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International Cooperation and Corporate Strategies: Accelerating Corporate Energy Transitions in Emerging Economies

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ABSTRACT

Driven by the growing focus on decarbonisation and energy economic dynamics in emerging economies, this study examines the interplay between executive compensation (EC), sustainability-based compensation (SBC), board sustainability committee initiative (BSCI), corporate energy transition initiatives (CETIs), corporate carbon emissions (CCEs) and firm performance (FP) using a multi-theoretical framework. Analysing a panel dataset from 13 emerging economies spanning 2002–2022, we find that SBC positively influences CETIs, while EC has no significant effect. Our results also show that EC and SBC do not impact CCE. BSCI positively affects CETIs but has no significant influence on CCE. Additionally, BSCI moderates the relationship between EC and CCE, highlighting the critical role of governance structures. While CETIs are associated with low FP, CCE appears to have no direct impact on FP. These findings vary across business operating periods and remain robust under alternative measures, addressing potential endogeneities and sample selection bias. The results provide insights for policy makers and practitioners aiming to enhance sustainability practices in emerging economies.

1 | Introduction

The global transition towards sustainable energy sources is imperative to combat climate change and its far-reaching impacts (Banerjee et al. 2024). Indeed, the escalating challenge of global climate change, highlighted by rising carbon emissions, has placed corporations at the forefront of global efforts towards environmental sustainability (Albitar et al. 2023; Kolk 2016). The urgency to mitigate these emissions has spurred governments and stakeholders to demand greater accountability and proactive engagement from international cooperation in climate change mitigation strategies (Backman et al. 2017; Pisani et al. 2017). For instance, according to Chaudhry et al. (2023) and Orazalin et al. (2024), international organisations and countries have implemented strategies and procedures to address issues relating to climate change. The 2015 Paris Agreement, the SDGs and the 1997 Kyoto Protocol are key international agreements aimed at accelerating energy transition and reducing carbon emissions (Luo and Tang 2021). Noticeably, business organisations face pressure from shareholders and investors to identify climate change consequences and reduce carbon emissions in response to the threat of global warming (Orazalin et al. 2024; Morrison et al. 2024).

Although there is growing research on corporate decarbonisation, most studies focus on developed economies with mature

regulatory systems and stable institutions (Dahlmann et al. 2019; Clarkson et al. 2015). By contrast, emerging economies characterised by weaker institutions, regulatory fragmentation and resource constraints remain significantly under-researched (Bhuiyan et al. 2025; Saa et al. 2025). Scholars such as Aqeeq et al. (2023) and Wang et al. (2023) stress that emerging economies, characterised by accelerated industrialisation and economic growth, play a critical role in the global energy transition. In these settings, regions such as Southeast Asia, Sub-Saharan Africa and Latin America face multifaceted issues in balancing the need for accelerated economic development with the environmental imperative to reduce carbon emissions. This struggle is further complicated by limited financial resources, technology gaps and fragmented or developing regulatory infrastructures (Saa et al. 2025). At the same time, these economies have the prospect to leapfrog traditional carbon-intensive growth paths by adopting more sustainable development models (Zhong et al. 2024).

Despite these unique dynamics, limited research exists on how firms in emerging markets are navigating decarbonisation pressures or how internal corporate governance (CG) mechanisms shape their energy transition responses. Most existing studies (e.g., Saa et al. 2025; Bhuiyan et al. 2025; Kılıç et al. 2021; Bhuiyan et al. 2025) provide little insight into how governance tools such as executive compensation (EC), board structures and sustainability-based incentives operate in complex and often volatile institutional contexts. This presents a critical research gap, especially as institutional pressures, governance reforms, and environmental challenges continue to diverge significantly across national boundaries. This presents a critical research gap, especially as institutional pressures, governance reforms and environmental challenges continue to diverge significantly across national boundaries. While international corporations are recognised as key actors in driving green investment in emerging economies (Zhong et al. 2024; Morrison et al. 2024), the effectiveness of their internal governance in supporting decarbonisation remains poorly understood. Understanding how these governance mechanisms influence strategic responses to climate-related challenges is vital for informing corporate, regulatory and policy practices in these contexts.

In spite of the progressively increasing investigation within the carbon performance (CP) literature, little focus has been paid to corporate energy transition initiatives (CETIs) that seeks to enhance corporate carbon emissions (CCEs) reduction and economic/financial consequences (Orazalin et al. 2024; Dahlmann et al. 2019; Orazalin et al. 2024). Our focus on pay incentives, CETIs and CCE in this study is driven by a number of crucial considerations. Firstly, previous studies have underlined the importance of CG structures in emerging economies especially in terms of establishing CETIs and CCE reduction guidelines that can improve the value for both stockholders, investors and other various stakeholders (Saa et al. 2025; Adjei-Mensah et al. 2024; Orazalin and Mahmood 2021). In view of this, CG mechanisms such as the design and implementation of pay incentives can improve environmental actions of corporations, particularly those that seek to enhance energy transition and limit CCE (Haque and Ntim 2020). This is due to the crucial role that pay incentives can play in encouraging and motivating corporate executives to make greater commitment towards CETIs and CCE reduction in emerging economies (Deckop et al. 2006; Cordeiro and Sarkis 2008). Secondly, some scholars have argued that effective CG structures such as the establishment of sustainability committees can enhance corporate accountability for climate change impacts by promoting sustainable board decisions in areas such as CETIs and CCE abatement with beneficial influence on the climate (Saa et al. 2025). In response, regulators in several emerging countries such as South Africa, Indonesia, Malaysia, Nigeria and the Philippines have implemented sustainability CG reforms that concentrate on both non-financial and financial facets of CG with a particular focus on integrated sustainability initiatives (Ntim et al. 2013).

Prior literature has increasingly highlighted the role of CG in designing and implementing decarbonisation strategies that create value for shareholders (Cumming et al. 2021). For example, effective board governance can enhance accountability for sustainability/decarbonisation impacts by encouraging sustainable business practices and promoting engagement in decarbonisation in order to manage climate risks/threats in an effective and efficient manner (Harjoto et al. 2015). In this case, a useful CG mechanism for enhancing corporate accountability for decarbonisation is to tie improvements to EC through sustainability-based compensation (SBC) policy (Shumsky 2019; Welsh 2014). This approach aims to draw corporate executives' attention to decarbonisation by providing a link between their pay and sustainability/decarbonisation goals (Maas and Rosendaal 2016; Welsh 2014). Accordingly, a growing number of corporations are linking sustainability/decarbonisation achievements to EC, which is a vital catalyst for getting corporate executives to pay more attention to climate change challenges (Shumsky 2019; Maas and Rosendaal 2016; Al-Shaer and Zaman 2019). For instance, a report by PwC shows that Sub Saharan Africa CEOs are more likely to have carbon metrics tied to their incentives (23% vs. 32% globally). Crucially, 9% of CEOs in Sub Saharan Africa have over 50% of their compensation linked to carbon metrics, compared to 4% globally (PwC 2025). Yet, a crucial policy question is whether such SBC approaches, which are increasingly being introduced by corporations in emerging economies, effectively can lead to an enhancement in sustainability/decarbonisation (Haque and Ntim 2020; Al-Shaer and Zaman 2019). Similarly, a board sustainability committee initiative (BSCI) can play a critical role in designing and implementing appropriate decarbonisation management practices to promote stakeholder engagement, improve accountability, address decarbonisation issues, and enhanced corporate outcomes (Luo and Tang 2021; Orazalin et al. 2024). Hence, BSCI is increasingly becoming a key CG mechanism to address decarbonisation, promote sustainability and generate value for stakeholders (Burke et al. 2019).

However, there is a dearth of research on the effect of SBC and BSCI on CETIs and CCE outcomes (Orazalin et al. 2024). The study suggests that investigating the moderating role of SBC and BSCI within this context can offer a valuable insight into corporate energy transition/decarbonisation strategies across nations with unique institutional and regulatory systems. As reasoned by Orazalin et al. (2024) and Sullivan and Gouldson (2017), CG mechanisms, corporate responses to decarbonisation and performance outcomes are interdependent and interrelated, and hence, it is crucial to evaluate them as

an all-inclusive, dynamic and interactive system rather than investigating each of them separately. The study contends that this creates a unique setting for investigating the interrelationships among pay incentives (SBC), CETIs and CCE in emerging economies. Thus, the study seeks to address this dearth of research by uniquely assessing the moderating impact of SBC and BSCI on the associations among EC, CETIs, CCE and FP in an emerging economy context.

Previous research on the effect of CCE on economic/financial outcomes have generated conflicting results (Matsumura et al. 2014; Clarkson et al. 2015; Saa et al. 2025). In particular, Baboukardos (2017) and Choi and Luo (2021) observe that CCE has a detrimental impact on market value. The authors suggest that market players respond unfavourably to high emissions. In a related study, Lewandowski (2017) finds that lower CCE has detrimental impact on market value, indicating that firm commitment to emission reductions can result in financial costs. Noticeably, the above/previous investigations have concentrated largely on specific nations/developed economies, thus failing to account for cross-nation variations, especially in emerging economies contexts. Consequently, the existing mixed evidence cannot be generalised across developing nations with unique regulatory and institutional contexts. Because regulators/governments actions to de-carbonisation efforts range significantly among nations and have varying financial effects for firms (Orazalin et al. 2024), there is a need to investigate the relations among CETIs, CCE and financial outcomes within emerging economies.

Hence, this study seeks to examine the role of international cooperations in facilitating energy transitions in emerging economies through the lens of multi-theoretical framework including resource-based view (RBV), stakeholder theory and neo-institutional theory (NIT). Precisely, we investigate the interrelations among SBC, BSCIs, EC, CETIs, CCE and firm performance (FP). First, we seek to determine how EC and SBC impact on the implementation of CETIs and CCE and ascertain whether SBC moderates these relationships. Second, we offer a first-time insight on the effect of BSCI on CETIs and CCE and assess whether BSCI can moderate the SBC and CETIs/CCE relationships. Third, we are among the first to assess the impact of CETIs and CCE on FP and then examine the moderating impacts of SBC and BSCI on these relationships. Finally, we contribute to the literature on a low-carbon economy governance (CG measures/mechanisms that seek to promote sustainable energy transitions), by investigating whether the predicted associations differ across different operating periods and different nation sets.

This study makes several contributions to the existing research. First, this study is among the first to investigate the effects of both CETIs and CCE on FP and then assess the moderating impact of both SBC and BSCI on the associations. Although prior research has largely focused on the link between CCE and FP, limited attention has been given to the value significance of CETIs. Second, we explore whether governance attributes such as SBC and BSCI can moderate the relationships between CETIs/CCE and FP, addressing gaps in the growing body of literature on climate change and CG (Orazalin et al. 2024). Third, this paper uniquely examines effect of EC on CETIs and CCE and evaluates the moderating role of SBC and BSCI on relationships, expanding the understanding of how incentive structures and governance mechanisms can influence sustainability outcomes. By incorporating real-world examples from the dataset, such as the role of SBC in enhancing CETIs in industries like energy and manufacturing, we provide practical insights into these mechanisms. Furthermore, we investigate if the predicted connections differ across the Paris Agreement and Kyoto Protocol periods, offering insights into how policy contexts shape these relationships. Finally, we explore variations in the relationships between nations with carbon tax policies and those without, highlighting the importance of regulatory frameworks in shaping sustainability outcomes.

The remainder of the study is structured as follows: in Section 2 we provide the background to the study. Section 3 discusses the theoretical framework of the study. In Section 4 focuses on reviewing relevant literature in the field and develops the hypotheses of the study. Section 5 describes the research methodology of the study. In Section 6, the study discusses the results of the research. Finally, Section 7 provides the conclusion to the study.

2 | Board Sustainability Committees, EC and CCE Reforms in Emerging Markets

The growing concerns about the increasing levels of carbon emissions worldwide have led the global community to respond to climate change risks by undertaking several agreements, guidelines, reforms and initiatives (Saa et al. 2025). In response, national authorities and various international establishments are in search of ways to avert the threats posed by climate change/global warming (Baboukardos 2018) through the implementation of several low carbon emission plans (Saa et al. 2025). For instance, a formal comprehensive low-carbon emission agreement called the 'Kyoto Protocol' was introduced in 1997 (Bhuiyan et al. 2025; Haque and Ntim 2020). The agreement became a legally binding global agreement that mandates ratify nations to improve their energy efficiency and energy transition initiatives in order to reduce carbon emissions and contribute to the fight against global warming (Olekanma et al. 2024). Emerging economies have adopted a number of integrated sustainability principles as part of the Protocol to fight global warming. The Paris Climate Agreement was established in 2015 (Saa et al. 2025). The agreement requires countries to make contributions to reduce emissions and aid in climate change adaptation. In response to climate change, numerous nations have implemented national laws and regulations (Haque and Ntim 2020).

The shift to a low-carbon economy is essential for reducing climate change and attaining sustainable development on a global scale, in addition to being an environmental need (Banerjee et al. 2024). In this context, Wang et al. (2023) and Aqeeq et al. (2023) claim that emerging economies—which are characterised by rapid industrialisation and growth—are at a crucial point in the shift to a low-carbon economy. In particular, parts of Southeast Asia, Latin America and Sub-Saharan Africa are having a harder time balancing the need to economically 'catch-up' while working in environments that are often politically polarising (Latin America) or heavily dependent on forest products and other natural resources.

This study addressed these issues by concentrating on the transition of Southeast Asian, Latin American and African nations to low-carbon economic environments. Furthermore, and perhaps more significantly, this study concentrated on these developing nations due to their weaker institutional frameworks in comparison to established economies (Ntim 2016; Saa et al. 2025). The governments of the majority of these nations are likewise incredibly bureaucratic and corrupt (Ntim and Soobaroyen 2013). Additionally, these developing nations have loose regulations (Ntim and Soobaroyen 2013) and poor levels of "transparency, accountability, and voice" (Adu and Roni 2024). Meanwhile, weak CG, transparency and ethical practices by corporations were identified to be the cause of a number of global financial crises in the 1990s and 2000s (Mallin 2002).

