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CSR Governance Committee and Carbon Emission Performance: Does Committee Composition Matter?

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ABSTRACT

This study examines the effect of corporate social responsibility (CSR) committee characteristics, namely the committee size, independence, chairperson independence, and meeting frequency, on firms' carbon emission performance. The authors test the hypotheses through a panel data analysis for a sample of non-financial firms listed on the Bloomberg World Large and Mid-Index from 2010 to 2020. Using data from Refinitiv Eikon and Bloomberg databases, the findings show that the CSR committee's presence is positively linked with carbon emission performance, suggesting that these committees play a crucial role in diminishing firms' carbon footprints. Moreover, the results indicate that larger committee size, the independence of the CSR committee chairperson, and increased meeting frequencies are positively associated with carbon emission performance. Our study underlines the importance of CSR committee in elevating firms' awareness and management of their carbon footprint, encouraging their adoption as a strategic measure against the rising concerns over carbon emissions. It highlights that the structure of these committees is necessary for their effectiveness, offering actionable insights for firms and policy considerations for regulators globally.

1 | Introduction

Climate change is one of the greatest ecological challenges of the twenty-first century. According to the International Energy Agency, global carbon dioxide (CO_2) emissions from energy combustion and industrial processes peaked in 2023 at 37.4 gigatons, placing corporations at the centre of the global challenge. In this regard, governments, regulators, environmentalists, and other stakeholders continue to pressure firms to undertake serious initiatives and establish strict carbon reduction policies and targets (Al-Shaer and Zaman 2018; Alsaifi et al. 2020; Widyawati 2020). This aligns with the United Nations agenda for sustainable development, particularly Sustainable Development Goal (SDG) 13, 'Climate Action', which imposes responsibilities on both public and private sector entities for tackling climate change (Banerjee et al. 2021).

Given that firms are the major contributors to greenhouse gas (GHG) emissions, their efforts to reduce their carbon footprints are worth analysing, specifically from the perspective of the CSR committee. According to Oyewo (2023) and Haque and Ntim (2018), corporate governance (CG) is one of the critical factors that could shape firms' environmental activities and strategies, where strengthening CG mechanisms represents a practical strategy for achieving decarbonisation targets. The CSR committee, therefore, is increasingly integral to modern CG and responding to the expanding responsibilities of boards in managing CSR issues (Dixon-Fowler et al. 2017; Elmaghrabi 2021; Gennari and Salvioni 2019; Velte 2021a).[1] Previous studies find that the existence of a CSR committee is linked with improved corporate environmental performance and disclosure (Peters and Romi 2015; Cucari et al. 2018), increased environmental transparency (Liao et al. 2015), and

greater efficiency in CSR strategies (Orazalin 2020). Similarly, García-Sánchez et al. (2019) report that a CSR committee facilitates the implementation of the Global Reporting Initiative (GRI) and the International Finance Corporation (IFC) policy, thus supporting environmental management policy systems.

While the presence of a CSR committee indicates positive intent, anecdotal evidence suggests that firms might create CSR committee for symbolic purposes, aiming to augment their public image and secure or maintain legitimacy (Peters and Romi 2015). These mixed findings and perspectives imply that merely having a CSR committee might not guarantee a firm's commitment to sustainability. Consequently, Burke et al. (2019) and Velte and Stawinoga (2020) call for an exploration of the heterogeneity within the CSR committee to better understand their effects. In response to these calls, the current study investigates the impact of various attributes of the CSR committee, including CSR committee size, independence, chairman independence, and meetings frequency, on carbon emission performance.[2]

Using a sample of non-financial firms listed in the Bloomberg World Large and Mid-Index from 2010 to 2020, the findings highlight the vital role that CSR committee play in augmenting firms' initiatives to reduce carbon emissions. In greater detail, CSR committee size, an independent chairperson in the committee, and more frequent meetings are positively associated with enhanced carbon emission performance. These outcomes remain consistent when employing two alternative regression approaches: The Heckman Two-stage Least Squares approach and the Two-Stage Least Squares (2SLS) approach. Moreover, the findings are robust to alternative measures of carbon emission performance.[3]

This study contributes to the existing literature in several ways. First, we demonstrate the influence of an unexplored aspect of corporate governance, namely the CSR committee, on carbon emission performance. While prior studies examined the impact of various CG mechanisms on carbon emission performance, such as board characteristics (Goud 2022; Haque 2017), audit committee (Elsayih et al. 2021), executive compensation (Radu and Smaili 2022) and ownership structure (Benlemlih et al. 2023; Wang et al. 2019), the specific role of the CSR committee has received limited attention. Moreover, a considerable portion of scholarly endeavours has been dedicated to understanding the impact of the CSR committee on firms' overall CSR performance (e.g., Eberhardt-Toth 2017; Elmaghrabi 2021; Jarboui et al. 2022), typically assessed through aggregate CSR scores. For example, a study by Li et al. (2023) examines the influence of the CSR committee on a firm's environmental performance for a sample of Australian firms but does not address the heterogeneity within the CSR committee. Another study by Burke et al. (2019) considers the diversity within the CSR committee concerning firms' social and environmental performance in US companies, yet neither study specifically focused on carbon emission performance, which is considered an alarming issue that warrants separate investigation. This gap highlights a critical need for research focusing on the role the CSR committee may play in mitigating carbon emissions, which this study aims to address.

Second, from a theoretical perspective, previous literature on the CSR committee characteristics-CSR activities nexus relies mainly on a single theory to justify this association, such as agency theory (Gull et al. 2023), stakeholder theory (Eberhardt-Toth 2017), and stakeholder-agency theory (Elmaghrabi 2021). In this study, we acknowledge the limitation of relying on a single theory in examining the link between CG and sustainability practices (see Hussain et al. 2018; Mallin et al. 2013). To provide a more comprehensive perspective, we adopt both agency theory (Jensen and Meckling 1976) and resource dependence theory (Pfeffer and Salancik 1978). We focus on these two theories since they present the monitoring role as per agency theory and the advising role as per resource dependence theory (Mallin et al. 2013) towards CSR-related practices (Bear et al. 2010).

Third, it is noteworthy that most of the previous scholarly works have focused on companies located in the UK (Elmaghrabi 2021), the US (Burke et al. 2019), and Australia (Li et al. 2023). In contrast, our study aims to widen the geographical reach by including an international sample. Hence, the result of the study can provide a critical addition to the literature in understanding carbon disclosure and performance for the global economy. Furthermore, findings from this study respond to the increasing regulatory and stakeholder pressures on firms to improve their environmental practices. Establishing a well-structured CSR committee helps increase companies' environmental awareness to reduce their carbon emissions and improves engagement with various stakeholders.

The remainder of the study is set out as follows. Section 2 discusses the theoretical framework of the study. Section 3 reviews the related literature and develops the hypotheses. Section 4 presents sample selection and data collection, measurement of variables, and the research models. Empirical results are reported in Section 5. Finally, Section 6 provides discussion and conclusions and suggests areas for future research.

2 | Theoretical Framework

According to the literature, no single theoretical framework thoroughly explains the impact of governance mechanisms on sustainability-related practices (Elmaghrabi 2021; Hussain et al. 2018). Previous studies on the relationship between CSR committee characteristics and CSR activities use either a single theory, such as agency theory (Gull et al. 2023), stakeholder theory (Eberhardt-Toth 2017), stakeholder-agency theory (Elmaghrabi 2021), or multiple theoretical frameworks, for example, agency and stakeholder theories (Jarboui et al. 2022; Matta et al. 2022). In this study, we acknowledge the lacuna of relying on a single theory in examining the CG-sustainability practices nexus (see Hussain et al. 2018; Mallin et al. 2013). Therefore, we employ agency theory (Jensen and Meckling 1976) and resource dependence theory (Pfeffer and Salancik 1978). We focus on these two organisational theoretical perspectives since they present the monitoring role as per agency theory and the advising role as per resource dependence theory (Mallin et al. 2013) towards CSR-related practices (Bear et al. 2010).

Based on agency theory, which is one of the most applied theoretical perspectives in the corporate governance literature (Salehi et al. 2023), committees are established to assist board members in controlling management's behaviour (Daily et al. 2003; Li

et al. 2023; Nicholson and Kiel 2007). Establishing a board committee can decentralise boards' power and duties, thus mitigating conflicts of interest and agency problems (Masud et al. 2018). In fact, creating a CSR committee arises from reducing agency issues resulting from the conflict of interests between managers and stakeholders (García-Sánchez et al. 2019). As agency theory argues, a CSR committee can enhance the monitoring role of boards regarding environmental matters, thus improving environmental performance (Li et al. 2023), including carbon performance. A CSR committee represents a dedicated monitoring mechanism that can provide more focused and effective control over managerial decisions related to environmental activities compared with the entire board level (Upadhyay et al. 2014).

In contrast to the agency perspective, which focuses on the monitoring role (Jensen and Meckling 1976), the resource dependence perspective focuses on the role of directors in offering firms with critical resources (Pfeffer and Salancik 1978). As this theory suggests, a CSR committee can provide companies with CSR-related resources that can help address environmental issues (Li et al. 2023). That is, the presence of a CSR committee is a crucial resource for firms (Mallin and Michelon 2011). According to the literature, a CSR committee is likely to offer managers and board members valuable and insightful advice on environmental matters (Karaman et al. 2024) and engage with significant stakeholders to acquire their perspectives and expectations regarding environmental issues (Paine 2014). This, in turn, leads to better environmental performance (e.g., carbon performance). The knowledge and experience of the CSR committee are critical for ensuring sustainability-related matters (Amran et al. 2014).

3 | Literature Review and Hypotheses Development

Several studies examine the impact of board characteristics on carbon performance (e.g., Cheung and Lai 2022; Cordova et al. 2021; Elsayih et al. 2021; Haque 2017; Mardini and Elleuch Lahyani 2022; Mehedi et al. 2024; Muktadir-Al-Mukit and Bhaiyat 2024; Oyewo 2023). One missing stream from the existing literature is to investigate CSR committee characteristics. Although some studies mentioned above show evidence of the impact of the existence of a CSR committee (e.g., Haque 2017; Mehedi et al. 2024; Oyewo 2023), several studies urge investigating further the attributes of such committees (e.g., Burke et al. 2019; Liao et al. 2015; Velte and Stawinoga 2020). According to Gull et al. (2024), companies may establish a CSR committee for several reasons, such as obtaining social legitimacy or reducing the negative environmental influence of their operations. Therefore, to better understand the role of the CSR committee, its attributes should be considered as well. In this regard, several studies have investigated the influence of CSR committee characteristics on CSR performance (Eberhardt-Toth 2017; Elmaghrabi 2021; Jarboui et al. 2022), CSR strategy formation, CSR controversies (Elmaghrabi 2021), CSR decoupling (Gull et al. 2023), CSR engagement (Godos-Díez et al. 2018), environmental performance (Saeed et al. 2021), CSR assurance (Martínez-Ferrero and García-Sánchez 2017; Peters and Romi 2015), and waste management (Gull et al. 2024). However, the commonality of these studies is that they do not examine carbon emission performance. Based on that, we argue that there is a need to extend the current literature and examine the relationship between the characteristics of the CSR committee and carbon emission performance.

