming: Using events data to assess the impact of human rights INGOs1: Shaming and Blaming. *International Studies Quarterly*, **56**(1), 1–16. doi:10.1111/j.1468-2478.2011.00694.x

Newell, P., 2008, Civil society, corporate accountability and the politics of climate change. *Global Environmental Politics*, **8**(3), 122–153. doi:10.1162/glep.2008.8.3.122

North, D. C., 1990, *Institutions, Institutional Change and Economic Performance* (New York: Cambridge University Press)

Ostrom, E., 1990, *Governing the Commons*, (Cambridge: Cambridge University Press)

Peters, B. G. and Pierre, J., 1998, Governance without government? rethinking public administration. *Journal of Public Administration Research and Theory*, **8**(2), pp. 223–243. doi:10.1093/oxfordjournals.jpart.a024379

Potoski, M. and Prakash, A., 2004, Regulatory convergence in nongovernmental regimes? cross-national adoption of ISO 14001 certifications. *The Journal of Politics*, **66**(3), pp. 885–905. doi:10.1111/j.1468-2508.2004.00281.x

Potoski, M. and Prakash, A., 2005, Green clubs and voluntary governance: ISO 14001 and firms' regulatory compliance. *American Journal of Political Science*, **49**(2), pp. 235–248. doi:10.1111/j.0092-5853.2005.00120.x

Potoski, M. and Prakash, A., 2009, *Voluntary Programs: A Club Theory Perspective*, (Cambridge, MA: MIT Press)

Prakash, A., 2000, *Greening the Firm: The Politics of Corporate Environmentalism*, (Cambridge: Cambridge University Press)

Prakash, A., 2001, Why do firms adopt 'beyond-compliance' environmental policies? *Business Strategy and the Environment*, **10**(5), 286–299. doi:10.1002/bse.305

Prakash, A. and Potoski, M., 2006, Racing to the bottom? trade, environmental governance, and ISO 14001. *American Journal of Political Science*, **50**(2), 350–364. doi:10.1111/j.1540-5907.2006.00188.x

Prakash, A. and Potoski, M., 2007, Investing up: FDI and the cross-country diffusion of ISO 14001 management systems. *International Studies Quarterly*, **51**(3), pp. 723–744. doi:10.1111/j.1468-2478.2007.00471.x

Prakash, A. and Potoski, M., 2012, Voluntary environmental programs: A comparative perspective. *Journal of Policy Analysis and Management*, **31**(1), pp. 123–138. doi:10.1002/pam.20617

Raustiala, K. and Victor, D. G., 2004, The regime complex for plant genetic resources. *International Organization*, **58**(2), pp. 277–309. doi:10.1017/S0020818304582036

Roger, C. and Dauvergne, P., 2016, The Rise of transnational governance as a field of study. *International Studies Review*, **18**(3), pp. 415–437. doi:10.1093/isr/viw001

Sending, O. J. and Neumann, I. B., 2006, Governance to governmentality: Analyzing NGOs, states, and power. *International Studies Quarterly*, **50**(3), pp. 651–672. doi:10.1111/j.1468-2478.2006.00418.x

Strand, R., 2013, The chief officer of corporate social responsibility: A study of its presence in top management teams. *Journal of Business Ethics*, **112**(4), pp. 721–734. doi:10.1007/s10551-012-1568-z

Sundström, A., Paxton, P., Wang, Y.-T., and Lindberg, S. I., 2017, Women's political empowerment: A new global index, 1900–2012. *World Development*, **94**, pp. 321–335. doi:10.1016/j.worlddev.2017.01.016

Tingley, D., Yamamoto, T., Hirose, K., Keele, L., and Imai, K., 2014, **mediation**: *R* Package for Causal Mediation Analysis. *Journal of Statistical Software*, online **59**(5), doi:10.18637/jss.v059.i05

Walls, J. L., Berrone, P., and Phan, P. H., 2012, Corporate governance and environmental performance: Is there really a link? *Strategic Management Journal*, **33**(8), pp. 885–913. doi:10.1002/smj.1952

World Bank, 2022, *World Development Indicators.*, (Washington, DC: The World Bank)

World Bank, 2023, Carbon Pricing Dashboard: Up-to-date overview of carbon pricing initiatives [online]. Washington, DC: The World Bank. Available at https://carbonpricingdashboard.worldbank.org/ (accessed 10 December 2023).