Given these trends, many countries have enacted CG reforms (Saa et al. 2025). The fact that recent CG reforms, especially those implemented in Anglo-Saxon nations, have primarily addressed financial issues must be emphasised (Ntim 2016). The CG reforms in Southeast Asia, Africa, and Latin America, on the other hand, have mostly focused on the financial and non-financial aspects of governance, like CCEs (Ntim et al. 2013). According to Ntim and Soobaroyen (2013), one of the earliest CG reforms in these emerging countries was the highly regarded Kings Report of South Africa—which was published in 1994 in response to persistent concerns about the need for greater transparency in accountability and financial reporting. Accordingly, codes of good governance have been issued by numerous emerging nations, including South Africa, Indonesia, Malaysia, Nigeria and the Philippines. Malaysia (2000), Thailand (1998), Nigeria (2003), Egypt (2006), Kenya (2002), Mexico (1999), Indonesia (2000), Morocco (2008), Brazil (2004) and the Philippines (2001) have all issued CG codes to improve financial disclosure and reporting, including South Africa's King Report on governance code (1994). It is important to highlight that in order to address the shortcomings of the previous regulations and include global best practices, such as the SDGs, these rising economies released updated governance codes. In essence, promoting CCE activities is the focus of the updated King Reports of South Africa (2016, 2010 and 2002), Malaysia (2007, 2012, 2017 and 2021), Indonesia (2001, 2006 and 2014), Nigeria (2011 and 2018), Morocco (2022), Egypt (2016), Kenya (2002 and 2014), Brazil (2009 and 2015), Thailand (2002, 2006, 2011 and 2017) and the Philippines (2009, 2016 and 2019) (Blesia et al. 2023; Kouloukoui et al. 2020).

The revised codes in these emerging economies (hence referred to as the Combined Code) include comprehensive section on integrated sustainability initiatives (Saa et al. 2025). Broadly, the Combined Code stipulates that the board should make sure that the corporation's business strategy is aligned with the Sustainable Development Goals (SDGs)/other international variants—International Sustainability standards, Triple Bottom Line Reporting, Global Reporting Initiative, and Integrated Thinking and Reporting. Specifically, the integrated sustainability initiatives section of the Combined Code strongly calls for corporations to conduct their operations in a sustainable manner that lessens wastages and inefficiencies, and where practical, ought to implement circular economy initiatives (CETIs) that boost a culture of recycling and reuse. For instance, the Combined Code stresses that board of directors should make sure that the corporation monitors the effect of their operations on the environment, including but not limited to tree and forest cover, water bodies, wetlands soil quality and air quality, and thereby help combat climate change. The Combined Code essentially contains extensive sections on corporate decarbonisation efforts. One of the main principles of this 'Combined Code' is the expectation that effective internal governance systems will have an impact on compensation incentives, encourage the creation of board sustainability committees, and motivate businesses to engage in carbon emission reduction efforts, all of which could enhance FP.

In particular, the Combined Code states that corporate boards should align EC with the long-term benefits of the corporations and their shareholders, integrating goals such as CETIs and CCE reduction (Saa et al. 2025). Further, the Combined Code stresses that corporate boards should disclose their compensation policies and procedures to shareholders and other stakeholders, safeguarding that sustainability principles are built-in in the performance appraisal of corporate executives (Saa et al. 2025). Accordingly, corporations in these emerging economies that are more concerned about CCE abatement, for instance, tend to align EC to sustainability (i.e., SBC) in anticipation that corporate executives should be compensated for the greater risks involved with the pursuit of climate change activities (Morrison et al. 2025). Motivated by the provisions of the Combined Code, corporations in these emerging economies are increasingly establishing BSCI to champion sustainability-related activities (Saa et al. 2025). Nonetheless, there are still important policy concerns regarding whether the voluntary compliance framework known as the Combined Code can raise the bar for sustainable corporate practices and decarbonisation efforts in these emerging economies. Subsequently, this study aims to examine how businesses operating in these emerging economies with similar sustainability/CCE reduction regulation and stakeholder demands react to climate change risks/threats by shaping their institutional settings as credible pathways to motivate businesses to participate in decarbonisation (CETIs and CCE reduction). This, in our opinion, offers a special environment for examining the relationships among EC, SBC, CETIs, CCE, BSCI and FP.

3 | Theoretical Framework

Despite the increasing interest scholars and corporations in energy transition and carbon emission reduction in the last two decades (Aqeeq et al. 2023; Wang et al. 2023; Haque and Ntim 2020), no unified and comprehensive theoretical framework has been developed to investigate and elucidate the motivation of corporations in emerging economies to participate and engage in carbon emissions abatement (Saa et al. 2025). To illustrate, literature search reveals that prior studies have employed several social- and economic-based theoretical viewpoints including neo-institutional, stakeholder, legitimacy and resource dependence theories to investigate corporate participation in carbon emissions reduction (Orazalin et al. 2024; Morrison et al. 2025). For example, social- and economic-based theoretical foundations have been utilised to elucidate the motivation of corporations in emerging economies to make greater commitments towards reducing carbon emissions (Bhuiyan et al. 2025; Saa et al. 2025). Nevertheless,

these viewpoints have shown a limited ability to fully explain the fundamental forces behind carbon emissions reduction (Olekanma et al. 2024; Haque and Ntim 2020), especially within the context of emerging countries (Saa et al. 2025; Bhuiyan et al. 2025).

However, earlier research indicates that a multi-theoretical approach can provide a better understanding of the differences in corporations' environmental performance actions (Haque 2017; Orazalin et al. 2024). Therefore, in response to recent calls for multi-theoretical approaches to examine the relationship among CG mechanisms and carbon emissions reduction performance of corporations in emerging economies, we adopt a multi-theoretical perspective (Saa et al. 2025; Bhuiyan et al. 2025). One important reason is that individual theories might not adequately explain the intricate relationships among BSCI, EC, SBC, CETIs, CCE and FP and how they interact to affect corporate decisions and outcomes in an emerging economy context. By contrast, integrating knowledge from several theoretical perspectives can yield novel insights for interpreting and explaining CETIs and CCE investments in a unique institutional and regulatory context, like in emerging economies (Saa et al. 2025). Moreover, a multi-theoretical lens can be beneficial in terms of elucidating the apparent connections among BSCI, EC, SBC, CETIs, CCE and FP (Saa et al. 2025; Orazalin et al. 2024).

Each theoretical approach appears to have limitations in its capacity to completely explain a corporation's efforts to reduce its carbon emissions, as the discussion above indicates. This study contends that a multi-theoretical approach is the most suitable foundation for understanding the heterogeneous nature of corporations' motivation for CETIs and CCE abatement activities. This perspective permits a broad elucidation of complicated and multifaceted relationships—both indirect and direct among BSCI, EC, SBC, CETIs, CCE and FP in an emerging economy setting. In particular, investigating these associations intrinsically involve several institutions and stakeholders with conflicting interests, operating in a distinct institutional and unique regulatory setting. Beside responding to the increasing call for the adoption of a multi-theoretical perspective (Haque and Ntim 2020; Saa et al. 2025; Bhuiyan et al. 2025), crucially, we address the limitations of prior studies that utilised single theories or no clear theoretical framework (mainly descriptive) in their investigations (e.g., Jia and Zhang 2011; McGuiness et al. 2017) by adopting a multi-theoretical lens. Based on the discussions above and precisely, combined insights from the NIT, RBV and stakeholder theoretical perspective can help in enhancing the relevance of SBC, BSCI, EC and CETIs in elucidating the diverse motivations of corporations in participating in CCE abatement. Together, the three theories are very useful in helping and supporting the research objectives and the problem statement of this study. This is critical given the regulatory, and socio-demographical diversity of in emerging nations, where a multi-theoretical underpinning can help in elucidating the results relating the relationship among BSCI, EC, SBC, CETIs, CCE and FP (Saa et al. 2025; Phung et al. 2022; Nigam et al. 2018).

First, NIT is a multifaceted theory that incorporates elements of traditional social—legitimacy and stakeholder) and economic—agency and resource dependence theoretical perspectives (Saa et al. 2025; Morrison et al. 2024; Suchman 1995). There are two primary viewpoints in the NIT arguments—the economic efficiency perspective, and the social legitimacy view (Bhuiyan et al. 2025; Olekanma et al. 2024). Economic efficiency perspective of NIT encompasses a firm participating in cost-effective sustainable business operation such as energy transition initiatives (enhanced CETIs) that can reduce carbon emissions (low CCE), thus accelerating the shift to a low-carbon corporate environment (Mazouz and Zhao 2019). To gain and maintain corporate legitimacy, businesses might try to conform to institutional powers in terms of social legitimacy view (Suchman 1995). Due to the increasing attention being paid to climate change risks, companies with more legitimacy might recruit and retain top talent, have easier access to financial resources (Pfeffer and Salancik 1978), and improve stakeholder relations (Oliver 1991). These factors can help them compete more effectively in the market (Olekanma et al. 2024; Saa et al. 2025), which can improve the FP.

Corporations seeking legitimacy are encouraged to participate and reveal their energy transitions in this setting as a reliable way to allay stakeholders' worries about issues linked to carbon emissions (Ashforth and Gibbs 1990). For instance, improved energy transition activities can benefit FP by assisting corporations in enhancing their corporate legitimacy and reputation (Morrison et al. 2024). By taking part in significant CCE abatement programs, corporations may seek to acquire or make well-informed decisions that enhance operational efficiency (energy transition such as CETIs) (Saa et al. 2025; Dahlmann et al. 2019). In light of this, this study argues that corporations can implement energy transition approaches (CETIs), such as the creation of a board sustainability committee (BSCI) and the implementation of CP linked EC packages (SBC), to mitigate climate change at a reasonable cost. This could lead to low carbon emissions—low CCE.

Second, RBV asserts that distinctive, valued resources and competencies that are hard to duplicate are what propel a company's competitive edge and long-term performance (Barney 1991). According to RBV, corporations can enhance their contributions to a low-carbon economy and preserve their competitive edge in the context of the energy transition by putting proactive sustainable development plans into place, which call for specialised resources and competencies (Hart 1995). The use of CETIs, which can boost economic efficiency through operational efficiency (low CCE), lower operating and legal costs, restrict business risks, foster stakeholder relationships, and provide long-term sustainable benefits like higher FP, may be one of the motivations (Hart and Dowell 2011). In addition, stakeholder engagement strategies such as the creation of sustainability committees, can be considered as a unique resource or competitive advantage which can improve FP.

The aforementioned perspective is supported by the fact that energy transitions (CETIs) can reduce waste, promote efficient use of resources and limit carbon emissions (low CCE), and enhance internal climate resilience (Weber and Neuhoff 2010). Nonetheless, RBV contends that a corporation's strategic use of skills and resources has advantages as well as disadvantages. According to Haque and Ntim (2020), the benefit viewpoint of RBV highlights the positive outcomes that arise from making effective use of a corporations' special and valued resources and

capabilities. Corporations that have access to valuable assets are more likely to participate in CETIs meant to increase economic efficiency in this setting because they are seen as reliable pathways to get a sustained competitive advantage that market participants can appreciate (Hart 1995; Haque and Ntim 2020).

The cost perspective, on the other hand, emphasises the possible drawbacks and difficulties of energy transition projects, including resource development, acquisition, and management (Orazalin et al. 2024; Bhuiyan et al. 2025). Given that energy transition requires significant financial resources to implement changes in low CCE, economic efficiency can be gradually achieved over time (Haque and Ntim 2020). In this scenario, participating in CETIs entails significant costs for any corporation (Saa et al. 2025; He et al. 2021). Third, according to Freeman's (1984) stakeholder theory approach, a corporation's engagement in environmental projects enhances its connections with its stakeholders. By adopting eco-friendly procedures and supporting low-carbon economy initiatives, corporations with an improved corporate sustainability strategy—such as the creation of a board sustainability committee and CP linked EC packages—can cultivate strong stakeholder relationships (Michelon and Parbonetti 2012; Morrison et al. 2024).

According to earlier studies, stakeholders such as consumers and employees can gain from a strong commitment to energy transition and low carbon (Saa et al. 2025). For example, research indicates that corporation leaders prefer companies that have a significant commitment to climate change projects (Backhaus et al. 2002; Berrone and Gomez-Mejia 2009). It is noteworthy that other investigations have found that customers actively seek out and are prepared to pay more for environmentally friendly goods and services when a corporation has a strong commitment to sustainability (Berrone and Gomez-Mejia 2009; Du et al. 2007). To improve stakeholder relations and corporate image, stakeholder theory in this instance supports the use of CETIs, the creation of corporate sustainability initiatives such board sustainability committees, and the adoption of CP linked EC.

Based on the multi-theoretical underpinnings of RBV, NIT and stakeholder viewpoints, corporations might implement CETIs and/or engage in corporate sustainability initiatives like creating board sustainability committees (a unique resource or competitive advantage) and connecting EC with CP in order to address different stakeholder demands and low-carbon economy legislation. The implementation of these policies might—(a) enhance the corporation's image and FP (Walls et al. 2012; Burke et al. 2019; Morrison et al. 2024); and (b) considerably cut carbon emissions through increased operational efficiency (i.e., high energy transition) and lesser operating costs (i.e., low CCE) (Saa et al. 2025; Orazalin et al. 2024).

4 | Literature Review and Hypotheses Development

4.1 | Pay Incentives, CETIs and CCEs

Corporate leaders are crucial in making and carrying out important decisions that have the potential to impact CETIs and CCE, according to the advantage attribute of RBV (Adu et al. 2022; Haque and Ntim 2020). In this context, it is possible to argue that corporate executives might encourage corporations to participate in energy transition initiatives that can positively affect SBPs for carbon emissions (Morrison et al. 2024). The aforementioned argument is predicated on the idea that a suitable EC strategy can direct corporate executives' focus towards energy transition projects (CETIs) and aid in the decrease of carbon emissions (CCE) (Saa et al. 2025; Bhuiyan et al. 2025).