3.1 | CSR Committee Size

Several studies (e.g., Becker-Blease and Irani 2008; Godos-Díez et al. 2018; Gull et al. 2023) suggest that board committees size can indicate their effectiveness and power. According to Gull et al. (2024), the size of the CSR committee is a significant factor that could affect firms' sustainability practices and strategies. In this regard, previous literature and applied theories offer two perspectives on the size of board committee regarding sustainability-related activities.

The first perspective, which aligns with the agency theoretical framework (Jensen and Meckling 1976), advocates for a small committee size. From the agency's theoretical perspective, a large number of directors can hinder governance efficiency (Hussain et al. 2018; Prado-Lorenzo and Garcia-Sanchez 2010) and result in agency issues (Cabeza-García et al. 2018). Having many directors can result in poor decision-making and ineffective management (Lipton and Lorsch 1992) and mitigate directors' capability to take strategic decisions and actions during, for example, environmental turbulence (Gull et al. 2024). One plausible reason for this is that having larger groups can lead to harmonisation and free riders' issues (Haque and Ntim 2018; Muktadir-Al-Mukit and Bhaiyat 2024), more difficulty in coordination, and more conflicts among members (Gull et al. 2024). Another reason is that large boards may underline courtesy and decorum without thought for candour and truthiness (Yermack 1996). Moreover, a higher number of participating directors can establish a suitable environment for powerful CEOs to protect their interests (Donnelly and Mulcahy 2008). Within the CSR area, and according to (Haque 2017), a large number of directors are likely to be inefficient in responding to climate protection issues due to, for instance, free-riding problems and increased conflicts during the decision-making process (Prado-Lorenzo and Garcia-Sanchez 2010).

In contrast, a small number of CSR committee members, since they have better coordination and efficient communication (Ahmed et al. 2006), can lead to better accountability (Elmaghrabi 2021) and monitoring of managers' practices (Dey 2008; Jizi et al. 2014), including environmental activities (Hussain et al. 2018). Eberhardt-Toth (2017) argue that, in a small CSR committee, each director is required to exert more individual effort to fulfil their tasks and make strategic changes, as they cannot rely as much on the contributions of other directors for decision-making. This also aligns with group dynamics and collective decision-making perspectives, arguing for a small number of directors (Hussain et al. 2018; Jizi et al. 2014). Empirically, previous studies report that a large number of directors is negatively associated, for instance, with CDP participation (Akbaş and Canikli 2019) and carbon performance (Muktadir-Al-Mukit and Bhaiyat 2024). Similarly, Eberhardt-Toth (2017) documents a negative impact of CSR committee size on corporate social performance. Thus, based on the above discussion and through the lens of agency theory, it can be argued

that a large CSR committee size can result in lower environmental performance, including carbon emissions.

On the other hand, the second perspective argues for a large number of directors, which is in line with resource dependence theory (Pfeffer and Salancik 1978). According to this theory, the larger size of the CSR committee can address stakeholders' needs by carrying out environmental initiatives (Gull et al. 2024), including carbon emission performance. As this theory argues, a large number of directors can result in better decision-making through the inclusion of diverse perspectives and ideas (Pfeffer and Salancik 2003) and offer companies the necessary diversity to obtain essential resources (Amran et al. 2014), hence enhancing environmental performance. Several studies argue that large CSR committee are more likely to better address social responsibility-related activities (Gull et al. 2023), such as environmental decisions (Godos-Díez et al. 2018; Rodrigue 2014). In fact, committees with more members tend to have the needed capacity and resources, for example, financial and technological ones (Haque 2017), to fulfil their responsibility effectively (Jarboui et al. 2022; Musallam 2018). Moreover, such committees can bring diverse experiences and thoughts to implement and discuss (Elmaghrabi 2021; Tauringana et al. 2017), for example, on environmental outcomes and risks (Haque 2017). This, in turn, can enhance boards' resource provision role towards CSR issues (Godos-Díez et al. 2018), mitigate environmental uncertainty (Gull et al. 2024), and increase spending on CSR practices (Benson et al. 2011). Empirically, several studies find that a larger number of directors is positively related to carbon-related practices (e.g., Cordova et al. 2021; Mehedi et al. 2024). Likewise, other studies report a significant and positive influence of CSR committee size on CSR performance (Jarboui et al. 2022), environmental performance (Saeed et al. 2021), CSR strategy (Elmaghrabi 2021), CSR engagement (Godos-Díez et al. 2018), greenhouse gas disclosure (Liao et al. 2015), and waste management (Gull et al. 2024). Thus, it can also be argued, based on the above discussion and resource dependence theoretical perspective, that large CSR committee is more likely to address environmental matters, such as carbon emissions.

Since there are contrasting perspectives in the literature for predicting a negative and a positive influence, as well as opposite viewpoints of agency and resource dependence theories, our first hypothesis is developed without direction as follows:

H1. *CSR committee size has a significant impact on carbon performance.*

3.2 | CSR Committee Independence

From the agency's theoretical viewpoint, the existence of independent directors results in better corporate governance since such directors are more effective in mitigating agency issues and costs (Barako et al. 2006), controlling managers' practices (Hussain et al. 2018), and guaranteeing that management serves shareholders' interests (Jensen and Meckling 1976). Having independent directors leads to higher transparency and accountability (Amran et al. 2014; Cheng and Courtenay 2006), reliability (Alta'any, Tauringana, et al. 2024), and long-term value-adding practices (Ibrahim et al. 2003). In turn, this enhances CSR-related activities (Harjoto et al. 2015), prevents the potential hazards of fleeting trends in CSR driven by managerial impulses (Finkelstein et al. 2009; Jarboui et al. 2022), and reduces CSR concerns (Gull et al. 2024). For instance, Kassinis and Vafeas (2002) find that a higher number of independent members results in a reduction of environmental lawsuits against their firms. Moreover, independent directors' compensations are not contingent on short-term performance compared with top managers and other directors (Jizi et al. 2014), and they are less independent of CEOs (Jizi 2017). Hence, they consider a counterweight mechanism that mitigates management opportunistic behaviour and keeps managers focusing on long-term firms' interests (Alta'any, Tauringana, et al. 2024), such as carbon performance. For example, independent directors better monitor management's practices on carbon projects and matters (Kock et al. 2012) and have a critical role in addressing agency issues that may arise from the long-term nature of carbon-related investments (see Haque 2017).

Furthermore, according to resource dependence theory, such directors play a significant role in providing companies with vital resources, skills, expertise, and external links (Hillman et al. 2000; Pfeffer and Salancik 1978). This, in turn, leads to adding value to communities' and companies' success and improving the decision-making process of boards (Ibrahim and Hanefah 2016). Besides, independent directors provide companies with human and relationship capital that is crucial for successful carbon-related initiatives (Haque 2017), managing external dependencies, attracting crucial resources, and resolving environmental uncertainties (Mallin and Michelon 2011). Moreover, independent directors can realise the significant potential value of expensive emission-control initiatives (Liao et al. 2015), promote long-term investments in environmental issues (De Villiers et al. 2011), and adopt friendly environmental policies (Elsayih et al. 2021). Previous studies report a significant and positive impact of independent directors on carbon accounting (e.g., Elsayih et al. 2021; Haque 2017; Liao et al. 2015; Mehedi et al. 2024). Regarding CSR committee characteristics, other studies show a significant and positive effect of CSR committee independence on CSR performance (e.g., Eberhardt-Toth 2017; Elmaghrabi 2021; Jarboui et al. 2022) and waste management (Gull et al. 2024).

On the other hand, the literature offers a counterargument for independent directors, where inside directors who have a better understanding of firms may offer better helpful counsel in strategic decisions (Davis et al. 1997; Donaldson 1990). According to the literature, independent members, due to the powerful CEOs' influences, may not indeed be independent in practice (Alta'any, Tauringana, et al. 2024), and their independence may be compromised, thus being more likely to work for those who appointed them (Jackling and Johl 2009). Moreover, independent directors may face some challenges, such as the absence of support from inside directors (Yasser et al. 2017), having multiple directorships (Farhan et al. 2017), and being outside the company. Such cases may affect their efficiency in controlling managers (Jackling and Johl 2009) and undermine their professional judgements and decisions regarding CSR-related practices (Alta'any, Tauringana, et al. 2024). In fact, the empirical results present that independent directors may be associated with lower environmental performance (Walls et al. 2012), higher amounts

of waste (Kock et al. 2012), and higher carbon emission rate (Oyewo 2023), while others, for instance, report no impact on CDP participation (Akbaş and Canikli 2019) or environmental disclosure (Alta'any, Tauringana, et al. 2024). Also, by examining CSR committee attributes, a number of studies find no effect of CSR committee independence on environmental performance (Saeed et al. 2021) or CSR assurance (Peters and Romi 2015). However, following agency and resource dependence theories, we argue that CSR committee independence is likely to enhance carbon performance. Hence, we draw our second hypothesis as follows:

H2. *CSR committee independence has a significant and positive impact on carbon performance.*

In line with CSR committee independence and through the lens of agency and resource dependence theories, appointing an independent director as a chairman of the CSR committee could affect carbon performance positively as well. In fact, the role of a committee can be more influential if the chairman is an independent director (Ashfaq and Rui 2019). According to Lutfi et al. (2022), the presence of an independent chair is crucial, as it allows for adequate time to perform duties and make unbiased decisions, thus providing board members with valuable recommendations. For instance, having an independent director who is the chairman of the audit committee leads to a committee that effectively monitors and controls managers' performance and enhances corporate performance (Ali and Atan 2013). Especially that an independent chairperson of an audit committee can better preserve the balance between social values and the interests of shareholders (Ashfaq and Rui 2019) and play an essential role in running meetings and coordinating meetings' agendas (Aldamen et al. 2012).

In the CSR context, Appuhami and Tashakor (2017) argue that the independent chair of the audit committee has a significant role in enhancing social responsibility-related activities. Empirically, Ashfaq and Rui (2019), for example, find a positive and significant relationship between audit committee independent chair and CSR-related practices. This can be extended to the CSR committee independent chair, given that CSR and audit committees share similar functions (García-Sánchez et al. 2019; Jarboui et al. 2022). Primarily, the CSR committee, rather than other committees, directly oversees sustainability and environmental matters. Therefore, based on the arguments mentioned above regarding CSR committee independence, it is expected that having an independent CSR committee chairman can enhance environmental performance. Recently, Elmaghrabi (2021) finds that CSR committees with more independent directors enhance CSR performance, especially when independent members chair such committees. Based on these arguments, we further hypothesis the following:

H3. *Independent CSR committee chairman has a significant and positive impact on carbon performance.*

3.3 | CSR Committee Meetings

The lack of sufficient time is a frequent challenge that boards face in fulfilling their responsibilities (Hu and Loh 2018), resulting in information gaps and limiting their ability to effectively control and evaluate firms' strategies (Lipton and Lorsch 1992). According to Oyewo (2023), instantly addressing issues creates opportunities for resolution, while delaying or neglecting challenges can affect organisations' overall efficiency. In this regard, several studies developed under the agency theory viewpoint argue that board meetings serve as the primary avenue through which directors fulfil their responsibility for management oversight (Aliyu 2019; Omran et al. 2021). Thus, from the agency theoretical perspective, and given the availability of additional time for directors to address firms' environmental strategy (Hussain et al. 2018), prior studies argue that more frequent meetings help in overcoming agency-related issues (Lipton and Lorsch 1992; Ofoegbu et al. 2018; Xie et al. 2003). Moreover, the number of meetings among board members enhances governance effectiveness (Elmaghrabi 2021) and monitoring managers (Elsayih et al. 2021), indicates committees' diligence (Jarboui et al. 2022), encourages companies to improve transparency (Hussain et al. 2018), and helps in addressing and controlling firms' issues (Jizi et al. 2014), including social responsibility-related activities (Alshbili et al. 2019). In fact, the frequency of meetings plays a crucial role in CSR committee control (Allegrini and Greco 2013; Jarboui et al. 2022), reflects its strength (Liao et al. 2015), enhances its effectiveness (Burke et al. 2019), and indicates its level of activity (Elmaghrabi 2021). Thus, it can be argued that CSR committee meetings are an effective tool for controlling management practices regarding, for instance, carbon performance.

Similarly, and through the lens of resource dependence theory, it can be argued that CSR committee meetings will enhance carbon performance. A CSR committee can provide firms with needed resources (Hillman and Dalziel 2003) to enhance environmental performance (Li et al. 2023; Paine 2014). In this regard, and in line with resource dependence theory, meetings within board members could be the time and place to achieve this (Ju Ahmad et al. 2017; Panicker and Upadhyayula 2020). In fact, a higher frequency of meetings helps in sharing information and ideas (Aliyu 2019), improving board communications (Elsayih et al. 2021), providing critical information (Naseem et al. 2017), and discussing future strategies (Taluka et al. 2022). Accordingly, this results in better identifying environmental policies (Hussain et al. 2018), for example, regarding carbon emissions (Elsayih et al. 2021). Moreover, according to Jarboui et al. (2022) and Matta et al. (2022), an active CSR committee tends to achieve greater CSR performance. Hence, CSR committee meetings are expected to be a critical and crucial resource for firms to enhance carbon performance. Empirically, several studies reveal that meetings within boards are positively and significantly associated with carbon performance (Elsayih et al. 2021; Mehedi et al. 2024). Similarly, a number of studies examine the influence of CSR committee meetings and report a positive and significant influence on CSR performance (Elmaghrabi 2021) and sustainability assurance (Martínez-Ferrero and García-Sánchez 2017).

However, the existing literature also offers an alternative perspective on the frequency of meetings. Bacon et al. (1997) mention that as the frequency of meetings increases, executives may affect the outside directors' interests and make them in

line with their own. According to Vafeas (1999), directors often spend their limited meeting time on formalities and management reports rather than engaging in meaningful dialogue, thus reducing outside directors' time to monitor management effectively. Additionally, boards may choose to partition the agenda among several meeting sessions without broadening the governance agenda's activities (Dienes and Velte 2016). Prior scholars show some evidence of a significant and negative effect of board meetings on carbon performance (e.g., Mardini and Elleuch Lahyani 2022) and carbon-related disclosure (Prado-Lorenzo and Garcia-Sanchez 2010). In contrast, other studies document an insignificant impact on carbon performance (e.g., Oyewo 2023). Regarding CSR committee attributes, Jarboui et al. (2022) find no influence of CSR committee meetings on CSR performance, and likewise, Peters and Romi (2015) show no impact on sustainability assurance. Still, in line with both agency and resource dependence theories and the above arguments, we suggest that CSR committee meetings can enhance monitoring management and provide firms with critical resources, thereby improving carbon performance. Therefore, our fourth hypothesis is:

H4. *CSR committee meetings have a significant and positive impact on carbon performance.*

4 | Research Design

4.1 | Sample and Data

This study examines non-financial companies listed in the Bloomberg World Large & Mid Cap Index covering an 11-year period from 2010 to 2020. This equity benchmark index employs a float market-capitalisation-weighted methodology to evaluate the performance of large and mid-cap firms globally. It encompasses approximately 85% of the total market capitalisation of its respective market. This index was chosen to increase the likelihood of identifying a sufficient number of firms that have established a board CSR committee. This selection aims to ensure that the empirical study yields statistically meaningful results. Subsequently, only non-financial entities were chosen for analysis, as they could be comparably evaluated regarding their financial performance. This exception pertains to banks, financial service providers, insurance businesses, and real estate firms (Abweny, Ahmed, et al. 2024; Eberhardt-Toth 2017).

The data were obtained from two primary sources and in two stages. Firstly, following Li et al. (2023), Samarawickrama et al. (2024), and Eberhardt-Toth (2017), data on CSR committee attributes were collected from the Bloomberg ESG database, which provides comprehensive details on these attributes. Bloomberg, a globally recognised financial markets database, offers news, analytics, and real-time pricing for over 5 million securities worldwide, along with extensive historical data and stock charts. It also delivers ESG data for more than 14,000 companies across over 100 countries. The database is widely utilised by professionals and academics, ensuring the reliability and depth of the information used in this study (Abweny, Afrifa, et al. 2025 ; Lopez-de-Silanes et al. 2024; Murè et al. 2021; Schiemann and Tietmeyer 2022; Yu and Van Luu 2021).

Subsequently, we merged the CSR committee data with data n carbon emission performance and other sustainability-related variables from the Refinitiv Eikon database. This platform offers one of the industry's most comprehensive ESG databases, covering over 85% of the global market capitalisation. It provides ESG data through an objective, structured and standardised approach, gathering information from diverse sources including firms' annual reports, stock exchange filings, carbon disclosure project, sustainability reports and company websites. Refinitiv Eikon is also widely employed in academic studies focused on sustainability topics (e.g., Cuomo et al. 2022; Gómez-Bolaños et al. 2020; Haque and Ntim 2022; Hossain and Farooque 2019; Nuber and Velte 2021; Zaman et al. 2023), providing robust data for empirical research. We finally collected firm-specific data from the Worldscope database, which is a part of the Refinitiv Eikon platform.

Table 1 illustrates the sample selection process from initial data collection to the final sample used in the analysis. Panel A begins with an initial dataset comprising 50,000 observations from Bloomberg (2010–2020). After merging this dataset with Refinitiv Eikon, the sample size remained at 32,247 observations. Subsequent exclusions included financial firms (5228 observations) and firms with missing data (8796 observations), resulting in a final sample of 18,223 firms for Equation (1). Of these, 12,729 firms did not have a CSR committee, while 5494 firms had a CSR

TABLE 1 | Sample selection process.

Panel A	**Obs.**	**%**
Initial global data from Bloomberg from 2010 to 2020	50,000	100
Merged sample with Refinitiv Eikon database	32,247	100.00
Less		
Financial firms	5228	16.21
Firms with missing data	8796	27.28
The final sample for Equation (1)	18,223	56.51
Firms without CSR committees	12,729	69.85
Firms with CSR committees	5494	30.15
Panel B	**Obs.**	**%**
Firms with CSR committees from 2010 to 2020	5494	100.00
Less		
Firms with missing data on CSR committee characteristics	2606	47.43
The final sample for Equation (2)	2888	52.57

Note: This table presents the sample selection process. Missing data on CSR committee characteristics (size 3143, chairman independence 3189, number of meetings 3056, and director's independence 3010) vary, which yields different sample observations for Equation (2).

TABLE 2 | Sample distribution by country, industry, and year.

Panel A				Panel B		
Country	**Obs.**	**Firm**	**%**	**Industry**	**Obs.**	**%**
Australia	143	29	4.95	Basic materials	330	11.43
Canada	164	48	5.68	Consumer discretionary	530	18.35
China	92	34	3.19	Consumer staples	309	10.70
Finland	14	2	0.48	Energy	375	12.98
France	160	43	5.54	Health care	216	7.48
Hong Kong	34	7	1.18	Industrials	490	16.97
India	366	84	12.67	Real estate	152	5.26
Ireland	24	9	0.83	Technology	132	4.57
Italy	11	2	0.38	Telecommunications	96	3.32
Netherlands	28	5	0.97	Utilities	258	8.93
New Zealand	51	10	1.77	Total	2888	100.00
Norway	11	3	0.38	**Panel C**		
Philippines	18	5	0.62	**Year**	**Obs.**	**%**
Russia	23	7	0.80	2010	13	0.45
Singapore	26	7	0.90	2011	15	0.52
South Africa	147	34	5.09	2012	16	0.55
South Korea	15	3	0.52	2013	18	0.62
Spain	30	6	1.04	2014	72	2.49
Sweden	19	5	0.66	2015	210	7.27
Switzerland	20	5	0.69	2016	342	11.84
Thailand	78	19	2.70	2017	426	14.75
United Kingdom	155	38	5.37	2018	523	18.11
United States	1259	372	43.59	2019	649	22.47
Total	2888	777	100.00	2020	604	20.91
				Total	2888	100.00

Note: This table shows sample distribution by country, industry, and year.

committee. Panel B focuses on firms with a CSR committee from 2010 to 2020, starting with 5494 observations. After excluding firms with missing CSR committee characteristics, such as size, chairman independence, and number of meetings, the sample size for Equation (2) was refined to 2888 observations.

Table 2 provides an overview of the sample distribution across countries, industries, and years. The data includes 2888 observations, with the United States contributing the largest share (43.59%), followed by India (12.67%) and other countries representing smaller portions. The industry breakdown shows that the Consumer Discretionary sector has the highest representation (18.35%), followed by Industrials (16.97%) and Basic Materials (11.43%). The sample spans from 2010 to 2020, with the majority of observations concentrated in 2019 (22.47%), 2020 (20.91%), and 2018 (18.11%), indicating a focus on recent years in the analysis.

4.2 | Variables Measurement

4.2.1 | Carbon Emissions Performance

Previous studies have utilised various proxies to measure firms' commitment to mitigating carbon emissions (Haque and Ntim 2022; Nuber and Velte 2021; Orazalin et al. 2024). Among these, the carbon emission score provided by Refinitiv Eikon is the most used in the literature (Baboukardos et al. 2024; Velte 2021b). This score ranges from 0 for firms making no effort to reduce carbon emissions to 100 for firms fully committed to emission reduction. Other studies utilise an index comprising eight variables representing firm initiatives to reduce carbon emissions[4] (Haque 2017). This index is calculated by adding 1 if a firm takes action to consider a variable and 0 otherwise; thus, it ranges from 0 if a firm does not consider any variable to 8 if all variables were considered

by the firm. In line with previous studies (Velte 2021b), we used the carbon emission score (ranging from 0 to 100) in our primary analysis and the index score (ranging from 0 to 8) as an alternative measure.

4.2.2 | CSR Committee and Its Attributes

The CSR committee is our independent variable that is represented as a dummy variable coded as 1 if a firm has a CSR committee, and 0 otherwise (Elmaghrabi 2021; Radu and Smaili 2022; Samarawickrama et al. 2024). The establishment of a CSR committee reflects the firms' commitment towards improving their sustainability engagement. Furthermore, we considered the influence of the composition of the CSR committee on carbon emission performance. In particular, CSR committee size is measured as the number of members on the committee (Eberhardt-Toth 2017; Li et al. 2023; Samarawickrama et al. 2024). The independence of CSR committee members is calculated as the percentage of independent members in total CSR committee size (Gull et al. 2023; Li et al. 2023; Samarawickrama et al. 2024). The independence of the committee chairman is coded as 1 if the chairman of the CSR committee is independent and 0 otherwise (Samarawickrama et al. 2024). CSR committee meetings are measured as the annual number of meetings per year (Eberhardt-Toth 2017; Gull et al. 2023; Li et al. 2023; Samarawickrama et al. 2024). As previously mentioned, consistent with previous studies, data on the CSR committee and its attributes were obtained from the Bloomberg database.