Although a company's CCE abatement and CETI programs may generate long-term value, these expenditures are typically thought of as costly (Morrison et al. 2024). This is because it has been suggested that these projects may require a considerable capital expenditure while providing indefinite financial benefits in the interim (Orazalin et al. 2024). Additionally, according to academics, CETI-related projects, particularly those pertaining to CCE abatement, need a labour-intensive environment and skilled personnel to organise and carry out (Haque and Ntim 2020; Olekanma et al. 2024). Developing renewable energy, offering eco-friendly goods and services, and lowering the risks of natural disasters brought on by global warming are a few of these investments (Haque and Ntim 2020). As a result, corporations may need to employ appropriate compensation packages in order to draw in and/or retain these highly qualified individuals with higher levels of competence and an inventive viewpoint (Adu and Roni 2024; Morrison et al. 2024). One could argue that top managers' participation is necessary to make these costly investments (Orazalin et al. 2024; Saa et al. 2025).

Consequently, the efficiency views of NIT and RBV suggest that corporations should create EC in a way that motivates executives to commit more to energy transition projects, especially investments in CCE reduction (Saa et al. 2025; Orazalin et al. 2024). Investing in CETIs and CCE reduction programs can offer corporations economic benefits (efficiency) in important areas like operational efficiency (energy efficiency), in addition to enhancing corporate legitimacy (social legitimacy view of NIT) (Haque and Ntim 2020; Orazalin et al. 2024). According to other academics, corporations with highly compensated corporate executives are likely to attract more media and societal attention (Morrison et al. 2024). Based on the idea that corporations that provide alluring compensation packages may come under public scrutiny (stakeholder theory) (Olekanma et al. 2024; Adu et al. 2022), this recommendation encourages them to keep up their active involvement in resolving CCE issues to avoid negative media coverage—which can boost organisational legitimacy (NIT).

According to empirical research, EC is important for improving corporate CP; however, few studies have found a positive correlation between compensation plans and CP (e.g., Adu et al. 2022; Haque 2017). To add to the growing body of research demonstrating the efficacy of EC in environmentally responsible stewardship, Haque and Ntim (2020) specifically indicate that EC is favourably correlated with greenhouse gas (GHG) performance of corporations in 13 industrialised European nations. Adu et al. (2022) report in a closely linked study that EC has a beneficial impact on CP in the UK. In accordance with RBV, NIT and stakeholder theoretical prospects, and the above arguments, we propose the first hypothesis as stated below:

Hypothesis 1a. *Executive compensation (EC) is positively linked with corporate energy transition initiatives (CETIs) and corporate carbon emission (CCE) reduction*.

Furthermore, proponents of SBC including Acharya et al. (2011) and Jensen and Murphy (1990) vehemently contend that the process—rather than the amount of compensation—is the most realistic means of bringing corporation executives' interests into line with those of shareholders. To increase corporate legitimacy (the social legitimacy aspect of NIT), it might be crucial for top senior managers to execute SBC policies in order to conduct CETIs and CCE reduction investments (Saa et al. 2025; Haque and Ntim 2020). Consequently, corporation are increasingly using SBC to encourage top senior managers to invest in CETIs and CCE reduction in order to secure long-term economic performance and survival (Morrison et al. 2024; Haque and Ntim 2020). For example, according to Newsweek's 2015 Green Rankings, more than 70% of global businesses and more than 50% of US businesses include sustainability-related factors in their EC packages. The board might therefore be better equipped to evaluate a company's CETIs and CCE risks when SBC policy is in place. Crucially, this will enable the pay committee to develop a thorough EC structure, which could enhance firms' CETIs and lower CCEs.

There is a dearth of empirical data about SBC's moderating influence on the EC-CETIs and EC-CCE relationship. In a related analysis, Haque and Ntim (2020) find that in European countries, the relationship between EC and process-based CP is positively moderated by ESG-linked pay programs. According to Adu et al. (2022), SBC has a favourable impact on the correlation between CEO compensation and CP in UK FTSE 350 non-financial companies. Distinctly, these investigations do not explore whether SBC moderates the EC and CETIs relationships. We thus propose the hypothesis below:

Hypothesis 1b. *SBC has a positive moderating impact on the relationship between EC and CETIs, and EC and CCE reduction*.

4.2 | BSCIs, CETIs and CCEs

According to academics, adopting sustainable elements is the first step in designing CETIs and CCE reduction investments (e.g., Morrison et al. 2024; Olekanma et al. 2024). Increased responsibility and monitoring, including the creation of a board sustainability committee, may encourage more CETIs and a decrease in CCEs (Orazalin et al. 2024). The creation of sustainability committees can improve a corporation's interaction with its stakeholders—stakeholder theory (Orazalin 2020). The board sustainability committee is leading the international program, especially due to stakeholder demands for greater transparency on issues related to low-carbon economy action (Orazalin et al. 2024). The creation of sustainability committees, in the opinion of stakeholders, shows a corporation's dedication to CETIs and CCE reduction initiatives in addition to forging closer ties with its stakeholders (Orazalin et al. 2024). To enhance the corporation's performance in CCE abatement (Orazalin 2020), as well as the management of CCE risks and climate-related difficulties (Burke et al. 2019), the board sustainability committee, for instance, might help the corporation create CETI strategies (Orazalin et al. 2024).

Increased CCE activities, including efforts to lower carbon emissions, have been associated with board sustainability committees (Orazalin et al. 2024). In particular, Luo and Tang (2021) state that the board sustainability committee promotes corporations to engage in CETIs and CCE abatement operations in response to stakeholder demand (stakeholder theory) and emphasises the advantages of ecologically responsible initiatives (Luo and Tang 2021; Orazalin 2020). According to stakeholder theory, corporations that have a sustainability committee on their board typically implement CETIs in order to appease stakeholders and encourage investments in CCE reduction (Orazalin et al. 2024). Recent studies have found that the establishment of sustainability committees is an essential board governance tool, especially when it comes to CCE initiatives (Orazalin et al. 2024; Orazalin 2020).

Additionally, according to the social legitimacy aspect of NIT, corporations can acquire societal legitimacy by willingly embracing established institutional rules, principles and procedures (Scott 2001; DiMaggio and Powell 1983). In this case, adhering to the worldwide mandate that corporations that establish sustainability committees could boost their legitimacy (NIT) by enhancing the corporations' standing (Saa et al. 2025; Morrison et al. 2024). Previous empirical studies have generally indicated that board sustainability committees can influence a company's green performance (e.g., Orazalin et al. 2024). For example, Adu et al. (2024) document that more sustainable banking initiatives are linked to board sustainability committees based on SSA banks. We anticipate that board sustainability committees will have an impact on CETIs and CCE given the crucial role they play in promoting environmental activities, supporting energy transition projects and mitigating the dangers associated with climate change (Orazalin et al. 2024). Consequently, the study puts forth the following hypotheses:

Hypothesis 2a. *Corporations with high board sustainability committee initiatives (BSCI) are more likely to have greater corporate energy transition initiatives (CETIs) and corporate carbon emission (CCE) reduction*.

Hypothesis 2b. *BSCI moderates the relationship between SBC and CETIs, and SBC and CCE reduction*.

4.3 | CETIs, CCE and FP

Stakeholder theory states that a corporation's long-term relationships with stakeholders have a significant influence on its FP (Saa et al. 2025; Olekanma et al. 2024). In this case, keeping up ties with significant stakeholders could protect banks' access to deposits and other vital resources—stakeholder theory (Haque and Ntim 2020). Furthermore, adhering to climate change regulations, such as the Paris Agreement, the Kyoto Protocol, and the Sustainable Development Goals, may improve economic efficiency by granting access to vital resources and assets, as well as business legitimacy by enhancing the reputation of the corporation (Orazalin et al. 2024; Adu et al. 2024).

By increasing the corporations' efficiency and positively impacting FP, this strategy may potentially lower the operating costs of the corporation—NIT (Campbell et al. 2007). In this framework, corporations can employ CCE investments and CETIs as legitimate means of establishing and maintaining goodwill and trust with their stakeholders (Bhuiyan et al. 2025; Haque and Ntim 2020). Businesses that participate more in CETIs and reduce CCEs, for instance, may build a great deal of goodwill that might protect them from unanticipated difficulties and lead to new business prospects that can potentially enhance their FP (Adu et al. 2024).

Notably, CCE reduction and CETIs are important measures that guide corporation's flow of vital resources. In this regard, corporations that make investments in CCE and CETIs, including recycling and material reuse, may draw in and win over low-carbon investors. Morrison et al. (2024), for instance, emphasise that businesses should view CETIs and CCE reduction initiatives as intangible resources that could help with more effective resource use, hence enhancing the enterprises' financial performance. However, according to NIT's social legitimacy perspective, CETIs and CCE reduction may help raise the company's standing, which will boost legitimacy (Haque and Ntim 2020). In this scenario, corporations may be able to boost FP by winning over many important stakeholders, which would lead to economic efficiency (NIT) through the purchase of essential resources and assets.

In support, Lewandowski (2017) highlights that firms failing to meet carbon emission objectives may face financial penalties or the need to purchase emission allowances in carbon trading markets. To avoid such costs, c companies are encouraged to actively engage in CP-related initiatives by adopting low-emission equipment (energy transition) and investing in green technologies. Lewandowski (2017) further argues that proactive emission reduction efforts not only decrease financial burdens but can also lead to cost savings, operational efficiencies, and improved corporate reputation (Chen et al. 2023). Consequently, improved CETIs and effective CCE reduction not only mitigate financial penalties but may also create revenue opportunities for firms that outperform expectations, while strengthening their market image and stakeholder trust.

On the other hand, other academics argue that a corporation can only have long-term value if its resources are used to carry out projects that increase stockholder value (Adu et al. 2024). This is based on the idea that increasing shareholder profit is the primary business goal (Friedman 1970), and that environmental initiatives like CETIs and CCE reduction may undermine this goal (Olekanma et al. 2024; Friedman 1970). Thus, opponents of climate change investments (Aupperle et al. 1985; Preston and O'bannon 1997; Barnett and Salomon 2006) argue that putting in place low-carbon and energy-efficient initiatives can make corporation less competitive and raise their operating costs.

The empirical evidence regarding the relationship between FP and CP is conflicting (Matsumura et al. 2014; Zhou et al. 2022; Busch and Hoffmann 2011; Adu et al. 2023). For instance, Adu et al. (2023) discover that FP in UK corporations is negatively impacted by CP. In contrast, Busch and Hoffmann (2011) report that CP has a positive influence on market value, while Haque and Ntim (2020) note that CP has no effect on the market value of European corporations.

Hypothesis 3. *Corporate energy transition initiatives (CETIs) and corporate carbon emission (CCE) abatement have a positive influence on firm performance (FP).*

4.4 | CETIs, CCE and FP: Moderating Impact of SBC

Previous studies have shown that incentive-based approaches can enhance long-term corporate operations (e.g., Tauringana and Chithambo 2015; Okafor and Ujah 2020). By providing greater evaluation and increased resource allocation to corporations with higher CETIs and CCE reduction, the market may promote long-term value creation and advance CETIs and CCE reduction, according to the efficient view of NIT (Adu et al. 2023; Haque and Ntim 2020). This has the potential to significantly increase enterprises' FP. According to Morrison et al. (2024), it is expected that well-intentioned corporations will use compensation-related strategies like SBC to persuade top senior managers to increase CCE reduction. Crucially, prominent business leaders could be reluctant to take part in CCE reduction initiatives and CETIs (Haque 2017). At least in the short term, these investments may require a considerable financial outlay with uncertain financial returns (Haque and Ntim 2020; Saa et al. 2025).

In this situation, tying company executives to improvements in carbon emission abatement can be a strong motivator for top managers to take climate change-related initiatives that could improve FP (Adu et al. 2023; Haque and Ntim 2020). Therefore, in order to increase CP, senior managers will be motivated to actively participate in the development and implementation of these expensive expenditures. From an NIT perspective, this can boost the corporation's FP (Campbell et al. 2007; Haque and Ntim 2020) and credibility (Saa et al. 2025; Mahoney and Thorn 2006). Accordingly, this study argues that SBC might incentivise corporate executives to evaluate the climate change risks facing their organisations, enabling them to create a comprehensive compensation plan that will raise CETIs and lower CCE.

According to a synthesis of the research in the area, there are few studies that assess how pay incentives may moderate the relationship between CP and FP. The relationship between CP and market value non-financial enterprises in the UK and Europe is unaffected by EC, according to related study by Adu et al. (2023) and Haque and Ntim (2020). Consistent with the aforementioned arguments, which emphasise the importance of SBC in promoting energy transition activities and tackling climate change challenges, the study anticipates that SBC will likely have an impact on how CETIs and CCE affect FP. As a result, we put out the following set of hypotheses:

Hypothesis 4a. *The relationship between CETIs and FP is moderated by SBC.*

Hypothesis 4b. *The relationship between CCE and FP is moderated by SBC.*

4.5 | CETIs, CCE and FP: Moderating Impact of BSCIs

Despite the importance of a board sustainability committee in CG arrangements, recent research has not adequately examined its value in relation to CETIs and CCE (Saa et al. 2025; Orazalin et al. 2024). To promote sustainable business practices, enhance the board's monitoring function (Dixon-Fowler et al. 2017) and meet stakeholder requests (Burke et al. 2019; Orazalin et al. 2024; Morrison et al. 2024), sustainability committees are set up. Accordingly, the board sustainability committee plays a crucial role in carrying out energy transition initiatives (CETIs) and advocating for the best carbon emission reduction investments (CCE), which can greatly aid in the shift to a low-carbon economy, address climate change risks, and boost stakeholder participation (stakeholder theory) (Luo and Tang 2021; Peters and Romi 2014).