4.2.3 | Control Variables

Following previous studies (e.g., Albitar et al. 2023; Gull et al. 2024; Haque and Ntim 2020; Moussa et al. 2020), we control for several factors that could have an influence on carbon emission performance. For firms' specific determinants, we control for firm size, proxied by the natural logarithm of total assets. Prior studies suggest that large firms tend to have more influence on the community and have greater exposure to media scrutiny, thus they are more likely to engage in environmental practices (De Villiers et al. 2011). We also include firm profitability (ROA), which is represented by the ratio of net income to total assets (Achiro et al. 2024; Alta'any, Kayed, et al. 2025). According to previous studies, more profitable firms tend that have enough resources that make them able involved in environmental initiatives, including carbon reduction plans (Moussa et al. 2020; Salehi et al. 2022). Furthermore, we use firm leverage because it is proposed that highly leveraged firms could have a higher tendency to improve their environmental performance to gain or maintain stakeholders' legitimacy (Haque 2017; Kayed and Meqbel 2024; Mardawi et al. 2024). This variable is measured by the ratio of long-term debt to total assets. Moreover, Withisuphakorn and Jiraporn (2016) find that firms' age is positively associated with the firm's environmental performance. Finally, sales growth was found to have a negative impact on carbon emission performance (Haque and Ntim 2022; Meng et al. 2023).

We also control for corporate governance variables impacting carbon emission performance, including board size (number of members), board diversity (percentage of women), and board activism (number of meetings). Haque (2017) finds that gender diversity positively influences carbon reduction initiatives, aligning with the resource-based view that female board members bring valuable human and relational capital, an innovative mindset, and a long-term perspective (Glass et al. 2016). Liao et al. (2015), Tanthanongsakkun et al. (2023), Albitar et al. (2023) and Haque (2017) also suggest that larger boards and more frequent meetings positively impact carbon performance. Larger boards provide diverse expertise and improve monitoring, while frequent meetings demonstrate active oversight, allowing for timely reviews and adjustments to sustainability strategies, thereby enhancing accountability and commitment to carbon reduction.

4.3 | Model Specification

To examine our hypotheses, we conducted two regression equations using the two-way cluster approach at the firm and year levels, as suggested by Petersen (2008). This approach ensures well-defined parameters and addresses heteroscedasticity in the context of a panel dataset, resulting in robust standard errors (Bouslah et al. 2018; Gow et al. 2010). The first equation investigates the impact of the existence of a CSR committee on a firm's carbon emission performance. The second equation examines whether CSR committee attributes (CSR committee size, independence, chairperson independence, and number of meetings) have a heterogeneous impact on a firm's carbon performance. The regression equations are as follows:

$$\begin{aligned}\text{Emiss\_perf}_{i,t} = {} & \beta_0 + \beta_1 \text{CSRC}_{i,t} + \beta_2 \text{Firm size}_{i,t} + \beta_2 \text{ROA}_{i,t} \\ & + \beta_3 \text{Leverage}_{i,t} + \beta_4 \text{Firm age}_{i,t} + \beta_5 \text{Sales growth}_{i,t} \\ & + \beta_6 \text{Board size}_{i,t} + \beta_7 \text{Board diversity}_{i,t} + \beta_8 \text{Board Activism}_{i,t} \\ & + [\text{Industry, Country, Year Indicators}] + \varepsilon_{i,t}\end{aligned} \tag{1}$$

$$\begin{aligned}\text{Emiss\_perf}_{i,t} = {} & \beta_0 + \beta_1 X_{i,t} + \beta_2 \text{Firm size}_{i,t} + \beta_2 \text{ROA}_{i,t} \\ & + \beta_3 \text{Leverage}_{i,t} + \beta_4 \text{Firm age}_{i,t} + \beta_5 \text{Sales growth}_{i,t} \\ & + \beta_6 \text{Board size}_{i,t} + \beta_7 \text{Board diversity}_{i,t} + \beta_8 \text{Board Activism}_{i,t} \\ & + [\text{Industry, Country, Year Indicators}] + \varepsilon_{i,t}\end{aligned} \tag{2}$$

In Equations (1) and (2), the dependent variable 'Emiss_perf' represents the performance score of a firm (i) at year (t) towards reducing carbon emissions. CSRC stands for CSR committee, and X refers to CSR committee characteristics, namely CSR committee size, independence, chairperson independence, and the number of meetings, each of which is examined in a separate regression to avoid multicollinearity issues. To mitigate the possibility of omitted variable bias, we followed previous studies (Gull et al. 2023), by including several control variables: Firm Size, Return on Assets (ROA), leverage, firm age, sales growth, board size, board diversity, and board activism. Furthermore, we included fixed effects at the country, industry, and year levels to control for unique variances among firms in our sample based on these factors. We also winsorised all continuous variables at the 1st and 99th percentiles to mitigate the influence of outlier observations on our results. The variable measurements, definitions, and data sources are presented in Appendix A.

TABLE 3 | Descriptive statistics.

	Firms with CSR committees							
Panel A	**Obs.**	**Mean**	**SD**	**Min**	**P25**	**P50**	**P75**	**Max**
Emiss_perf.	2888	64.61	27.45	0.00	47.41	71.00	87.50	99.80
CSRCSIZE	2888	4.38	1.36	2.00	3.00	4.00	5.00	10.00
CSRCDIND	2888	80.60	25.88	0.00	66.67	100.00	100.00	100.00
CSRC_CHAIR_IND	2888	0.86	0.35	0.00	1.00	1.00	1.00	1.00
CSRCNMEET	2888	3.96	1.93	1.00	3.00	4.00	5.00	15.00
CSRCINDEX	2888	0.12	1.24	−4.10	−0.29	0.60	0.89	3.01
Firm size	2888	16.45	1.24	10.10	15.64	16.30	17.18	21.25
ROA	2888	6.47	7.03	−26.02	3.36	5.96	9.51	33.82
Leverage	2888	25.86	14.82	0.00	16.05	25.33	34.62	72.40
Firm age	2888	3.22	0.94	0.00	2.77	3.22	3.91	4.99
Sales growth	2888	4.90	21.94	−47.62	−5.00	2.53	11.54	200.00
Board size	2888	11.03	2.43	4.00	9.00	11.00	12.00	20.00
Board diversity	2888	24.49	11.98	0.00	16.67	25.00	33.33	50.00
Board activism	2888	89.10	10.23	70.80	75.00	94.00	98.06	100.00
	Full sample							
Panel B	**Obs.**	**Mean**	**SD**	**Min**	**P25**	**P50**	**P75**	**Max**
Emiss_perf.	18,223	50.11	33.09	0.00	19.85	54.25	79.92	99.86
CSRC	18,223	0.30	0.46	0.00	0.00	0.00	1.00	1.00
Firm size	18,223	16.06	1.12	10.10	15.34	15.94	16.71	21.56
ROA	18,223	6.81	7.43	−26.02	3.44	6.10	10.00	33.82
Leverage	18,223	22.26	16.29	0.00	9.59	20.77	32.35	72.40
Firm age	18,223	3.09	0.93	0.00	2.56	3.09	3.71	5.21
Sales growth	18,223	9.10	25.73	−47.62	−1.96	5.61	15.38	200.00
Board size	18,223	10.39	2.78	4.00	9.00	10.00	12.00	20.00
Board diversity	18,223	17.59	12.75	0.00	9.09	16.67	25.00	50.00
Board activism	18,223	88.97	10.39	70.80	75.00	93.50	98.38	100.00

Note: This table shows the descriptive statistics, with Panel A summarising firms with CSR committees and Panel B covering the full sample of firms. All continuous variables are winsorised at the 1st and 99th percentiles to adjust for potential outliers. The definitions and measurements of the variables are presented in Appendix A.

5 | Empirical Results and Discussion

5.1 | Descriptive Statistics

Table 3 presents the descriptive statistics for the variables used in this study. Panel A summarises the variables for the sample of CSR committees, while Panel B represents the full sample. As shown in Panel A, the average carbon emission performance (Emissions) of the sample is 64.61, ranging from 0.00 to 99.8, and a standard deviation of 27.45. The data show that the median number of members in the CSR committee (CSRCSIZE) is 4, ranging from 2 to 10 members. The variable for CSR committee independence (CSRCDIND) has a mean value of 80.60%, suggesting that most firms have independent members in their CSR committee. The independence of the CSR committee chairperson (CSRC_CHAIR_IND) is shown to have a mean value of 86% and a standard deviation of 0.35, indicating that most chairpersons in the CSR committee are independent. Finally, the number of meetings held by the CSR committee (CSRCNMEET) has a mean value of 3.96, a median of 4, and a standard deviation of 1.93. This suggests that, on average, the CSR committee holds approximately four meetings annually, with the number of meetings ranging from 1 to 15. Panel B of Table 3 reveals that CSR committees are present in 30% of firms in the sample. This indicates that the majority of firms have not yet adopted this governance practice.

Figure 1 displays the trend in carbon performance across the entire sample, as well as separately for both the high-carbon and low-carbon industries, from 2010 to 2020. It shows that carbon

emission performance increased between 2010 and 2012, then slightly decreased from 2012 to 2015. After 2015, there was a partial recovery, which may be attributed to the implementation of EU Directive 2014/95/EU. This directive represents an international milestone in environmental regulation (Abu Alia et al. 2024; Cuomo et al. 2022; Dwekat et al. 2025; García-Sánchez et al. 2022). The improvement in carbon performance can also be linked to the introduction of the UN Sustainable Development Goals in 2015, aimed at achieving the 17 goals by 2030. Additionally, the figure indicates that carbon performance is significantly higher in carbon-sensitive industries (i.e., basic materials, energy, utilities, and industrials) compared to less carbon-intensive industries. This suggests that firms with higher pollution levels tend to engage more actively in carbon emission reduction strategies and policies.

Figure 2 presents the average carbon emission performance across industries. It shows that firms that operate in energy, real estate, and basic materials have the greatest carbon emission reduction performance compared with other industries. On the other hand, Figure 3 illustrates the average carbon emission performance across countries. It reveals significant disparities, with some countries demonstrating higher averages, likely due to the implementation of stringent environmental regulations and international sustainability commitments. In contrast, other countries exhibit lower averages, indicating the need for stronger regulatory measures and policies. These figures highlight the impact of industry characteristics and national regulations on emission performance outcomes.

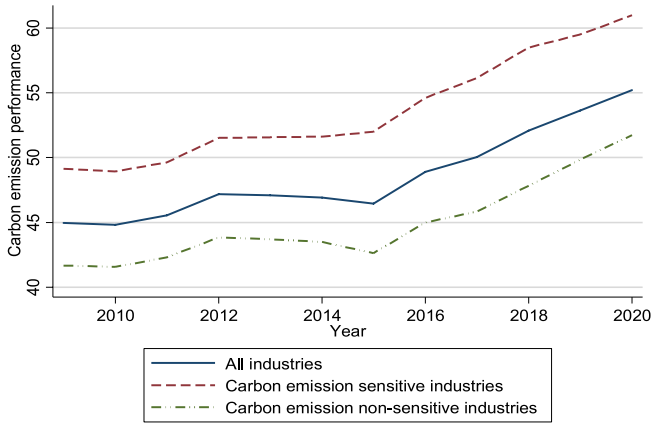

FIGURE 1 | Annual average of carbon emissions performance. [Colour figure can be viewed at wileyonlinelibrary.com]

Table 4 shows the correlation matrix among all independent variables. The figures demonstrate that all the correlation values are below ($r = 0.80$), as Field (2013) proposed. This suggests that the correlation coefficients observed in the dataset do not suggest the presence of multicollinearity concerns (Myers 1990). Furthermore, the Variance Inflation Factor (VIF) test is employed as an additional measure to assess the presence of multicollinearity. As per Gujarati (2022), the acceptable level of VIF is less than 10. Thus, the statistics show that the average VIF between the independent variables is 1.21, which confirms the absence of a multicollinearity issue.