According to earlier studies, for example, establishing a sustainability committee enhances governance quality, encourages climate change strategies (Orazalin et al. 2024) and boosts the effectiveness of GHG mitigation initiatives (Mackenzie 2007). Other scholars such as Michelon and Parbonetti (2012) stress that, there is a tendency for sustainability committees to enhance corporate responsibility and transparency. Additionally, a board sustainability committee can assist reach higher FP (Burke et al. 2019), enhance sustainability performance (Kılıç et al. 2021) and meet stakeholders' interests (Al-Shaer and Zaman 2019). As a result, the board sustainability committee has developed into a crucial tool for CETIs and CCE abatement in the eyes of investors, shareholders and market participants (Haque and Ntim 2020). Board sustainability committee has the potential to create long-term value for owners and stakeholders (Orazalin et al. 2024).

Research on the board sustainability committee's moderating effect on the relationship between CP and FP is scarce (Orazalin et al. 2024). Board sustainability committees have a positive impact on market value but no influence on CP, according to a related study by Orazalin et al. (2024). Notably, the ability of broad board sustainability initiatives (BSCI) to mitigate the relationships between CETIs/CCE reduction and FP is not examined in this study. The analysis predicts that a BSCI is likely to have an impact on the CETIs–FP and the CCE–FP connections, given the significance of BSCI in advancing energy transition projects and creating stockholder worth (Orazalin et al. 2024). As a result, the investigation develops the final set of hypotheses shown below:

Hypothesis 5a. *BSCI moderates the association between CETIs and FP.*

Hypothesis 5b. *BSCI moderates the relationship between CCE and FP.*

To enhance clarity and explicitly demonstrate how the hypotheses are aligned with the overarching research questions, we provide the following mapping. RQ1 asks how EC, SBC and BSCI influence CETIs and CCEs. This question is addressed by Hypothesis 1a and Hypothesis 1b, which examine the effects of EC and SBC on CETIs; Hypothesis 2a and Hypothesis 2b, which explore the effects of EC and SBC on CCE; and Hypothesis 3, which investigates the impact of BSCI on both CETIs and CCE. RQ2 considers how CETIs and CCE affect FP, and to what extent these relationships are moderated by SBC and BSCI. This is addressed by Hypothesis 4a and Hypothesis 4b, which evaluate the moderating role of SBC, and Hypothesis 5a and Hypothesis 5b, which assess the moderating role of BSCI. The direct effects of CETIs and CCE on FP are captured in the main effect of Hypothesis 3, which connects corporate CP to firm outcomes. RQ3 explores whether international climate governance regimes influence the effectiveness of CG mechanisms, namely EC, SBC and BSCI, on CETIs, CCE, and FP. While not explicitly depicted in Figure 1, this dimension is discussed conceptually and explored in the broader analysis through interaction terms that consider institutional context. Figure 1 visually presents the conceptual framework, outlining the predicted relationships among EC, SBC, BSCI, CETIs, CCE and FP. It illustrates the direct effects of EC and SBC on corporate CP, operationalised through CETIs and CCE; the subsequent influence of CCP on FP; and the moderating effects of both SBC and BSCI on these pathways.

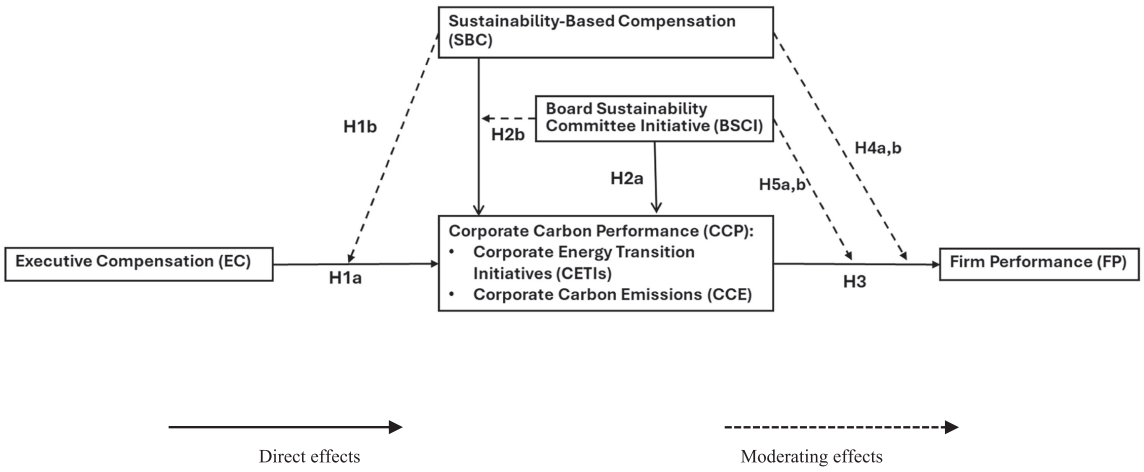

FIGURE 1 | Conceptual framework.

5 | Methodology

5.1 | Sample and Data

The sample consists of listed non-financial firms in Southeast Asia, Africa, and Latin America—specifically from Chile, Brazil, Egypt, Kenya, Malaysia, Indonesia, Philippines, Nigeria, Mexico, Morocco, South Africa, Uganda and Thailand (see Table 1). These countries were selected not only based on the availability of consistent and reliable data in the Refinitiv Workspace database but also due to their active engagement in climate change and sustainability initiatives. These economies have demonstrated significantly efforts toward decarbonisation and transitioning to a low-carbon economy, aligning closely with objectives of this study. Additionally, these emerging economies have undergone comparable governance reforms in the last decade, including the establishment of sustainability-related policies and regulations such as carbon taxation, renewable energy mandates and CG codes that emphasize environmental stewardship. These governance frameworks create an ideal context for examining the interplay between governance mechanisms, CETIs, and CCEs. It is acknowledged, however, that grouping countries from Africa, Latin America and Southeast Asia entails addressing significant inter-regional differences in economic, political and environmental contexts.

To account for these variations, this study employs country-level control variables including inflation and GDP growth, to reflect economic conditions and governance indicators, such as political stability and regulatory quality, to capture institutional differences. The theoretical rationale for including these countries stems from their critical role as emerging economies where rapid industrial growth and resource use are juxtaposed with increasing pressures to adopt sustainable practices. This duality provides a rich setting for understanding how governance mechanisms, such as sustainability committees and compensation structures, influence CETIs and CCE within complex socio-economic and regulatory landscapes.

Consistent with prior studies (Haque and Ntim 2020; Orazalin et al. 2024), the focus on non-financial corporations reflects their unique governance and regulatory characteristics. Only corporations with at least five consecutive years of consistent data were included to ensure robustness. The sample covers the years 2002–2022 and includes data on CETIs and CCEs, aligning with the aim of this study. Data for the study, including CCE, CETIs, EC, BSCI, SBC, CG and firm-specific variables from 13 emerging economies, were obtained from the Refinitiv Workspace database. The selection of EC, BSCI, SBC and the CG variables were based on the evidence of prior literature that find a relationship between these variables and CP (Saa et al. 2025; Haque and Ntim 2020; Orazalin et al. 2024; Morrison et al. 2025). For instance, Morrison et al. (2025) observe a positive association between EC and greenhouse gas performance, while Saa et al. (2025) find a negative relationship between EC and CP.

The focus on non-financial companies reflects their unique regulatory and governance characteristics compared to financial firms, such as differences in reporting standards and operational risks (Luo and Tang 2021), which align with the study's objectives to explore sustainability governance and performance. The World Bank database was utilised to get GDP growth rates and inflation as the nation-specific control variables, while Kaufmann et al.'s (2011)' Worldwide Governance indicators (WDI) were used to gather data on country governance indicators (World Bank 2020). The selection of these variables were informed by evidence from prior literature (Haque and Ntim 2020; Saa et al. 2025; Orazalin et al. 2024). For instance, some prior literature observes that WDI has negative impact on various measures of corporate environmental performance (Morrison et al. 2025). Similarly, other scholars document a negative relationship between inflation and environmental performance of

TABLE 1 | Sample distribution by country.

Country	Corporations	Observations	Percentage (%)	Cumulative (%)
Brazil	48	1008	17.78	17.78
Chile	18	378	6.67	24.44
Egypt	8	168	2.96	27.41
Indonesia	16	336	5.93	33.33
Kenya	1	21	0.37	33.7
Malaysia	34	714	12.59	46.3
Mexico	17	357	6.3	52.59
Morocco	4	84	1.48	54.07
Nigeria	1	21	0.37	54.44
Philippines	10	210	3.7	58.15
South Africa	90	1890	33.33	91.48
Thailand	22	462	8.15	99.63
Uganda	1	21	0.37	100
Total	270	5670	100	

corporations (Morrison et al. 2025; Saa et al. 2025), whereas others find a negative link between inflation and CP (e.g., Orazalin et al. 2024). Further, Orazalin et al. (2024) find a positive link between GDP and CP. Overall, the evidence of these prior literature offers a strong validation for all the selected variables in our study.

The sample comprises 5670 corporation-year data from 270 corporations across 46 distinct industries. The sample distribution by nation is shown in Table 1. The SSA countries are the least represented, with Uganda, Nigeria and Kenya each accounting for 0.37% of the total sample. Notably, South Africa has the most observations (1890, or 33.33% of the sample), followed by Brazil (1008). The results in Table A1 show that carbon emission intensive industries including food products, and metals and mining, substantially dominate our sample with 8.15% and 7.78%, respectively, whereas personal care products and others, place last with 0.37%.[1]

5.2 | Empirical Models

Firstly, based on fixed-effects panel regression, the model in Equation (1) is utilised to assess the relationship among EC, CETIs, CCE and the moderating impact of SBC on the EC–CETIs and EC–CCE relationships. The fixed-effects model was selected as it accounts for unobserved heterogeneity across the corporations and countries that may correlate with the explanatory variables, a critical consideration given the cross-country and corporation-level nature of the dataset. This approach was deemed more suitable than random effects, which assumes no such correlation, an assumption unlikely to hold in this context. Although the generalised method of moments (GMM) is often used to address endogeneity issues, diagnostic tests suggested that endogeneity was not a significant issue in our dataset, supporting the robustness of the fixed-effects approach for this study.

$$\begin{aligned} CETIP_{it} &= \alpha_0 + \beta_1 * EC_{it} + \beta_2 * SBC_{it} + \beta_3 * \left(EC_{it} * SBC_{it}\right) \\ &+ \beta_4 * BMEET_{it} + \beta_5 * BSIZE_{it} + \beta_6 * BIND_{it} + \beta_7 * BGEN_{it} \\ &+ \beta_8 * CEOCD_{it} + \beta_9 * FSIZE_{it} + \beta_{10} * PROF_{it} + \beta_{11} * LEVE_{it} \\ &+ \beta_{12} * SLACK_{it} + \beta_{13} * CAPIN_{it} + \beta_{14} * GDP_{kt} + \beta_{15} * INF_{kt} \\ &+ \beta_{16} * WGI_{kt} + \varepsilon_t \end{aligned} \tag{1}$$

where CETI performance ($CETIP_{it}$) represents either CETIs or CCE of firm i at period t. *EC*SBC* denotes the interaction between SBC and EC. The explanations of all the remaining variables are offered in Table 2.

The second model in Equation (2) is utilised to assess the relationship among EC, CETIs, CCE and the moderating impact of SBC on the EC–CETIs and EC–CCE relationships:

$$\begin{aligned} CETIP_{it} &= \alpha_0 + \beta_1 * EC_{it} + \beta_2 * BSCI_{it} + \beta_3 * \left(EC_{it} * BSCI_{it}\right) \\ &+ \beta_4 * BMEET_{it} + \beta_5 * BSIZE_{it} + \beta_6 * BIND_{it} + \beta_7 * BGEN_{it} \\ &+ \beta_8 * CEOCD_{it} + \beta_9 * FSIZE_{it} + \beta_{10} * PROF_{it} + \beta_{11} * LEVE_{it} \\ &+ \beta_{12} * SLACK_{it} + \beta_{13} * CAPIN_{it} + \beta_{14} * GDP_{kt} + \beta_{15} * INF_{kt} \\ &+ \beta_{16} * WGI_{kt} + \varepsilon_t \end{aligned} \tag{2}$$

where *EC*BSCI* signifies the interaction between BSCI and EC. Every other variable remains same, as indicated in Equation (1).

The third model in Equation (3) is utilised to assess the relationship among CETIs, CCE, FP and the moderating effect of SBC on the CETIs–FP and CCE–FP relationships:

$$\begin{aligned} FP_{it} &= \alpha_0 + \beta_1 * CETIP_{it} + \beta_2 * SBC_{it} + \beta_3 * \left(CETIP_{it} * SBC_{it}\right) \\ &+ \beta_4 * BMEET_{it} + \beta_5 * BSIZE_{it} + \beta_6 * BIND_{it} + \beta_7 * BGEN_{it} \\ &+ \beta_8 * CEOCD_{it} + \beta_9 * FSIZE_{it} + \beta_{10} * PROF_{it} + \beta_{11} * LEVE_{it} \\ &+ \beta_{12} * SLACK_{it} + \beta_{13} * CAPIN_{it} + \beta_{14} * GDP_{kt} + \beta_{15} * INF_{kt} \\ &+ \beta_{16} * WGI_{kt} + \varepsilon_t \end{aligned} \tag{3}$$

where firm performance (FP_{it}) represents either Tobin's Q or ROA of firm i at period t. *CETIP*SBC* denotes the interaction between SBC and CETIP. Every other variable remains same, as indicated in Equation (1).