5.2 | Regression Analysis

Table 5 presents the results of the impact of CSR committee presence and its attributes on carbon emission performance. To evaluate these associations, the study first examines the impact of CSR committee presence on carbon emission performance (Model 1). Then, the study uses five distinct models (Models 2 through 5) to test our hypotheses (i.e., investigate CSR committee characteristics). More specifically, the impact of CSR committee size, independence, independent chairman, and number of meetings on carbon emission performance is examined in Model 2, Model 3, Model 4, and Model 5, respectively. After that, in Model 6, we combined all CSR committee factors into an index variable (CSRCINDEX) representing the effectiveness of these factors together using the principal component analysis (PCA) method. This method ensures the absence of measurement problems and multicollinearity issues when multiple related factors are included in one regression model (Johnstone 2001).

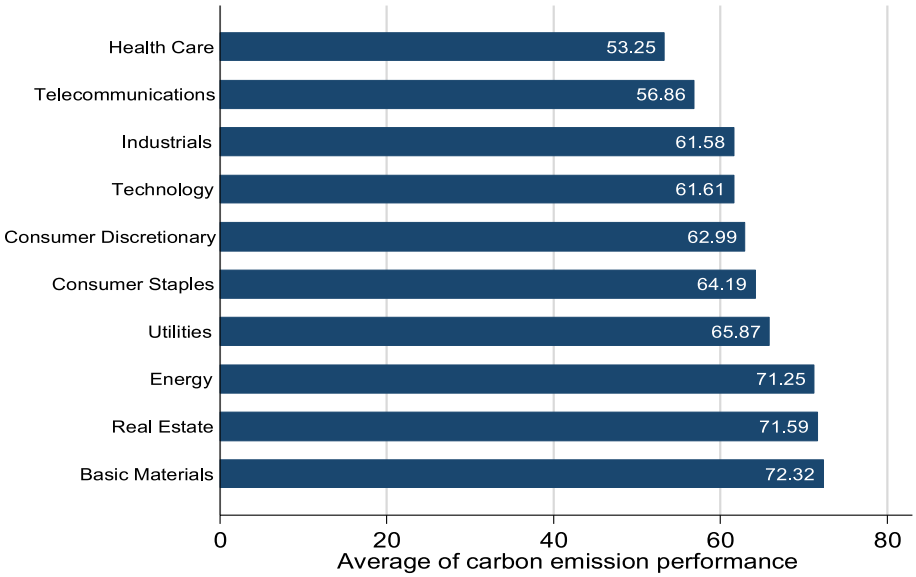

FIGURE 2 | Average carbon emission performance by industry. [Colour figure can be viewed at wileyonlinelibrary.com]

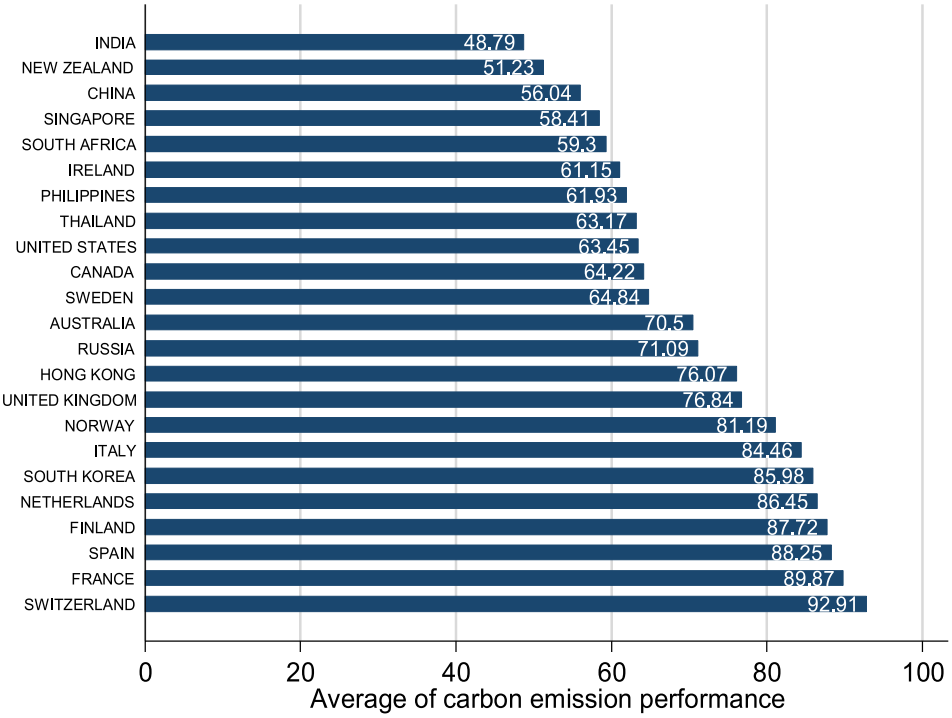

FIGURE 3 | Average carbon emission performance by country. [Colour figure can be viewed at wileyonlinelibrary.com]

The findings show that the presence of a CSR committee has a positive and significant effect on carbon emission performance (coef = 12.102; $p < 0.01$). The outcomes are in line with prior studies (e.g., Godos-Díez et al. 2018; Li et al. 2023). Moreover, these results align with theoretical perspectives on agency and resource dependence. From an agency theory viewpoint, the CSR committee can advance the monitoring role of boards regarding environmental matters, thus enhancing environmental performance, including carbon performance (García-Sánchez et al. 2019; Li et al. 2023). That is, the CSR committee acts as a dedicated monitoring mechanism, offering more focused and effective oversight of managerial decisions on environmental issues compared with the entire board level (Upadhyay et al. 2014). Likewise, based on resource dependence theory, such committees can offer firms resources relevant to CSR (e.g., access to sustainable practices, expertise in environmental stewardship, or connections with stakeholders committed to environmental responsibility) that aid in resolving environmental challenges (Li et al. 2023). Overall, our results suggest that CSR committee are crucial for firms seeking to navigate environmental challenges (i.e., carbon emissions).

Regarding CSR committee characteristics, the findings show a significant and positive relationship between CSR committee size and carbon emission performance (coef = 0.789; $p < 0.01$). Thus, H1 is confirmed. Concerning independence, the results document that carbon emission performance is insignificantly associated with CSR committee independence, while significantly and positively associated with the independence of the CSR committee chairperson (coef = 3.166; $p < 0.05$). Accordingly, H2 is rejected, while H3 is supported. Finally, the CSR committee meeting is significantly and positively influence on carbon emission performance (coef = 0.470; $p < 0.05$). Hence, H4 is accepted.

Our results demonstrate that larger CSR committee are indicative of their capacity to deal with environmental issues and can enhance carbon emission performance. These results are in line with resource dependence theory, which advocates larger size (Pfeffer and Salancik 1978), but not with agency theory, which supports smaller size (Jensen and Meckling 1976). According to resource dependency theory, decision-making can benefit from the varied views and resources of having more directors and CSR committee members (Amran et al. 2014; Pfeffer and Salancik 1978). Moreover, these findings are consistent with previous studies investigating environmental-related issues (Al Natour et al. 2022; De Villiers et al. 2011; Elmaghrabi 2021; Godos-Díez et al. 2018; Gull et al. 2023; Haque 2017; Jarboui et al. 2022; Musallam 2018; Rodrigue 2014; Tauringana et al. 2017).

On the one hand, different to the perspectives of agency theory and resource dependence theory, the outcomes suggest that the independence of the CSR committee members may not be a determinant of carbon emission performance. These findings are consistent with prior studies examining activities related to social responsibility (Peters and Romi 2015; Saeed et al. 2021). On the other hand, the independence of the CSR committee chairperson appears to matter, supporting both agency theory and resource dependence theory. This is in line with previous studies arguing that if the chairman of a committee is independent, their role could be more influential (Ashfaq and Rui 2019), for instance, in addressing social-responsibility-related issues (Appuhami and Tashakor 2017; Elmaghrabi 2021). According to Lutfi et al. (2022), to ensure impartial decisions, efficient task execution, and insightful recommendations, committees must have an independent chairperson. An independent chairman on the CSR committee represents a critical governance mechanism, assisting in oversight and effectively executing environmental strategies. This structure is instrumental in advancing carbon

TABLE 4 | Correlation matrix.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	CSRC	1.000													
2	CSRCSIZE	−0.018	1.000												
3	CSRCDIND	0.014	0.049*	1.000											
4	CSRC_CHAIR_IND	−0.021	0.053*	0.637*	1.000										
5	CSRCNMEET	−0.029	0.073*	0.232*	0.249*	1.000									
6	CSRCINDEX	−0.013	0.165*	0.861*	0.868*	0.522*	1.000								
7	Firm size	−0.035*	0.136*	0.330*	0.186*	0.236*	0.329*	1.000							
8	ROA	−0.004	−0.018	−0.119*	−0.059*	−0.070*	−0.107*	0.094*	1.000						
9	Leverage	0.017	0.067*	0.257*	0.191*	0.158*	0.268*	0.092*	−0.241*	1.000					
10	Firm age	0.018	0.141*	−0.124*	−0.038*	−0.033	−0.074*	0.008	0.143*	−0.173*	1.000				
11	Sales growth	−0.030	−0.050*	−0.049*	−0.044*	−0.032	−0.059*	0.036*	0.169*	−0.102*	−0.101*	1.000			
12	Board size	0.025	0.328*	−0.020	0.025	0.153*	0.077*	0.304*	−0.041*	0.056*	0.147*	−0.037*	1.000		
13	Board diversity	0.134*	0.069*	0.292*	0.231*	0.180*	0.310*	0.198*	−0.078*	0.131*	0.024	−0.092*	0.073*	1.000	
14	Board activism	−0.032	−0.037*	−0.269*	−0.136*	−0.070*	−0.219*	−0.110*	−0.034	−0.099*	−0.019	−0.016	−0.022	0.041*	1.000

Note: This table shows the correlation matrix among independent variables included in the study. All continuous variables are winsorised at the 1st and 99th percentiles to adjust for potential outliers. The definitions and measurements of the variables are presented in Appendix A. *Indicates statistical significance at the 5% level.