The last model in Equation (4) is utilised to assess the relationship among CETIs, CCE, FP and the moderating effect of BSCI on the CETIs–FP and CCE–FP relationships:

$$\begin{aligned} FP_{it} &= \alpha_0 + \beta_1 * CETIP_{it} + \beta_2 * BSCI_{it} + \beta_3 * \left(CETIP_{it} * BSCI_{it}\right) \\ &+ \beta_4 * BMEET_{it} + \beta_5 * BSIZE_{it} + \beta_6 * BIND_{it} + \beta_7 * BGEN_{it} \\ &+ \beta_8 * CEOCD_{it} + \beta_9 * FSIZE_{it} + \beta_{10} * PROF_{it} + \beta_{11} * LEVE_{it} \\ &+ \beta_{12} * SLACK_{it} + \beta_{13} * CAPIN_{it} + \beta_{14} * GDP_{kt} + \beta_{15} * INF_{kt} \\ &+ \beta_{16} * WGI_{kt} + \varepsilon_t \end{aligned} \tag{4}$$

where *CETIP*BSCI* denotes the interaction between CETIP and BSCI. Every other variable remains same, as indicated in Equation (1).

5.3 | Main Variables

FP is assessed using Tobin's Q—market-based FP measure and return on assets (ROA)—accounting-based FP measure. Tobin's Q is regarded as a market long-term FP indicator (Haque and Ntim 2020). In contrast, ROA measures accounting return/short-term FP (Saa et al. 2025). Consistent with prior research (Morrison et al. 2024; Orazalin et al. 2024), the energy transition initiatives index is designed to assess the CETIs.[2] CETIs is an index adjusted for industry specifics and weighted based on 40 distinct energy transition initiatives at the corporation level, where greater CETIs values suggest heightened advocacy for energy transition-related concerns. Table A2 contains the list of 40 provisions for the index. In line with related research (Orazalin et al. 2024; Moussa et al. 2020), this analysis uses the natural logarithm of the CCE as a carbon measurement, considering both Scope 1 and Scope 2 emissions in tonnes.[3] As a measure of EC, this analysis uses the natural logarithm of the total fixed and variable compensation provided to all corporate leaders in USD, as stated by the corporations, in line with prior studies (Saa et al. 2025). With SBC, a binary variable that is set to 0 otherwise and to 1 if the corporation implements SBC (Haque and Ntim 2020). Furthermore, as listed in Table A3, the BSCI also denotes seven extensive corporation-specific BSCIs.

TABLE 2 | Descriptions of variables.

Variable	Symbols	Description	Source
Corporate carbon emissions	CCE	Natural log of total carbon emissions, encompassing both Scope 1 (direct emissions from sources within the corporation's ownership or control) and Scope 2 comprises of indirect emissions originating from the use of bought electricity, heat, cooling, steam and comparable sources in tonnes. Greater positive carbon emissions scores denote higher degrees of greenhouse gas emissions, suggesting weaker carbon performance and vice versa.	Refinitiv Workspace
Corporate energy transition initiatives	CETIs	The index refers to a sector-adjusted weighted mean, obtained from 40 individual corporation-level factors relevant to energy transition initiatives and activities (see Table A2). Its scale extends from 0 (implying no indication of CETIs) to 40 (demonstrating completely applied CETIs).	Refinitiv Workspace
Executive compensation	EC	Natural log of the total variable and fixed compensation paid to all top executives, stated in USD. The fixed element includes the base salary and additional non-monetary benefits—transportation, housing and healthcare. The variable element includes bonuses and other long-term incentive schemes including extended share options and equity ownership.	Refinitiv Workspace
Sustainability-based compensation	SBC	A dummy variable that equals one if the corporations have sustainability-based incentives, and zero if otherwise.	Refinitiv Workspace
Board sustainability committee index	BSCI	The index represents a sector-adjusted weighted average index obtained from seven corporation-specific items (see Table A3) related to sustainable reporting initiatives by the board sustainability committee. It spans between 0 (non-existence of board sustainability committee initiatives) and seven (completely established board sustainability committee initiatives).	Refinitiv Workspace
Market value	TOBIN'S Q	Derived as total assets less book value of equity plus market value of equity scaled by total assets.	Refinitiv Workspace
Return on assets	ROA	Ratio of operating profit to total assets.	Refinitiv Workspace
Control variables			
Number of board meetings	NBMEET	Natural log of the number of board meetings throughout the year.	Refinitiv Workspace
Board size	BSIZE	Natural log of the total number of board directors within the year.	Refinitiv Workspace
Board independence	BIND	The proportion of board members who are independent.	Refinitiv Workspace
Board gender diversity	BGEND	The proportion of female board members	Refinitiv Workspace
CEO Chairman duality	CEOCD	A binary variable is employed, where it is allocated a score of 1 when the board chair and the CEO are separate individuals, and 0 in situations where they are the same person.	Refinitiv Workspace
Company-level control variables			
Firm size	FSIZE	Natural log of total assets.	Refinitiv Workspace
Profitability	PROFT	The ratio of net income to total asset value.	Refinitiv Workspace

(Continues)

TABLE 2 | (Continued)

Variable	Symbols	Description	Source
Leverage	LEVE	The ratio of total debt divided to the aggregate value of total assets.	Refinitiv Workspace
Slack	SLACK	The ratio of cash and cash equivalents divided to the aggregate value of total assets.	Refinitiv Workspace
Capital intensity	CAPIN	The ratio of plant, property and equipment to the value of total assets.	Refinitiv Workspace
Country-level variables			
GDP growth	GDP	The total production value, including the gross value added by local producers, inclusive of product taxes, while deducting subsidies not included in the product values.	World Bank
Inflation rates	INF	The yearly percentage change in the prices of goods and services, which can either remain constant or vary in a year.	World Bank
World governance index	WGI	An aggregate index constructed to denote country governance quality. Computed based on CG factors such as rule of law, regulatory quality, political stability and government effectiveness. This metric ranges between 0 (low governance quality) and 1 (greatest feasible level of governance excellence).	Worldwide Governance Indicators

5.4 | Control Variables

This study makes use of a number of control variables to account for the potential effect of apparent country- and corporation-specific attributes. Following relevant research, we include CG characteristics such as board size, the duality of CEO-Chairman roles, and board independence, which are critical in shaping firm-level decision-making and governance practices (Orazalin et al. 2024). At the corporation level, variables like profitability, capital intensity, corporation size and leverage are employed as control variables, given their well-established roles in influencing corporate strategies and financial outcomes (Berrone and Gomez-Mejia 2009; Siddique et al. 2021; Orazalin et al. 2024).

Additionally, the study includes country-level macroeconomic and governance indicators, such as GDP growth rates and inflation, to capture the wider economic and institutional environment in which the corporations operate. GDP growth reflects the economic health of a country, which can affect FP, investment decisions and the capacity to engage in energy transition initiatives (CETIs) (Saa et al. 2025). Inflation, on the other hand, accounts for changes in purchasing power and input costs, which may impact corporate financial outcomes and decisions related to carbon emission reductions (CCE) (Haque and Ntim 2020; Marin and Vona 2021; Orazalin et al. 2024).

It is acknowledged that these macroeconomic factors might vary significantly across countries, reflecting differences in development stages, regulatory frameworks and market dynamics, all of which may influence firm-level variables like CETIs and CCE. While cultural factors could also play a role in shaping corporate sustainability policies, they are not explicitly included in this study due to the challenges of obtaining consistent and reliable measures across multiple countries. The sample period of 2002–2022 was chosen to offer a wide-ranging view of corporation-level responses to significant global sustainability initiatives—the Kyoto Protocol and the Paris Agreement, as well as governance reforms implemented in the past two decades, ensuring the study captures long-term trends and policy impacts.

6 | Empirical Results

6.1 | Descriptive Statistics

The variables' descriptive statistics are displayed in Table 3. With a mean score of 7.95, the values of the CETIs span from a minimum of 0 to a maximum of 35. The scores of CCE range from 1.63 to 24.42—with a standard deviation of 1.75 and an average score of 14.93. Furthermore, results in Table 3 show that about 18% of the corporations have tied a percentage of corporate executives' compensation to meeting sustainability goals. This evidence is in line with earlier research by Orazalin et al. (2024) in an international sample, Haque and Ntim (2020) in European corporations and Saa et al. (2025) in an African sample.

Furthermore, in line with related research (see Saa et al. 2025; Morrison et al. 2025), the pairwise correlation coefficients shown in Table 4 suggest that SBC, BSCI and EC are positively correlated with CETIs and CCE.

Additionally, Table 4 demonstrates that the independent variables' correlation coefficients are generally low (do not exceed 0.80)—indicating that there do not appear to be any significant multicollinearity issues (Shrestha 2020; Haque and Ntim 2020). Furthermore, the VIF[4] of 1.86 and 1.71 for CETIs and BSCI, respectively, are far less than the threshold of 10.

TABLE 3 | Summary statistics.

Variable	Observations	Mean	Standard Dev.	Minimum	Maximum
CCE (ln)	2441	14.927	1.746	1.634	24.415
CETIs	5670	7.950	8.824	0.000	35.000
EC (In)	2189	14.927	1.746	1.634	24.415
SBC	3098	0.196	0.397	0.00	1.00
BSCI	5670	2.600	2.796	0.000	8.000
TOBIN'S Q	4171	2.071	0.695	1.210	8.460
ROA	3314	0.063	0.076	0.420	1.000
BMEET (ln)	2120	1.974	0.517	0.693	3.932
BSIZE (ln)	3314	2.340	0.336	0.000	3.497
BIND (%)	2120	46.275	20.157	0.000	100.000
BGEN (%)	3094	14.942	12.715	0.000	75.000
CEOCD	3098	0.188	0.390	0.000	1.000
FSIZE (ln)	3987	21.977	1.370	6.059	26.513
SLACK (ratio)	3612	0.059	0.077	−0.692	0.768
LEVE (%)	3987	0.075	0.170	0.000	4.110
PROF (%)	3987	23.32	13.29	−0.040	824.3
CAPIN (ratio)	5144	5.942	45.903	−18.253	15.843
GDP (%)	5505	3.374	4.098	−9.518	34.000
INF (%)	5505	10.492	13.007	−1.139	48.000
WGI (%)	5670	0.343	0.281	−1.231	0.740

6.2 | Multivariate Results and Discussion

6.2.1 | Pay Incentives, CETIs and CCEs

In investigating the fixed regression results of the various relationships, the industry, country and year effects are controlled to make sure that the observed relations are not confounded by these external, time-invariant features (Saa et al. 2025). Firstly, Table 5 reveals the results of the fixed-effects regression of BSCI, SBC and EC against CETIs—with each column demonstrating the various models. Column (1) demonstrates that EC has no significant effect on CETIs, suggesting that Hypothesis 1a is rejected. This suggests that traditional, possibly short-term-oriented, compensation schemes may be insufficient for driving long-term environmental strategies. This aligns with critiques in the CG literature, which argue that unless linked to environmental targets, EC may lack the necessary motivational alignment (Haque and Ntim 2020). The lack of significant effect between EC and CETIs has key practical implications for CG structures in these emerging economies. In particular, the results of the study suggest that in order to propel energy transition, the remuneration committees of corporations within these countries should increasingly link the pay of corporate executives with actual progress made by their corporations in energy transition ventures. Noticeably, this will compel the corporate executives to make greater commitment towards accelerating the energy transition efforts of their corporations and help contribute to a low-carbon economy environment. Our results are comparable with prior studies that find no link between EC and actual CP (e.g., Saa et al. 2025; Haque and Ntim 2020; Morrison et al. 2025; Adu et al. 2023). However, this evidence differs from earlier research that observe a positive link between EC and environmental performance of corporations (Haque 2017; Cordeiro and Sarkis 2008; Berrone and Gomez-Mejia 2009; Mahoney and Thorn 2006; Deckop et al. 2006). Our results also contradict the evidence of studies that observe a negative association between EC and environmental performance (e.g., McGuire et al. 2003; Cai et al. 2011).

Alternatively, the regression evidence in Column (2) reveals that SBC has a positive impact on CETIs ($p < 0.01$)—offering empirical support to Hypothesis 1a. This evidence corroborates prior studies that reveal that pay incentives can encourage corporate leaders to undertake key initiatives that can improve their corporations' energy transition activities (e.g., Qian and Schaltegger 2018; Haque and Ntim 2020; Saa et al. 2025). Our evidence implies that the setting of carbon metric in EC does lead to an increase in CETIs. One feasible reason is that setting carbon metric in top corporate executives' compensation will motivate them to make greater contributions towards energy transition activities (Haque and

TABLE 4 | Pairwise correlation.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) CCE	1.000																		
(2) CETIs	0.390**	1.000																	
(3) EC	0.123**	0.114**	1.000																
(4) SBC	0.005	0.124**	0.088*	1.000															
(5) BSCI	0.199**	0.599**	0.117**	0.149**	1.000														
(6) TOBINS Q	0.085**	−0.055**	−0.055**	−0.174**	−0.085**	1.000													
(7) NBMEET	0.197**	0.184**	−0.005	−0.034	0.196**	0.253**	1.000												
(8) BSIZE	0.193**	0.184**	0.091**	0.092**	0.149**	−0.049**	0.068**	1.000											
(9) BIND	−0.048**	−0.004	0.009	0.212**	0.085**	−0.186**	−0.225**	−0.011	1.000										
(10) BGEND	−0.125**	0.071**	−0.042	0.302**	0.156**	−0.270**	−0.155**	0.119**	0.348**	1.000									
(11) CEOCD	−0.033	0.012	0.092**	−0.048**	−0.062**	0.080**	0.011	0.013	−0.027	−0.144**	1.000								
(12) FSIZE	0.557**	0.429**	0.167**	−0.086**	0.366**	0.133**	0.327**	0.297**	−0.189**	−0.206**	0.103**	1.000							
(13) PROFT	−0.006	0.016	0.003	−0.009	0.016	−0.030	0.015	0.004	0.043*	0.009	−0.011	−0.016	1.000						
(14) LEVE	0.011	0.341**	−0.082**	0.005	0.300**	0.008	−0.017	0.046**	0.085**	0.112**	0.035	0.147**	−0.008	1.000					
(15) SLACK	−0.149**	0.003	0.035	−0.003	0.005	−0.196**	−0.189**	−0.121**	0.031	0.069**	−0.055**	−0.178**	0.003	−0.121*	1.000				
(16) CAPIN	−0.035	−0.028*	0.009	0.019	−0.014	−0.042**	−0.063**	−0.007	0.037**	0.079**	−0.045**	−0.064**	0.000	0.009	−0.007	1.000			
(17) GDP	0.031	−0.118**	0.016	−0.085**	−0.121**	0.123**	0.081**	−0.098**	−0.073**	−0.082**	0.020	−0.022	0.004	−0.090*	0.096*	−0.033*	1.000		
(18) INF	0.009	−0.282**	0.037	−0.025	−0.310**	0.153**	−0.019	−0.044**	−0.002	0.004	0.072**	−0.208**	−0.009	−0.116*	−0.028	−0.035*	0.362*	1.000	
(19) WGI	0.136*	−0.032**	−0.010	−0.275**	−0.029**	0.479**	0.311**	−0.097**	−0.330**	−0.420**	0.076**	0.134**	−0.036*	−0.209*	−0.065*	−0.091*	0.137*	0.148*	1

Note: $^{**}p < 0.01$; $^{*}p < 0.05$.

TABLE 5 | Effects of board sustainability committee index and pay incentives on corporate energy transition initiatives.

Dependent variable Models	CETIs (1)	CETIs (2)	CETIs (3)	CETIs (4)	CETIs (5)
Independent variables					
EC	−0.117 (−1.25)			−0.153 (−1.47)	0.030 (0.18)
SBC		1.765*** (4.32)		1.819 (0.48)	
BSCI			1.643*** (20.27)		1.932*** (3.51)
EC*SBC				0.255 (0.92)	
SBC*BSCI					−0.021 (−0.69)
BMEET	0.276 (0.43)	0.450 (1.21)	−0.034 (−0.29)	0.062 (0.48)	−0.302 (−0.63)
BSIZE	1.728* (1.75)	0.537 (0.54)	−0.086 (−0.13)	1.564 (1.70)	0.047 (0.16)
BIND	0.043** (2.10)	0.039** (2.45)	0.027* (1.82)	0.034** (2.11)	0.028** (2.32)
BGEND	0.113*** (5.36)	0.126*** (7.23)	0.063*** (5.76)	0.119*** (6.47)	0.047*** (3.32)
CEOD	0.819 (1.23)	0.373 (0.52)	0.918 (1.58)	0.853 (1.42)	1.460** (2.31)
FSIZE	5.543*** (12.15)	5.610*** (12.54)	3.872*** (10.33)	5.275*** (12.42)	3.954*** (9.68)
PROFT	−1.56 (−0.42)	−7.743*** (−2.63)	−5.626** (−2.38)	−1.109 (−0.32)	−1.062 (−0.37)
LEVE	3.273*** (3.82)	3.975*** (5.30)	2.740*** (4.32)	3.471*** (4.50)	2.658*** (3.81)
SLACK	0.004 (0.26)	0.017 (0.59)	0.003 (0.26)	0.008 (0.73)	0.007 (0.29)
CAPIN	0.003 (0.42)	0.009 (0.23)	0.012 (1.08)	0.010 (0.67)	0.015 (1.28)
GDP	−0.251*** (−6.27)	−0.140*** (−4.28)	−0.121*** (−4.43)	−0.208*** (−6.55)	−0.165*** (−5.10)
INFL	0.240*** (6.43)	0.135*** (5.28)	0.129*** (5.21)	0.232*** (7.54)	0.171*** (6.40)
WGI	5.761*** (3.45)	15.320*** (3.35)	4.638 (1.29)	19.400*** (3.58)	6.432 (1.47)
Constant	−13.64*** (−11.48)	−12.432*** (−12.21)	−8.432*** (−9.54)	−19.326*** (−12.58)	−8.415*** (−8.92)
Year, industry & country dummies	Fixed	Fixed	Fixed	Fixed	Fixed
No. of observations	982	1287	1287	982	982
R-squared	0.354	0.342	0.520	0.411	0.527

Note: This table presents the regression results of board sustainability committee initiatives, pay incentives and executive compensation on corporate energy transition initiatives. All variables are defined and measured in Table 2. *t*-Statistics estimated using robust standard errors are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

Ntim 2020; Morrison et al. 2024). The findings demonstrate that providing executives with incentives connected to sustainability effectively encourages business energy transition initiatives in these developing nations (Delmas Lyon et al. 2019; Adu et al. 2023). The evidence offers empirical support to the multi-theoretical foundation that draws insights from RBV, NIT and stakeholder theoretical perspectives.

The evidence lends support to the theoretical prediction that, suitable EC are more probable to increase corporation executives (RBV) to participate in CETIs to fulfil the expectations of interested parties (stakeholder theory) and encourage low-carbon economy activities (Morrison et al. 2024) to obtain legitimacy, create shareholder value, and in the process facilitating access essential resources (NIT) (Olekanma et al. 2024; Orazalin et al. 2024). However, Column 4 of Table 5 reveals the result of the moderating effect of SBC on the EC-CETIs relationship. The result demonstrate that the coefficient of the moderating term (SBC*EC) has a positive but insignificant association with CETIs, indicating that SBC has no moderating role on the EC-CETIs nexus. The findings suggest that Hypothesis 1b is rejected.

Secondly, Table 6 provides the fixed-effects regression of SBC and EC against CCE. In Column (1), the results reveal that EC negatively but insignificantly associated with CCE, thereby suggesting that Hypothesis 1a is not empirically supported. Likewise, Column (2) demonstrates that SBC has a negative but insignificant effect on CCE. The result does not offer empirical support to Hypothesis 1a. Also, the evidence in Column (4) of Table 6 reports that the moderation term EC*SBC has a negative but insignificant moderating influence on CCE. This evidence implies that Hypothesis 1b is not empirically supported. These findings support the hypothesis that pay incentives that unrelated to actual carbon emissions may not be a useful tool for reducing the risks associated with climate change and improving the sustainability performance of corporations (Saa et al. 2025).

According to the findings, business executives may have an impact on how compensation incentives are set up. In this instance, the real decrease in CCE may not be connected to the compensation incentives as established in prior studies (Haque and Ntim 2020; Olekanma et al. 2024). The finding also confirms the evidence previous research that observe that SBC has on impact on the link between EC and CP (e.g., Adu et al. 2023; Morrison et al. 2025). On the flip side, the evidence is in sharp contrast to studies that document that SBC has beneficial effect on the link between EC and environmental performance (e.g., Haque and Ntim 2020; Saa et al. 2025). For instance, Haque and Ntim (2020) detect that ESG-based compensation has a positive moderating influence EC and process-based CP construct.

6.2.2 | Board Sustainability Committee Index, CETIs and CCEs

Table 5 presents the regression results on the relationship among EC, CETIs, BSCI and CCE. The finding in Column (3) of Table 5 shows that BSCI is positively and significantly associated with CETIs ($p < 0.01$). The result implies that Hypothesis 2a is empirically supported. This evidence indicates that corporations with greater value in BSCIs tend to plan and engage in effective energy transition actions (Saa et al. 2025; Orazalin and Mahmood 2021), which could assist the board in addressing the risks and problems associated with energy transition (Orazalin 2020; Orazalin and Mahmood 2021). Noticeably, such activities can potentially have positive impact in terms of improving the energy transition information quality of the corporation (Kılıç et al. 2021).

The finding backs up NIT viewpoints, which suggest that BSCI may be extremely helpful in promoting excellent energy transitions programs and putting CETIs into action (Peters and Romi 2014; Olekanma et al. 2024). Our result confirms the stakeholder theory that a corporation that prioritises stakeholder needs—by establishing BSCIs will perform better in CETIs. Noticeably, this might increase stakeholder participation and create collective benefit for shareholders (Orazalin et al. 2024; Peters and Romi 2014; Luo and Tang 2021). This is in line with past research that observes that CG features like sustainability committees benefit climate change activities (Saa et al. 2025; Morrison et al. 2025; Orazalin et al. 2024). Furthermore, the estimated results in Column (5) of Table 5 reveal that the coefficient for the moderating variable (EC*BSCI) has a negative but insignificant influence on CETIs—demonstrating that BSCI has no moderating impact on the EC-CETIs relationship. This result implies that Hypothesis 2b is rejected. In addition, its supports Maas and Rosendaal (2016) suggestion that long-term incentives motivate executives to consider and enhance firms' long-term performance.

Furthermore, the evidence in Column (3) of Table 6 reveal that BSCI has a positive but insignificantly linked with CCE, demonstrating that Hypothesis 2a is not empirically supported. Our result is in sharp contrast with earlier studies that report that BSCIs promote more engagement in climate change initiatives (Luo and Tang 2021; Orazalin et al. 2024). Additionally, Column (5) of Table 6 shows that the coefficient for the moderating term (EC*BSCI) has a positive impact on CCE ($p < 0.05$), establishing that BSCI has a beneficial moderating influence on the EC-CCE nexus. The result offers strong empirical support to Hypothesis 2b. Our findings suggest that the relationship between EC and CCE depends on the BSCI. Our evidence corroborates the results of prior study by Saa et al. (2025).

6.2.3 | CETIs, CCE and Firm Performance

Tables 7 and 8 offer the fixed effects regression results on the impact of BSCI, CETIs and CCE on FP. The result in Column (2) of Table 7 shows that there is a negative relationship between CETIs and Tobin's Q ($p < 0.01$), suggesting that corporations with higher CETIs are associated with lower FP. The findings imply that Hypothesis 3 lacks empirical backing. Our results seem to support the arguments made by academics who oppose investments related to climate change, arguing that putting in place low-carbon and energy-efficient projects can raise operating costs and disadvantage businesses in the marketplace (Preston and O'bannon 1997; Aupperle et al. 1985; Friedman 1970; Barnett and Salomon 2006) with detrimental impact on FP of corporations. The findings support earlier research including Barnett and Salomon (2006) and that Adu et al. (2023) that

TABLE 6 | Effects of board sustainability committee index and pay incentives on corporate carbon emissions.

Dependent variable Models	CCE (1)	CCE (2)	CCE (3)	CCE (4)	CCE (5)
Independent variables					
EC	−0.041 (−1.37)			−0.030 (−1.23)	−0.253*** (−2.87)
SBC		−0.086 (−0.09)		−0.044 (−0.02)	
BSCI			0.015 (0.73)		−0.520** (−2.21)
EC*SBC				−0.008 (−0.07)	
SBC*BSCI					0.037** (2.32)
BMEET	−0.148 (−1.25)	−0.176* (−1.75)	−0.204* (−1.82)	−0.143 (−1.09)	−0.170 (−1.25)
BSIZE	0.204 (0.72)	0.132 (0.68)	0.126 (0.59)	0.242 (0.79)	0.182 (0.63)
BIND	0.009 (−0.14)	−0.006 (−0.39)	−0.007 (−0.42)	−0.005 (−0.06)	−0.003 (−0.02)
BGEND	0.005 (−0.02)	−0.008 (−0.80)	−0.005 (−0.84)	−0.008 (−0.11)	−0.003 (−0.38)
CEOD	0.176 (0.98)	0.074 (0.59)	0.099 (0.50)	0.185 (0.81)	0.220 (1.17)
FSIZE	0.850*** (6.37)	0.832*** (7.64)	0.831*** (7.58)	0.932*** (6.37)	0.804*** (6.41)
PROFT	1.674** (2.33)	1.232* (1.90)	1.247* (1.92)	1.675** (2.21)	1.703** (2.35)
LEVE	0.072 (0.43)	0.054 (0.31)	0.075 (0.49)	0.070 (0.38)	0.073 (0.42)
SLACK	−0.008 (−0.21)	−0.007 (−0.22)	−0.003 (−0.07)	−0.007 (−0.25)	−0.003 (−0.17)
CAPIN	0.006 (0.09)	0.005 (0.06)	0.009 (0.02)	0.005 (0.57)	−0.004 (−0.08)
GDP	0.010 (1.08)	0.008 (0.23)	0.007 (0.31)	0.010 (0.95)	0.014 (1.17)
INFL	−0.002 (−0.47)	0.004 (0.52)	0.008 (0.13)	−0.007 (−0.30)	−0.009 (−0.64)
WGI	−0.705 (−0.52)	−1.273 (−1.16)	−1.215 (−1.02)	−0.853 (−0.62)	−1.33 (−0.87)
Constant	−5.543** (−2.47)	−4.187** (−2.52)	−3.543** (−2.16)	−5.650** (−2.09)	−3.308* (−1.79)
Year, industry & country dummies	Fixed	Fixed	Fixed	Fixed	Fixed
No. of observations	789	982	982	789	789
R-squared	0.080	0.083	0.079	0.082	0.097

Note: This table presents the regression results of board sustainability committee initiatives, executive compensation and pay incentives on corporate carbon emissions. All variables are defined and measured in Table 2. *t*-Statistics estimated using robust standard errors are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

TABLE 7 | Impacts of corporate carbon emissions, corporate energy transition initiatives, board sustainability committee index and pay incentives on firm performance (Tobin's Q).