TABLE 5 | CSR committee characteristics and carbon emission performance.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CSRC	12.102***					
	(24.83)					
CSRCSIZE		0.789***				
		(2.80)				
CSRCDIND			0.026			
			(0.97)			
CSRC_CHAIR_IND				3.166**		
				(2.02)		
CSRCNMEET					0.470**	
					(1.99)	
CSRCINDEX						1.233**
						(2.26)
Firm size	9.215***	7.106***	7.238***	7.252***	7.212***	7.380***
	(45.72)	(16.48)	(16.59)	(16.76)	(16.75)	(16.96)
ROA	−0.208***	−0.129*	−0.108	−0.159**	−0.103	−0.085
	(−7.37)	(−1.81)	(−1.50)	(−2.19)	(−1.42)	(−1.16)
Leverage	0.071***	0.078**	0.093***	0.129***	0.107***	0.109***
	(5.15)	(2.26)	(2.63)	(3.81)	(3.09)	(3.09)
Firm age	3.896***	2.375***	2.571***	2.656***	2.307***	2.293***
	(17.38)	(4.64)	(4.98)	(5.16)	(4.50)	(4.36)
Sale growth	−0.129***	−0.074***	−0.079***	−0.073***	−0.067***	−0.072***
	(−16.11)	(−3.18)	(−3.32)	(−3.14)	(−2.86)	(−3.03)
Board size	1.388***	1.194***	1.477***	1.315***	1.488***	1.644***
	(15.75)	(5.28)	(6.49)	(6.05)	(6.70)	(7.18)
Board diversity	0.188***	0.298***	0.320***	0.291***	0.302***	0.317***
	(9.30)	(5.99)	(6.36)	(6.03)	(6.03)	(6.24)
Board activism	0.069**	0.101*	0.096	0.096*	0.083	0.088
	(2.48)	(1.77)	(1.63)	(1.65)	(1.42)	(1.48)
Constant	−136.508***	−93.180***	−98.561***	−96.473***	−95.772***	−99.837***
	(−36.42)	(−11.85)	(−12.11)	(−12.30)	(−12.17)	(−12.62)
Year FF	Yes	Yes	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes	Yes	Yes
Country FF	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,223	3143	3010	3189	3056	2888
Adj. *R*-square	0.413	0.311	0.317	0.306	0.317	0.321
F statistics *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Note: This table shows the effects of CSR committee characteristics on carbon emissions using the two-way cluster approach.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

emission performance, as it positions the independent chairman to champion and scrutinise sustainable practices. Such independence aligns with shareholder aspirations for long-term value and environmental stewardship, reinforcing the premise of agency theory regarding the role of governance mechanisms in enhancing organisational performance and accountability (Donaldson and Davis 1991; Hill and Jones 1992; Jensen and Meckling 1976).

For CSR committee meetings, the findings show that the frequency of meetings can improve corporate performance regarding carbon emissions. These results support agency and resource dependence theoretical perspectives and are consistent with prior literature regarding sustainability-related practices (Elmaghrabi 2021; Martínez-Ferrero and García-Sánchez 2017). From the agency theoretical perspective, previous studies argue that meeting frequency helps overcome agency-related issues (Lipton and Lorsch 1992; Ofoegbu et al. 2018; Xie et al. 2003). Thus, it can be argued that CSR committee meetings are an effective tool for controlling management practices regarding, for instance, carbon performance. The CSR committee, rather than board members or other committees, directly oversees sustainability and environmental matters. Similarly, the resource dependency theory states that more frequent meetings allow the sharing of ideas and knowledge (Aliyu 2019), delivering important information (Naseem et al. 2017), and debating possible plans for the future. According to Jarboui et al. (2022) and Matta et al. (2022), actively engaging in the CSR committee is a common way to achieve greater CSR performance. Thus, CSR committee meetings are expected to be crucial for companies trying to enhance their carbon performance.

Finally, Model 6 uses principal component analysis in a proxy manner to assess the effectiveness of the CSR committee. The results reveal a positive and statistically significant effect on carbon emissions performance. This result confirms the previously mentioned patterns and emphasises the critical role that CSR committee qualities play in shaping and improving environmental sustainability. More specifically, CSRCINDEX has a positive and significant influence on carbon emission performance (coef = 1.233; $p < 0.05$).

Regarding the economic significance of CSR committee characteristics, our results show that a one standard deviation (SD) increase in CSRC, CSRCSIZE, CSRCDIND, CSRC_CHAIR_IND, CSRCNMEET, and CSRCINDEX leads to an increase of 2.25% ((12.102*0.12)/64.61), 1.66% ((0.789*1.36)/64.61), 1.04% ((0.026*25.88)/64.61), 1.72% ((3.166*0.35)/64.61), 1.40% ((0.47*1.93)/64.61), and 2.37% ((1.233*1.24)/64.61), respectively, in the mean value of 'Emiss_perf.'

TABLE 6 | CSR committee characteristics and carbon emission performance (2014–2020).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CSRC	11.557***					
	(20.21)					
CSRCSIZE		0.879***				
		(3.07)				
CSRCDIND			0.028			
			(1.02)			
CSRC_CHAIR_IND				3.167**		
				(2.00)		
CSRCNMEET					0.451*	
					(1.89)	
CSRCINDEX						1.252**
						(2.29)
Constant	−133.051***	−95.423***	−100.303***	−98.524***	−97.426***	−101.432***
	(−29.83)	(−11.88)	(−12.11)	(−12.32)	(−12.15)	(−12.58)
Control variables	Included	Included	Included	Included	Included	Included
Year FF	Yes	Yes	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes	Yes	Yes
Country FF	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,161	2289	2243	2422	2376	2826
Adj. *R*-square	0.401	0.310	0.315	0.305	0.317	0.320
F statistics *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Note: This table shows the effects of CSR committee characteristics on carbon emissions using the two-way cluster approach.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

TABLE 7 | Sensitive analysis: CSR committee characteristics and carbon emission performance (including Hofstede's cultural dimensions).

	Model 1	Model 2	Model 3	Model 4	Model 5
CSRCSIZE	1.005***				
	(3.22)				
CSRCDIND		0.027			
		(0.84)			
CSRC_CHAIR_IND			5.441***		
			(2.95)		
CSRCNMEET				0.570**	
				(2.31)	
CSRCINDEX					2.104***
					(3.31)
PDI	−0.444***	−0.374***	−0.230**	−0.448***	−0.368***
	(−6.05)	(−4.13)	(−2.56)	(−6.34)	(−3.93)
IDV	−0.253***	−0.288***	−0.248***	−0.187***	−0.241***
	(−4.50)	(−4.29)	(−3.68)	(−3.33)	(−3.46)
MAS	0.090*	0.152***	0.066	0.120**	0.151**
	(1.80)	(2.79)	(1.15)	(2.46)	(2.25)
UAI	0.199***	0.194***	0.120***	0.159***	0.146***
	(4.88)	(4.27)	(2.71)	(3.85)	(2.98)
LTOWVS	0.438***	0.443***	0.427***	0.452***	0.494***
	(9.28)	(8.83)	(8.30)	(9.62)	(9.55)
IVR	0.065	0.111	0.167	−0.030	0.007
	(0.78)	(0.99)	(1.49)	(−0.37)	(0.07)
Constant	−109.751***	−118.599***	−125.254***	−110.688***	−113.497***
	(−10.49)	(−10.06)	(−10.19)	(−10.77)	(−9.28)
Control variables	Included	Included	Included	Included	Included
Year FF	Yes	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes	Yes
Country FF	No	No	No	No	No
Observations	3143	3010	3189	3056	2888
Adj. *R*-square	0.328	0.330	0.325	0.329	0.335
F statistics *p*-value	0.000	0.000	0.000	0.000	0.000

Note: This table shows the effects of CSR committee characteristics on carbon emissions with including Hofstede's cultural dimensions, using the two-way cluster approach.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Referring to Table 2, Panel C, a significant increase in the number of observations post-2013 is evident, potentially skewing the outcomes. Consequently, the analysis in Table 6 is deliberately narrowed to the period from 2014 to 2020. This focused approach reinforces the consistency of the main findings across the entire sample, ensuring a robust examination of the trends identified. Accordingly, the findings reported in Table 6 are consistent with those in Table 5.

5.3 | Sensitive Analyses

5.3.1 | Cultural Dimensions

Several studies (e.g., Dwekat et al. 2022; Meqbel et al. 2024; Pattak et al. 2023; Simoni et al. 2020) suggest that country-level elements, such as legal enforcement, legal systems, the sociocultural backdrop, and cultural aspects, influence firms' decisions

TABLE 8 | Robustness check: CSR committee characteristics and carbon emission performance (including CSR sensitive industry factor).

	Model 1	Model 2	Model 3	Model 4	Model 5
CSRCSIZE	0.847***				
	(2.93)				
CSRCDIND		0.008			
		(0.29)			
CSRC_CHAIR_IND			2.721*		
			(1.67)		
CSRCNMEET				0.536**	
				(2.16)	
CSRCINDEX					1.009*
					(1.75)
CSRSIND	5.317***	5.873***	5.052***	6.074***	5.787***
	(5.81)	(6.29)	(5.60)	(6.63)	(6.07)
Constant	−87.575***	−90.833***	−88.667***	−90.561***	−92.995***
	(−11.11)	(−11.03)	(−11.22)	(−11.45)	(−11.63)
Control variables	Included	Included	Included	Included	Included
Year FF	Yes	Yes	Yes	Yes	Yes
Industry FF	No	No	No	No	No
Country FF	Yes	Yes	Yes	Yes	Yes
Observations	3143	3010	3189	3056	2888
Adj. *R*-square	0.277	0.282	0.271	0.281	0.284
F statistics *p*-value	0.000	0.000	0.000	0.000	0.000

Note: This table shows the effects of CSR committee characteristics on carbon emissions, including CSR sensitive industry factor using the two-way cluster approach.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

to engage in social and environmental activities. In this context, cultural characteristics introduced by Hofstede (2011) (i.e., power distance [PDI], individualism vs. collectivism [IDV], masculinity vs. femininity [MAS], uncertainty avoidance [UAI], long-term orientation vs. short-term orientation [LTOWVS], and indulgence vs. restraint [IVR])[5] were used as proxies for country indicator variables. According to Khlif et al. (2015), national culture can affect a country's business and government institutions, and the relationship between institutions and culture affects environmental sustainability. Based on this, we propose that cultural factors could influence carbon emission performance. Accordingly, after substituting the country dummy variables with the cultural dimensions, the results presented in Table 7 show that the relationships between CSR committee characteristics and carbon emission performance are consistent with the main results reported in Table 5.

In terms of the impact of cultural dimensions on carbon emission performance, the findings indicate that Power Distance (PDI) and Individualism (IDV) are negatively and significantly associated with carbon emission performance, whereas Masculinity (MAS), Uncertainty Avoidance (UAI), and Long-Term Orientation versus Short-Term Normative Orientation (LTOWVS) have a positive and significant influence on carbon emission performance. Husted (2005) suggested that cultures with higher power distances and greater respect for authority tend to have less capacity for debate and limited awareness of sustainability issues. Consequently, managers from societies with wider power distances are more narcissistic and use their power to prioritise their self-interests and thus pay less attention to social and environmental matters (Lin et al. 2019; Waldman et al. 2006).

Moreover, systems that protect individual rights are well-developed in individualistic societies, and thus, stakeholders are less interested in achieving objectives that are not their own (Peng and Lin 2009). In the same vein, firms in highly individualistic cultures tend to pay less attention to employees, the environment, and the community (Pucheta-Martínez and Gallego-Álvarez 2020; Thanetsunthorn 2015), which results in poorer carbon emission performance.

It is argued that climate change is linked with high levels of uncertainty, and uncontrolled climate change may lead to fluctuations in temperature, resulting in extreme weather, increasing sea levels, and other undesirable consequences. Societies with higher uncertainty avoidance tend to be more risk-averse (Riddle 1992) and could feel uncomfortable with the

TABLE 9 | Robustness check: CSR committee characteristics and carbon emission performance (Heckman two-stage).