Dependent variable Models	TobinsQ (1)	TobinsQ (2)	TobinsQ (3)	TobinsQ (4)	TobinsQ (5)	TobinsQ (6)	TobinsQ (7)	TobinsQ (8)
Independent variables								
CCE	0.027 (1.39)				0.029 (1.30)		−0.017 (−0.19)	
CETIs		−0.010*** (−3.26)				−0.005*** (−3.21)		0.028 (0.13)
SBC			0.052 (1.61)		0.032 (0.35)	0.120 (1.54)		
BSCI				−0.018* (−1.79)			−0.073 (−1.49)	0.036 (1.43)
CCE*SBC					0.007 (0.10)			
CETIs*SBC						−0.008 (−0.83)		
CCE*BSCI							0.012 (1.50)	
CETIs*BSCI								−0.039** (−2.16)
BMEET	−0.062* (−1.79)	−0.055* (−1.73)	−0.060* (−1.78)	−0.048* (−1.71)	−0.053* (−1.79)	−0.060* (−1.76)	−0.072* (−1.70)	−0.047* (−1.68)
BSIZE	0.023 (0.47)	0.028 (0.35)	0.013 (0.26)	0.020 (0.35)	0.037 (0.39)	0.023 (0.24)	0.035 (0.42)	0.027 (0.30)
BIND	0.011 (1.56)	0.007 (1.20)	0.016 (0.71)	0.022 (1.09)	0.002 (1.46)	0.008 (1.15)	0.011* (1.73)	0.027 (1.34)
BGEND	−0.043 (−0.19)	−0.005 (−0.27)	−0.008 (−0.84)	−0.005 (−0.57)	−0.002 (−0.89)	−0.004 (−0.13)	0.024 (0.09)	−0.039 (−0.14)
CEOD	0.145 (1.08)	0.128** (2.06)	0.124** (2.18)	0.128** (2.12)	0.108 (1.60)	0.128** (2.32)	0.058 (1.51)	0.139** (2.14)
FSIZE	0.070** (2.14)	0.119*** (3.72)	0.079** (2.10)	0.083*** (2.60)	0.092** (2.11)	0.146*** (3.14)	0.132** (2.10)	0.138*** (3.59)
PROFT	−1.506*** (−5.42)	−1.250*** (−5.59)	−1.211*** (−5.43)	−1.208*** (−5.52)	−1.443*** (−5.39)	−1.232*** (−5.65)	−1.432*** (−5.27)	−1.265*** (−5.374)
LEVE	−0.019 (−0.46)	0.031 (0.32)	0.009 (0.47)	0.017 (0.05)	−0.025 (−0.13)	0.032 (0.55)	−0.008 (−0.19)	0.020 (0.33)
SLACK	−0.027 (−1.39)	−0.008 (−1.47)	−0.026 (−1.38)	−0.029 (−1.42)	−0.007 (−1.26)	−0.023 (−1.40)	−0.008 (−1.36)	−0.045 (−1.28)
CAPIN	0.012** (2.38)	0.020* (1.68)	0.012* (1.78)	0.007* (1.73)	0.009** (2.04)	0.006* (1.74)	0.009** (2.54)	0.061* (1.73)
GDP	0.024 (0.17)	−0.011 (−1.04)	−0.032 (−0.59)	−0.009 (−0.68)	0.032 (0.17)	−0.056 (−0.78)	−0.008 (−0.13)	−0.016 (−1.19)
INFL	0.015 (1.56)	0.017*** (3.45)	0.015** (2.32)	0.012*** (3.40)	0.014 (1.53)	0.019*** (3.40)	0.023* (1.82)	0.008*** (3.45)

(Continues)

TABLE 7 | (Continued)

Dependent variable Models	TobinsQ (1)	TobinsQ (2)	TobinsQ (3)	TobinsQ (4)	TobinsQ (5)	TobinsQ (6)	TobinsQ (7)	TobinsQ (8)
WGI	−1.840***	−1.421***	−1.406***	−1.765***	−1.346***	−1.305***	−1.740***	−1.370***
	(−4.32)	(−4.35)	(−4.23)	(−4.25)	(−3.47)	(−3.82)	(−3.85)	(−3.67)
Constant	−2.985*	−1.543**	−1.898	−1.376*	−1.986*	−1.973**	−1.432	−1.369**
	(−1.74)	(−2.58)	(−1.59)	(−1.78)	(−1.70)	(−2.40)	(−1.30)	(−2.22)
Year, industry & country dummies	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
No. of obs.	982	1287	1287	1287	982	1287	982	1287
R-squared	0.090	0.075	0.082	0.071	0.093	0.088	0.156	0.089

Note: This table reports the regression results of corporate carbon emissions, corporate energy transition initiatives, pay incentives and board sustainability committee initiatives on financial performance (Tobin's Q). All variables are defined and measured in Table 2. *t*-Statistics estimated using robust standard errors are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

establish a negative relationship between environmental management practices and financial returns of corporations. By contrast, the estimated result in Column (2) of Table 8 suggests that there is no significant association between CETIs and ROA, implying that Hypothesis 3 is not empirically supported.

The results in Columns (1) of Tables 7 and 8, show a negative but insignificant effect of CCE on Tobin's Q and ROA, respectively, indicating that Hypothesis 3 is not validated. The findings are consistent with prior research that document no significant connection between environmental performance and FP (Matsumura et al. 2014; Haque and Ntim 2020; Busch and Hoffmann 2011; Adu et al. 2023). For example, this result validates the evidence of earlier research by with Haque and Ntim (2020) that observe that actual CP has no impact on market value of corporations in Europe. Conversely, our findings stand in stark contrast to the findings of Busch and Hoffmann (2011), who observe that CP has a beneficial effect on market value of corporations.

Further, the findings in Columns (4) of Table 7 and Table 8 reveal that BSCI is negatively associated Tobin's Q ($p < 0.10$) and ROA ($p < 0.05$), respectively. This suggests that firms with BSCI tend to engage in increased carbon investments, which can be costly and hence reduce the FP of the firms at least in the short-term. The results differ from emerging literature that finds beneficial connection between sustainability committees and FP. Nevertheless, this evidence lends support to the result of Orazalin et al. (2024) who observe a negative relationship between the establishment of board sustainability committees and market value. In the interim, the study observes insignificant relationship between SBC and FP in Columns (3) of Table 7 (Tobin's Q) and Table 8 (ROA), respectively.

6.2.4 | CETIs, CCE and FP: Moderating Impact of SBC

Tables 7 and 8 also present the findings of the moderating effect of SBC on CETIs, CCE and FP associations. The findings in Columns (6) of Tables 7 and 8 show that the moderating variable CETIs*SBC has insignificant effect on Tobin's' Q and ROA, respectively, indicating that Hypothesis 4a is not empirically validated. In this case, the idea that SBC can create value by making sure businesses take part in initiatives that support the energy transition and help create a low-carbon economy is not supported by our sample. Similarly, the findings in Columns (5) of Tables 7 and 8 demonstrate that the coefficients for the moderating term (CCE*SBC) are positive but not significant, suggesting that SBC has no moderating impact on the CCE–FP relationship. These findings imply that Hypothesis 4b is not validated. This evidence lends strong empirical support to previous study by Adu et al. (2023) that document that pay incentives have no moderating effect on the relationship between actual CP and FP.

6.2.5 | CETIs, CCE and FP: Moderating Effect of Board Sustainability Committee Index

Because sustainability committees play such an important part in this study, we have reasoned that the BSCI may attenuate the link between CETIs and FP. The results in Column (8) of Table 8 demonstrate that the interaction term CETIs*BSCI is positively related with ROA ($p < 0.10$), respectively, suggesting that Hypothesis 5b is empirically validated. The results are consistent with NIT and stakeholder theoretical recommendations that BSCI can create value by making sure that corporations undertake activities that foster energy transition and propel the transition to a low-carbon economy (Morrison et al. 2025). This is consistent with previous research (Orazalin et al. 2024) that detects that board sustainability committees can act as essential CG mechanisms that can shift business leaders' attention towards process-based greenhouse gas emission reduction activities with beneficial effect on the ROA. By contrast, the results in Column (8) of Table 7 show that the interaction term CETIs*BSCI is negatively connected with Tobin's Q ($p < 0.10$). These results imply that Hypothesis 5b is not empirically supported. Alternatively, the results in Columns (7) of Tables 7 and 8 reveal that the coefficients for the moderating term

TABLE 8 | Impacts of the corporate carbon emissions, corporate energy transition initiatives, board sustainability committee index and pay incentives on firm performance (return on assets).

Dependent variable Models	ROA (1)	ROA (2)	ROA (3)	ROA (4)	ROA (5)	ROA (6)	ROA (7)	ROA (8)
Independent variables								
CE	−0.030 (−0.42)				−0.045 (−0.23)		0.068 (0.53)	
CETIs		−0.011 (−1.53)				−0.015 (−1.47)		−0.006 (−1.52)
SBC			0.008 (0.36)		−0.016 (−0.52)	−0.048 (−0.21)		
BSCI				−0.015** (−2.32)			0.060 (0.51)	−0.017** (−2.20)
CCE*SBC					0.031 (0.75)			
CETIs*SBC						0.054 (0.47)		
CCE*BSCI							−0.009 (−0.44)	
CETIs*BSCI								0.023* (1.70)
BMEET	−0.010* (−1.76)	−0.006 (−1.47)	−0.017 (−1.62)	−0.015 (−1.39)	−0.010* (−1.73)	−0.003 (−1.54)	−0.017* (−1.70)	−0.028 (−1.44)
BSIZE	−0.035*** (−2.50)	−0.029** (−2.11)	−0.025** (−2.32)	−0.020** (−2.26)	−0.038*** (−2.97)	−0.023** (−2.31)	−0.045** (−2.53)	−0.031** (−2.49)
BIND	−0.048 (−0.57)	−0.009 (−0.76)	−0.043 (−1.14)	−0.097 (−1.43)	−0.014 (−0.56)	−0.054 (−0.93)	−0.008 (−0.34)	−0.030 (−1.38)
BGEND	−0.038 (−0.74)	−0.016 (−0.69)	−0.008 (−1.34)	−0.002 (−0.60)	−0.065 (−0.93)	−0.004 (−0.62)	−0.059 (−0.74)	−0.054 (−0.53)
CEOD	0.032* (1.70)	0.023 (1.40)	0.014 (1.52)	0.019 (1.28)	0.014* (1.77)	0.018 (1.36)	0.032 (1.60)	0.018 (1.36)
FSIZE	−0.005 (−0.89)	−0.008 (−1.67)	−0.030** (−2.23)	−0.018* (−1.76)	−0.011 (−1.07)	−0.017* (−1.69)	−0.010 (−0.72)	−0.013 (−1.61)
PROFT	0.095** (2.24)	0.039 (1.05)	0.045 (1.02)	0.039 (1.07)	0.348** (2.40)	0.031 (1.08)	0.094** (2.38)	0.045 (1.31)
LEVE	0.013 (0.95)	0.018 (1.54)	0.007 (0.98)	0.018 (1.36)	0.013 (1.09)	0.027 (1.19)	0.015 (1.02)	0.013 (1.16)
SLACK	−0.050 (−0.18)	−0.009 (−0.25)	−0.037 (−0.34)	−0.009 (−0.03)	−0.047 (−0.08)	−0.006 (−0.49)	−0.009 (−0.14)	−0.007 (−0.05)
CAPIN	0.007 (0.43)	0.016 (0.18)	0.054 (0.19)	0.037 (0.08)	0.003 (0.52)	0.048 (0.12)	0.008 (0.31)	0.003 (0.18)
GDP	0.062 (0.09)	0.030 (0.55)	0.058 (0.79)	0.042 (0.90)	0.004 (0.05)	0.065 (0.51)	0.007 (0.18)	0.006 (0.53)
INFL	−0.008 (−0.90)	−0.032 (−1.61)	−0.006* (−1.72)	−0.005* (−1.56)	−0.027 (−0.94)	−0.005* (−1.63)	−0.020 (−0.90)	−0.014* (−1.76)

(Continues)

TABLE 8 | (Continued)

Dependent variable Models	ROA (1)	ROA (2)	ROA (3)	ROA (4)	ROA (5)	ROA (6)	ROA (7)	ROA (8)
WGI	0.365***	0.269***	0.253***	0.290***	0.363***	0.252***	0.343***	0.250***
	(5.89)	(4.43)	(4.60)	(4.45)	(5.18)	(4.80)	(5.19)	(4.32)
Constant	0.953	0.237**	0.603***	0.456**	0.219	0.372**	0.765	0.607**
	(1.46)	(2.15)	(3.54)	(2.37)	(1.35)	(2.48)	(0.97)	(2.15)
Year, industry & country dummies	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
No. of observations	840	1074	1074	1074	840	1074	840	1074
R-squared	0.073	0.052	0.050	0.056	0.074	0.053	0.078	0.069

Note: This table reports the regression results of corporate carbon emissions, corporate energy transition initiatives, pay incentives and board sustainability committee initiatives on financial performance (ROA). All variables are defined and measured in Table 2. *t*-Statistics estimated using robust standard errors are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

(CCE*BSCI) are positive but not significant, indicating that BSCI has no moderating impact on the CCE-FP relationship. These findings imply that Hypothesis 5a is not empirically supported. These results corroborate the evidence of Saa et al. (2025) who observe that the establishment of board sustainability committees have no impact on the relationship between greenhouse gas performance and FP in African sample.

6.3 | Additional Analyses

According to earlier studies, governance structures, sustainable business management systems, and corporate performance are vastly influenced by different institutional systems, regulatory frameworks, and climate policies at the national and sectoral levels (Orazalin et al. 2024; Saa et al. 2025; Andreou and Kellard 2021). Thus, when examining the characteristics and drivers of businesses' energy transition projects and corporate carbon actions, it is crucial to focus on variations in time periods and national contexts (Morrison et al. 2025; Orazalin et al. 2024). In response to these suggestions, we conduct a set of country- and -period investigations to address these concerns in the sample.

First, the study re-estimates the results in Tables 5 and 6 to ascertain the effect of international climate change initiatives/reforms such as the Paris Agreement (2022–2016) and Kyoto Protocol (2015–2005). The results in Panel A of Table 9 show significant associations among SBC, BSCI, EC*BSCI and CETIs in the Paris Agreement subsamples (Columns 2–5), and significant relations for only BSCI and EC*SBC in the Kyoto Protocol subsample (Columns 8–9). Overall, these results highlight the significance of the Paris Agreement in encouraging CETIs in these emerging countries.

Also, the findings in Panel B of Table 9 reveal significant associations among EC*BSCI, EC*SBC and CCE in the Paris Agreement subsamples in Columns 4–5, and significant relationships for only EC*BSCI in the Kyoto Protocol subsample in Column 10. The findings underscore the significance of the Paris Agreement in increasing businesses' awareness of the negative effects of carbon emissions.