	Model 1	Model 2	Model 3	Model 4	Model 5
CSRCSIZE	0.823***				
	(2.74)				
CSRCDIND		0.020			
		(0.89)			
CSRC_CHAIR_IND			2.652**		
			(2.05)		
CSRCNMEET				0.413**	
				(1.98)	
CSRCINDEX					1.235***
					(2.62)
Firm size	8.553***	8.498***	9.801***	8.577***	8.617***
	(21.34)	(20.64)	(27.26)	(21.03)	(20.74)
ROA	−0.251***	−0.223***	0.395***	−0.230***	−0.198***
	(−3.90)	(−3.39)	(6.30)	(−3.53)	(−3.02)
Leverage	0.115***	0.110***	0.062**	0.125***	0.124***
	(3.77)	(3.52)	(2.08)	(4.05)	(3.94)
Firm age	2.039***	2.013***	2.079***	2.085***	1.768***
	(4.34)	(4.22)	(4.60)	(4.46)	(3.70)
Sale growth	−0.070***	−0.077***	−0.044**	−0.066***	−0.071***
	(−3.47)	(−3.77)	(−2.29)	(−3.31)	(−3.45)
Board size	0.949***	1.383***	1.047***	1.188***	1.485***
	(5.01)	(7.17)	(5.72)	(6.46)	(7.64)
Board diversity	0.312***	0.342***	0.331***	0.338***	0.343***
	(8.18)	(8.34)	(8.64)	(8.71)	(8.27)
Board activism	0.159***	0.163***	0.109**	0.145***	0.139***
	(3.15)	(3.14)	(2.20)	(2.82)	(2.67)
CSRSCON	3.239***	3.510***	2.293**	3.578***	5.143***
	(3.14)	(2.77)	(2.09)	(3.45)	(4.03)
GDP	−2.188***	−2.262***	−2.414***	−2.156***	−2.464***
	(−5.88)	(−5.75)	(−6.74)	(−5.78)	(−6.34)
GDP growth	−1.490***	−1.367***	−1.080***	−1.345***	−1.144***
	(−6.47)	(−5.68)	(−4.60)	(−5.73)	(−4.57)
Constant	−33.824**	−30.041**	−49.866***	−32.805**	−24.719*
	(−2.44)	(−2.09)	(−3.63)	(−2.33)	(−1.69)
CSRC	2.966***	3.098***	2.927***	2.890***	3.093***
	(58.85)	(53.18)	(58.82)	(60.15)	(52.15)
Constant	−2.346***	−2.504***	−2.330***	−2.289***	−2.521***
	(−51.02)	(−46.01)	(−51.54)	(−52.79)	(−45.45)

(Continues)

TABLE 9 | (Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5
IMR	−3.272**	−5.464***	−4.362***	−3.963***	−6.138***
	(−2.08)	(−2.91)	(−2.87)	(−2.58)	(−3.23)
Year FF	Yes	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes	Yes
Country FF	No	No	No	No	No
Observations	18,223	18,223	18,223	18,223	18,223
Censored obs.	15,080	15,213	15,034	15,167	15,335
Uncensored obs.	3143	3010	3189	3056	2888
Pseudo *R*-square	0.573	0.584	0.567	0.563	0.582
Wald Chi2 *p*-value	0.000	0.000	0.000	0.000	0.000

Note: This table shows the effects of CSR committee characteristics on carbon emissions using the Heckman two-stage method.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

unpredictable consequences of climate change. Accordingly, they employ practical measures and strategies to mitigate these unintended consequences (Wang et al. 2021). Finally, national cultures with a long-term orientation are more concerned with economic growth and environmental quality, while those with a short-term orientation place greater value on their social traditions (Hofstede 2011).

5.3.2 | CSR Sensitive Industries

To control for the influence of each industry, we categorised firms based on whether they are CSR-sensitive or non-CSR-sensitive (Cadez et al. 2019; Dwekat et al. 2022). Following Simnett et al. (2009), firms in the basic materials, energy, utilities, and industrials are classified as CSR-sensitive because they are presumed to be more motivated to present a positive public perception, and their activities have a greater impact on the environment (Al-Shaer and Zaman 2018). Consistent with previous studies, our results in Table 8 show that CSR sensitivity (CSRSIND) positively and significantly influences carbon emission performance. This finding indicates that CSR-sensitive firms tend to reduce carbon emissions strategically. Regarding the relationship between CSR committee characteristics and carbon emission performance, we restated the hypotheses after controlling for CSR-sensitive industry influence. Table 8, therefore, shows that the main variables' associations remain consistent with our previous findings reported in Table 5.

5.4 | Robustness Check

5.4.1 | Alternative Regression Approaches

The endogeneity issue is a common concern in CG and CSR research due to various reasons, such as omitted variables, reverse causality, and sample selection (Abweny, Afrifa, et al. 2025; Liu et al. 2021; Ullah et al. 2021). Following previous studies (Ahmed et al. 2024; Chen et al. 2017; Gull et al. 2023), we address these concerns by employing two alternative regression approaches: the Heckman Two-stage Least Squares approach and the Two-Stage Least Squares (2SLS) approach.

5.4.1.1 | Heckman Two-Stage Least Squares Approach. The Heckman approach is employed to address sample selection bias (Heckman 1979; Marquis and Qian 2014). In the first stage, we estimate the likelihood of a CSR committee's existence using our full sample ($N = 18{,}223$). This selection model enables us to predict the Inverse Mills Ratio (IMR), which represents the probability of a firm establishing a CSR committee. The results from stage one, reported in Table 9, show that the coefficients for the IMR are consistently significant. Therefore, in line with Sauerwald and Su (2019) and Ahmed et al. (2024), we include the IMR in the second stage to address sample-induced endogeneity (Marquis and Qian 2014; Su and Tsang 2015). In the second stage, we re-estimate the impact of CSR committee characteristics on carbon emission performance, incorporating the control variables from Equation (1) along with the IMR estimated in stage 1. The results of the Heckman approach in Table 9 are in line with our main findings in Table 5. This consistency provides more validity that our results are not affected by sample selection bias.

5.4.1.2 | Two-Stage Least Squares (2SLS) Approach. Our results could be influenced by omitted variables. For instance, carbon emission performance may be impacted by unobserved factors such as CEO characteristics and ownership structure, which could introduce bias into our findings (Hossain, Masum, et al. 2023; Hossain, Saadi, et al. 2023). Moreover, the issue of reverse causality may impact our findings. It is possible that firms with strong and diverse CSR committees enhance their carbon emission performance, while firms with superior carbon emission performance may also be more inclined to form robust and diverse CSR committees. These endogeneity issues (omitted variables and reverse causality) can be addressed using the 2SLS approach (Ahmed et al. 2024; Gull et al. 2023). However, applying the 2SLS approach requires selecting an appropriate instrumental variable that is directly related to the independent variables but does not influence the dependent variable. Following previous studies (Boubakri et al. 2018), we

TABLE 10 | Robustness check: CSR committee characteristics and carbon emission performance (2SLS).

	Model 1	Model 2	Model 3	Model 4	Model 5
CSRCSIZE	2.851***				
	(2.81)				
CSRCDIND		0.026			
		(0.55)			
CSRC_CHAIR_IND			7.191**		
			(2.44)		
CSRCNMEET				0.829**	
				(2.24)	
CSRCINDEX					1.783**
					(2.03)
Firm size	8.243***	8.299***	9.687***	8.080***	8.253***
	(21.58)	(20.86)	(27.17)	(20.38)	(20.59)
ROA	−0.345***	−0.309***	0.357***	−0.323***	−0.285***
	(−4.78)	(−4.30)	(5.44)	(−4.45)	(−3.95)
Leverage	0.102***	0.107***	0.019	0.114***	0.128***
	(3.06)	(3.14)	(0.57)	(3.36)	(3.76)
Firm age	1.052**	1.396***	1.444***	1.473***	1.218**
	(2.01)	(2.75)	(2.97)	(2.93)	(2.37)
Sale growth	−0.068***	−0.073***	−0.039*	−0.063***	−0.067***
	(−2.89)	(−3.10)	(−1.76)	(−2.69)	(−2.80)
Board size	0.498*	1.215***	0.833***	1.047***	1.310***
	(1.94)	(6.16)	(4.38)	(5.61)	(6.66)
Board diversity	0.286***	0.296***	0.287***	0.294***	0.297***
	(7.35)	(6.69)	(6.91)	(7.37)	(6.66)
Board activism	0.208***	0.227***	0.147***	0.221***	0.210***
	(3.81)	(4.09)	(2.72)	(4.02)	(3.76)
CSRSCON	3.962***	3.184*	3.189**	3.436***	5.540***
	(3.58)	(1.89)	(2.43)	(3.51)	(3.55)
GDP	−1.979***	−2.148***	−2.180***	−1.956***	−2.383***
	(−5.01)	(−4.94)	(−5.80)	(−4.96)	(−5.86)
GDP growth	−1.702***	−1.549***	−1.130***	−1.492***	−1.306***
	(−7.10)	(−6.05)	(−4.49)	(−5.97)	(−4.96)
Constant	−39.530***	−36.884**	−59.343***	−36.489**	−27.465*
	(−2.67)	(−2.43)	(−4.00)	(−2.43)	(−1.75)
Year FF	Yes	Yes	Yes	Yes	Yes
Industry FF	No	No	No	No	No
Country FF	No	No	No	No	No
Observations	3143	3010	3189	3056	2888
Centred *R*-square	0.231	0.246	0.306	0.237	0.253
Underidentification test *p*-value	0.000	0.000	0.000	0.000	0.000
K-Paap (Cragg-Donald) *F* statistic	172.145	623.856	373.942	493.412	594.790
Overidentification (Hansen *J*-statistics)	Yes	Yes	Yes	Yes	Yes

Note: This table shows the effects of CSR committee characteristics on carbon emissions using the 2SLS method.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

use the country-industry average of CSR committee characteristics as an instrumental variable. This variable is appropriate because it is directly related to CSR committee characteristics but does not have a relationship with carbon emission performance. Table 10 presents the results of the 2SLS, which are also in line with our main results reported in Table 5. This provides robustness to our study's findings, suggesting that endogeneity issues do not influence them. In Table 10,

TABLE 11 | Robustness check: CSR committee characteristics and carbon emission performance (alternative measure of carbon emission performance).

	Model 1	Model 2	Model 3	Model 4	Model 5
CSRCSIZE	0.057***				
	(4.18)				
CSRCDIND		0.002			
		(1.37)			
CSRC_CHAIR_IND			0.206***		
			(3.15)		
CSRCNMEET				0.086*	
				(1.90)	
CSRCINDEX					0.102***
					(4.12)
Firm size	0.348***	0.375***	0.341***	0.341***	0.341***
	(16.49)	(17.42)	(16.67)	(15.93)	(16.08)
ROA	−0.012***	−0.014***	−0.012***	−0.009***	−0.008***
	(−3.80)	(−4.51)	(−4.05)	(−2.81)	(−2.72)
Leverage	0.004***	0.006***	0.006***	0.005***	0.005***
	(2.93)	(4.17)	(3.99)	(3.42)	(3.39)
Firm age	0.095***	0.181***	0.118***	0.104***	0.115***
	(4.05)	(6.93)	(5.10)	(4.41)	(4.79)
Sale growth	−0.006***	−0.007***	−0.006***	−0.006***	−0.006***
	(−6.13)	(−7.09)	(−6.40)	(−6.07)	(−6.43)
Board size	0.045***	0.052***	0.051***	0.052***	0.051***
	(4.72)	(5.27)	(5.71)	(5.34)	(5.28)
Board diversity	0.008***	0.010***	0.007***	0.008***	0.009***
	(3.82)	(4.57)	(3.37)	(3.70)	(3.79)
Board activism	0.007***	0.005**	0.008***	0.006**	0.006**
	(2.88)	(2.00)	(3.38)	(2.53)	(2.51)
Constant	−2.090***	−2.855***	−2.106***	−1.908***	−1.846***
	(−5.71)	(−7.27)	(−5.81)	(−5.06)	(−5.00)
Year FF	Yes	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes	Yes
Country FF	Yes	Yes	Yes	Yes	Yes
Observations	3143	3010	3189	3056	2888
Adj. *R*-square	0.374	0.378	0.354	0.358	0.368
F statistics *p*-value	0.000	0.000	0.000	0.000	0.000

Note: This table shows the effects of CSR committee characteristics on carbon emissions using the two-way cluster approach.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

the weak identification test (Kleibergen-Paap) reveals that the *F*-statistic significantly exceeds the critical value recommended by Stock et al. (2002). This result ensures the validity of our instrumental variables.

5.4.2 | An Alternative Measure of Carbon Emission Performance

In our main model, data for carbon emission performance scores have been readily collected from Refinitiv Eikon. Several studies, however, proposed other proxies for carbon emissions performance. Busch and Hoffmann (2011), for instance, employ two different indicators of carbon emission performance: carbon management strategies (e.g., processes, strategies, and policies) as a process-oriented measure and greenhouse gas (GHG) emissions as an outcome-oriented measure. They describe carbon management strategies as internal initiatives and response options on environmental concerns instead of actual emissions.

In this regard, Delmas et al. (2013) suggest that process-oriented dimensions of environmental performance contribute positively to reducing future environmental effects, while outcome-oriented performance relates to actual negative releases or emissions harmful to the environment. Further studies suggest that strategies and policies focusing on preventing carbon emissions are more effective than those primarily addressing actual GHG emissions after their occurrence. Therefore, arguments based on agency theory favour rewarding managers who implement emission prevention strategies over those focusing on end-of-pipe outcomes (Berrone and Gomez-Mejia 2009).

Based on the above discussion, we re-examined the study's hypotheses using a process-oriented carbon emission performance measure, utilising an index developed by (Haque 2017). This index represents several firm-specific activities addressing climate change and GHG emissions. More specifically, it consists of eight questions, with a value of 1 being assigned if the answer is yes and zero otherwise.[6] A higher score reflects a greater level of climate emission-related involvement by a firm. Accordingly, the results reported in Table 11 are consistent with our main results in Table 5.

6 | Conclusion

Growing concern about global warming has increased the pressure on firms to set carbon reduction plans and targets to mitigate their carbon footprint (Widyawati 2020). Previous studies examining the impact of firm-level environmental initiatives on carbon emission performance (e.g., Elsayih et al. 2021; Haque 2017; Wang et al. 2019) have overlooked the role that a CSR committee could play in environmental initiatives. According to Aguilera et al. (2021) and Velte and Stawinoga (2020), firms may enhance their environmental performance by having a board committee dedicated to sustainability matters. In this study, therefore, we aim to fill the gap in the literature and provide robust evidence of the influence of CSR committee characteristics (namely, size, independence, chairperson independence, and the number of meetings) on carbon emission performance.

Using a sample of non-financial firms listed in the Bloomberg World Large and Mid-Cap Index from 2010 to 2020, our cross-country evidence indicates that the presence of a CSR committee significantly and positively impacts carbon emission performance. This highlights the crucial role of the CSR committee in supporting and overseeing environmental activities, particularly in managing carbon emissions. Regarding the composition of the CSR committee, the findings reveal that a larger committee size, chairperson independence, and meeting frequency significantly enhance carbon emission performance, while committee independence does not have a significant effect. Finally, employing the principal component analysis to evaluate the effectiveness of the various components of the CSR committee, the results reveal a positive and significant impact on carbon emission performance. Our outcomes remain robust after conducting various sensitivity tests, including replacing country dummies with cultural dimensions and controlling for CSR-sensitive industries. Additionally, we employed alternative regression methods, such as the Heckman two-stage approach and the Two-Stage Least Squares (2SLS) approach, to further validate our findings.

Our findings have significant implications for multiple stakeholders. For management teams, the threat of global warming is a worldwide concern, with all stakeholders increasingly recognising its consequences. Establishing a CSR committee can allow firms to engage with this governance and social movement. Therefore, our research is likely to interest boards of directors, suggesting that forming a well-structured CSR committee is a strategic approach to enhancing their companies' environmental awareness. Additionally, firms need to ensure the independence of the CSR committee chairman to maintain its effectiveness.

Still, our study has some limitations that could be addressed in future studies. First, due to data availability, this study focuses only on four CSR committee attributes, namely CSR committee size, independence, chairperson independence, and meeting frequency. Future studies could explore additional characteristics, such as gender diversity, nationality, educational level, and CSR committee expertise, which could influence firms' strategies and decisions to reduce carbon emissions. Second, the current study relies on the carbon emission performance score provided by the Refinitiv Eikon database, which was commonly used in previous research. However, future studies could further examine the impact of CSR committee characteristics on carbon emission disclosures using data from the Carbon Disclosure Project (CDP).

Third, while this study employs multiple regression analysis to account for endogeneity problems, it has been noted that recent studies apply Fuzzy-set Qualitative Comparative Analysis (Fs-QCA) due to its ability to handle complexity and nuance in causal relationships, which are commonly present in social scientific research. Furthermore, Fs-QCA allows for the simultaneous examination of multiple causal paths, providing a more comprehensive understanding of the underlying mechanisms driving a phenomenon (Mardawi et al. 2023). Researchers are invited to explore this methodology when examining the impact of CSR committee characteristics on carbon performance.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Endnotes

[1] It is worth noting that the CSR committee is often labelled under various titles while retaining similar responsibilities, including sustainability committee, environmental committee, social committee, health and safety committee, ethics committee, and sustainable development committee (Elmaghrabi 2021).

[2] Carbon emission performance, as measured by Refinitiv's emissions score, represents a percentile ranking that evaluates a company's commitment and effectiveness in reducing environmental emissions across its production and operational practices, benchmarked against industry peers. A higher score indicates a stronger focus on minimising carbon emissions. Please refer to Appendix A for variable definitions.

[3] For further details, please refer to Section 5.4.

[4] Appendix A provides a detailed description of these eight variables.

[5] Refer to Appendix A for definitions of variables.

[6] Refer to Appendix A for further details.

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Appendix A

Definitions of the Variables

Variable	Definition	Source
Dependent variable		
Carbon emission performance (Emiss_perf.)	The emission category score measures a company's commitment and effectiveness towards reducing environmental emissions in the production and operational processes. The higher the score the more initiative and efforts to reduce carbon emission performance.	Refinitiv Eikon
An alternative measure of carbon emission performance	Following Haque (2017), this variable is calculated by adding 1 if the answer is yes to questions 1 to 8 and 0; otherwise, it is (1) Does the company have processes in place to improve its energy efficiency? (2) Does the company evaluate the commercial risks and/or opportunities in relation to climate change? (3) Does the company report on initiatives to reduce, substitute, or phase out ozone-depleting (CFC-11 equivalents, chlorofluorocarbon) substances? (4) Does the company make use of renewable energy? (5) Does the company report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances? (6) Does the company show an initiative to reduce, reuse, recycle, substitute, phased out or compensate CO_2 equivalents in the production process? (7) Does the company report on initiatives to recycle, reduce, reuse or phase out fluorinated gases such as HFCs (hydrofluorocarbons), PFCs (perfluorocarbons) or SF6 (sulphur hexafluoride)? (8) Does the company engage any emissions trading initiative?	Refinitiv Eikon
Independent variables		
CSRC	The dummy variable equal to 1 if the firm had a CSR, or equivalent, committee that report to the board and 0 otherwise.	Bloomberg
CSRCSIZE	Number of directors on the firm's CSR, or equivalent, committee.	Bloomberg
CSRCDIND	Percentage of independent CSR, or equivalent, committee members of the total size of the firm's CSR committee.	Bloomberg
CSRC_CHAIR_IND	The dummy variable is equal to 1 if the chairperson of the firm's CSR, or equivalent, committee is independent and zero otherwise.	Bloomberg
CSRCNMEET	Number of CSR, or equivalent, meetings.	Bloomberg
CSRCINDEX	A proxy of CSR committee effectiveness was estimated using principal component analysis (PCA).	Authors' estimation
Control variables		
Firm size	Natural logarithm of total assets.	Refinitiv Eikon
ROA	The Ratio of net income to total assets.	Refinitiv Eikon
Leverage	The ratio of long-term debt to total assets.	Refinitiv Eikon
Firm age	Natural logarithm of the number of years since listing.	Refinitiv Eikon
Sales growth	The percentage increase in a firm's total revenue during a certain time frame.	Refinitiv Eikon
Board size	Number of board members.	Refinitiv Eikon
Board diversity	Percent of women on board of directors.	Refinitiv Eikon
Board activism	Percentage of board meetings attendances of board members.	Refinitiv Eikon
CSR sensitive Industries	A dummy variable is set to 1 for firms belonging to industries sensitive to CSR and 0 for those in industries less concerned with CSR.	Simnett et al. (2009).
IMR ratio	The inverse Mills ratio is estimated from the Heckman two-stage method.	Authors' estimation
Hofstede's cultural dimensions		
PDI	Hofstede's Power Distance Index ranges from 0 to 100. A higher index score indicates a larger power distance between individuals. This cultural dimension measures the degree to which the less powerful members of organisations and institutions accept and expect that power is distributed unequally.	Hofstede (2011)
IDV	Hofstede's Individualism Index. This dimension measures the extent to which individuals are combined into groups.	Hofstede (2011)

Variable	Definition	Source
MAS	Masculinity/Femininity dimension Index. This dimension indicates that a masculine culture is driven by competition, achievement and success, with success being defined by the 'best-in the field'. A low score means that the dominant values in the feminine society consist of caring for others and quality of life.	Hofstede (2011)
UAI	Hofstede's Uncertainty Avoidance Index spans from 0 to 100, with a higher score indicating a greater tendency to avoid uncertainty. This dimension assesses how cultures condition their members to either embrace or feel uneasy in situations that lack structure.	Hofstede (2011)
LTOWVS	Hofstede's Long-Term Orientation score reflects the firm's home country's cultural inclination. It gauges how much a society values forward-thinking virtues, such as persistence and adaptability, with an emphasis on future rewards over immediate results.	Hofstede (2011)
IVR	The Indulgence versus Restraint index measures a society's approach to joy and fulfilment. Indulgent societies freely satisfy basic desires, focusing on enjoying life, while restrained societies limit these desires with strict norms. Indulgent cultures feel in control of their lives and emotions; restrained ones see external factors as controlling them. A higher Indulgence index indicates a society that prioritises free gratification of desires and values enjoyment of life.	Hofstede (2011)