Secondly, the study re-estimates the results contained in Tables 5–8 for nations that have enacted carbon tax legislation. The countries in the emerging countries that have enacted carbon tax policy are South Africa, Mexico and Chile. The nations in the sample that have not enacted carbon tax policy include Morocco, Nigeria, Kenya, Philippines, Malaysia, Uganda, Egypt, Indonesia Thailand and Brazil. Our findings—for brevity, not reported but available on request, reveal no significant differences between the no carbon tax policy subsample and the carbon tax policy subsample. The findings indicate that carbon tax policy did not significantly impact on the estimated findings in the emerging countries.

6.4 | Robustness Tests

A number of additional investigations were conducted in this study to guarantee that the results are reliable. Firstly, all the equations were estimated using a dynamic two-step system generalised method of moments (GMM)—developed by Blundell and Bond (1998) and Arellano and Bond (1991). In the GMM estimation of CCEP, EC is employed as an endogenous variable; the specification of CCE also includes EC as an endogenous variable. The findings from GMM as contained in Tables 10 and 11 are similar to those stated in Tables 5 and 6. These results confirm the robustness of the main findings to endogeneity and sample selection bias. In the same vein, the study conducted further analyses to test the robustness of the findings in Tables 7 and 8. Precisely, the study estimated GMM models, which for brevity are not reported, but will be available upon request. The results of these additional estimations were consistent with the main findings in Tables 7 and 8.

TABLE 9 | Additional analysis.

Panel A: Effects of pay incentives, executive compensation and board sustainability committee initiatives on energy transition initiatives.

	Paris (2022–2016)					Kyoto (2015–2005)				
Dependent variable Models	**CETIs (1)**	**CETIs (2)**	**CETIs (3)**	**CETIs (4)**	**CETIs (5)**	**CETIs (6)**	**CETIs (7)**	**CETIs (8)**	**CETIs (9)**	**CETIs (10)**
Independent variables										
EC	−0.075 (−0.83)			−0.137 (−1.29)	−0.040 (−0.13)	0.031 (0.15)			−0.232 (−1.18)	−0.050 (−0.46)
SBC		1.510*** (3.46)		1.632 (0.38)			1.432** (2.18)		−9.654 (−2. 08)	
BSCI			1.140*** (9.55)		1.346** (2.02)			1.207*** (10.39)		0.706 (0.83)
EC*SBC				−0.242 (−0.17)					0.653** (2.10)	
EC*BSCI					−0.015** (−0.32)					0.035 (0.37)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry & country dummies	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
No. of obs.	626	754	754	626	626	356	530	532	356	356
R-squared	0.308	0.310	0.357	0.340	0.418	0.253	0.254	0.430	0.253	0.391

Panel B

	Paris (2022–2016)					Kyoto (2015–2005)				
Dependent variable Models	**CCE (1)**	**CCE (2)**	**CCE (3)**	**CCE (4)**	**CCE (5)**	**CCE (6)**	**CCE (7)**	**CCE (8)**	**CCE (9)**	**CCE (10)**
Independent variables										
EC	−0.022 (−0.68)			−0.024 (−0.70)	−0.072 (−0.59)	−0.034 (−0.38)			−0.053 (−0.75)	−0.508** (−2.23)
SBC		−0.059 (−0.73)		−0.701 (−0.49)			−0.047 (−0.34)		−0.360 (−0.17)	
BSCI			0.047 (1.28)		−0.010 (−0.08)			0.032 (0.39)		−1.520** (−2.27)
EC*SBC				0.053** (0.39)					0.025 (0.14)	
EC*BSCI					0.017** (0.28)					0.143** (2.31)
Controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(Continues)

TABLE 9 | (Continued)

Panel B										
Paris (2022–2016)						**Kyoto (2015–2005)**				
Year, industry & country dummies	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
No. of obs.	578	686	686	578	578	211	295	295	211	211
R-squared	0.040	0.034	0.031	0.046	0.047	0.198	0.126	0.124	0.258	0.237

Note: This table displays the regression results executive compensation, pay incentives and board sustainability committee initiatives on energy transition initiatives for three different regimes: PARIS (2022–2016) and KYOTO (2015–2005). The definitions for all variables are provided in Table 2. The *t*-statistics calculated with robust standard errors are shown in brackets.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

TABLE 10 | GMM regression on the effects of board sustainability committee initiatives and pay incentives on corporate energy transition initiatives.

Dependent variable Models	**CETIs (1)**	**CETIs (2)**	**CETIs (3)**	**CETIs (4)**	**CETIs (5)**
Independent variables					
EC	−0.025 (−0.16)			−0.140 (−1.53)	−0.129 (−0.48)
SBC		1.858*** (3.52)		−8.284* (−1.79)	
BSCI			1.710*** (11.43)		1.643** (2.27)
EC*SBI				0.568** (2.14)	
EC*BSCI					0.006 (0.12)
Control variables	Fixed	Fixed	Fixed	Fixed	Fixed
Country effects	Fixed	Fixed	Fixed	Fixed	Fixed
Industry effects	Fixed	Fixed	Fixed	Fixed	Fixed
Year effects	Fixed	Fixed	Fixed	Fixed	Fixed
Observations	982	1287	1287	982	982
Arellano-Bond (AR-1)	0.092	0.663	0.037	0.578	0.020
Arellano-Bond (AR-2)	0.342	0.231	0.125	0.990	0.872
Hansen test (*p-value)*	0.020	0.182	0.639	0.018	0.335

Note: This table reports the GMM regression results of executive compensation, pay incentives, and board sustainability committee initiatives on corporate energy transition initiatives. All variables are defined and measured in Table 2. *t*-Statistics estimated using robust standard errors are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

Secondly, we adopt a two-stage least squares (2SLS) to ensure that the main findings are not driven by endogeneity issues. Consistent with prior studies (Saa et al. 2025; Orazalin et al. 2024) the first lag and industry mean values of the main independent variables are employed as instruments. Though not reported to preserve space, our results are highly consistent with our earlier findings reported in Tables 5 to 8. Overall, the findings of the robust analyses implied that the results were not influenced by any potential sample selection bias and endogeneity issues.

TABLE 11 | GMM regression on the effects of board sustainability committee initiatives and pay incentives on corporate carbon emission.

Dependent variable Models	CCE (1)	CCE (2)	CCE (3)	CCE (4)	CCE (5)
Independent variables					
EC	0.038 (0.67)			0.105 (0.46)	0.057 (0.90)
SBC		0.059 (0.78)		−2.864 (−1.50)	
BSCI			0.063 (1.45)		0.235 (0.89)
EC*SBC				0.196 (1.48)	
EC*BSCI					−0.013 (−0.47)
Control variables	Fixed	Fixed	Fixed	Fixed	Fixed
Country effects	Fixed	Fixed	Fixed	Fixed	Fixed
Industry effects	Fixed	Fixed	Fixed	Fixed	Fixed
Year effects	Fixed	Fixed	Fixed	Fixed	Fixed
Observations	789	982	982	789	789
Arellano-Bond (AR-1)	0.710	0.550	0.470	0.741	0.552
Arellano-Bond (AR-2)	0.363	0.428	0.424	0.363	0.274
Hansen test (*p-value)*	0.878	0.976	0.989	0.820	0.687

Note: This table presents the GMM estimation results of pay incentives, executive compensation, and board sustainability committee initiatives on corporate energy transition initiatives. All variables are defined and measured in Table 2. *t*-Statistics estimated using robust standard errors are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

7 | Conclusion

The transition to a low-carbon economy is not only an environmental necessity, but also a basic economic transformation critical for mitigating climate change and achieving sustainable development globally (Banerjee et al. 2024). In particular, the global community faces challenges in establishing sustainable business practices to enhance energy transition and lower carbon emissions. Various initiatives have been developed and implemented in the recent past by non-governmental bodies, policy organisations and governments with the aim of tackling climate change and contributing to the transition to a low-carbon economy. These efforts include international agreements such as the Net Zero Coalition, Paris Agreement and Kyoto Protocol, which seek to limit carbon emissions while propelling energy transition activities. Nonetheless, there is scant evidence regarding the possible of corporate sustainability strategies such as SBC policy and BSCIs in tackling and/or mitigating climate change threats. This study sought to bridge this gap by investigating the interrelations among EC, SBC, BSCI, CETIs, CCE and FP utilising a dataset of 270 firms from 13 emerging countries representing 5670 firm-year observations from 2002 to 2022. The findings reveal that SBC and BSCI are critical governance tools in promoting firm engagement in CETIs. While EC alone has no significant impact, SBC drives transitions by aligning managerial incentives with environmental objectives. BSCI similarly enhances CETIs through strategic oversight. Although these governance mechanisms do not show immediate effects on reducing carbon emissions, they play important moderating roles in mitigating the short-term financial costs associated with energy transitions.

First, the results contribute to the emergent literature (Orazalin et al. 2024) by suggesting that pay incentives and BSCIs positively influence CETIs but have no similar effects on CCE. For instance, firms in the energy sector from South Africa and Malaysia within our dataset have leveraged BSCI structures to introduce low-carbon operational strategies and renewable energy investments. Similarly, manufacturing firms in Mexico and Indonesia have linked executive pay to emissions targets, resulting in expanded CETI adoption such as energy efficiency audits and transitions to cleaner production inputs. In addition, our evidence lends support to the compensation structures in Sub Saharan Africa. For instance, a report by PwC shows that Sub Saharan Africa CEOs are more likely to have carbon metrics tied to their incentives (23% vs. 32% globally). Crucially, 9% of CEOs in Sub Saharan Africa have over 50% of their compensation linked to carbon metrics, compared to 4% globally (PwC 2025).

Second, our study contributes to CG and climate change research (Orazalin et al. 2024; Orazalin 2020) by identifying that CETIs can have detrimental impacts on FP. Unlike previous studies that primarily assess direct relationships, this study identifies and tests potential moderators, such as SBC and BSCI, which reveal how governance mechanisms shape sustainability outcomes.

By integrating illustrative cases such as energy firms in Kenya and Nigeria that adopted sustainability-based incentives linked to emissions targets (Usman et al. 2025), or board-led CETI planning observed in Chilean manufacturing companies we offer tangible evidence of how firms operationalise governance strategies to drive transition outcomes (OECD/UN 2018).

The study also highlights how these associations vary across different operating periods, emphasizing the influence of policy timelines, such as Paris Agreement and Kyoto Protocol periods. Overall, our findings underscore the critical role that well-designed SBC and BSCI frameworks can play in motivating executives to engage in energy transition activities and carbon emission reduction initiatives, providing actionable insights for policymakers and practitioners.

Our study has substantial practical and policy implications, particularly for emerging economies where institutional

capacity, regulatory enforcement, and access to capital often constrain environmental progress. First, our findings highlight the urgent need for corporate executives and business boards especially in emerging markets to address the negative impact of high carbon emissions on the planet and society, which may ultimately affect FP. Given the heightened vulnerability of these economies to climate-related shocks, integrating carbon strategies is not only socially responsible but financially prudent. Our evidence provides a compelling business case for executives and corporate boards in emerging economies to accelerate the transition to a sustainable and low economy by aligning their corporation's carbon emission priorities with their CG frameworks and EC key performance indicators. Based on the evidence of this study, the establishment of BSCIs in these emerging economies can be a starting point on a path to creating a sustainable compensation scheme for corporations that can serve as a crucial catalyst for positive change and help combat climate change.

In addition, our evidence supports the call by Orazalin et al. (2024) for institutional investors to actively raise awareness among stakeholders about the detrimental effects of carbon emissions and advocate for stronger corporate accountability. Second, our findings suggest that corporate boards should reform compensation structures to better align with sustainability goals. Specifically, this can involve incorporating sustainability-based metrics, such as reductions in carbon emissions or progress in energy transition initiatives, into EC packages. For example, long-term incentives tied to CETIs, or carbon emission reduction targets can encourage executives to prioritize sustainability. Third, government and regulators in emerging economies should establish clear guidelines and policies that incentivise firms to adopt robust energy transition strategies. This could include mandating the establishment of board sustainability committee focused on climate-related activities and linking these requirements to tax incentives or financial support programs to encourage compliance. Fourth, policymakers should address the high costs associated with carbon emission abatement by implementing coordinated efforts to enforce mandatory CETIs and CCE reduction objectives at the global, national, and corporate levels. For example, governments could introduce funding mechanisms or subsidies to support firms investing in clean energy technologies and energy-efficient infrastructure. Lastly, emerging economies should design governance frameworks that integrate climate-focused initiatives into corporate decision-making, ensuring that sustainability goals are embedded into the strategic operations of firms.

Our study has some limitations that provide opportunities for further research. First, due to data restrictions, this study captures the initiatives of board sustainability committees rather than attributes of individual committee members, such as gender, educational background, expertise, age, and cultural diversity, which may influence decision-making processes. Second, while the measures for EC, SBC, BSCI, CETIs and CCE are derived from established metrics, they may not fully capture the complexity of real-world practices. Third, differences in regulatory environments across the 13 emerging economies in the sample may influence the generalizability of the results. Future research could examine how variations in governance and regulatory frameworks shape the observed relationships. Fourth, the exclusive reliance on data from the Refinitiv Workspace database may limit the scope to firms with robust reporting practices, potentially biasing the findings toward more transparent and better-governed companies. Fifth, while this study focused on firms in emerging economies with publicly traded shares across multiple stock markets, the findings may not be applicable to SMEs or non-publicly traded enterprises. Future research could explore whether these associations hold for SMEs and privately held firms to provide additional insights into broader contexts. Lastly, future studies could delve deeper into which specific initiatives within the BSCI are most influential in driving sustainability outcomes.

Conflicts of Interest

The authors declare no conflicts of interest.

Endnotes

[1] See Table A1 on sample distribution by industry.

[2] Corporate energy transition initiatives (CETIs) denote executive-driven actions encompassing frameworks, activities, transparency measures, strategic policies and planning aimed at energy transition.

[3] Scope 1 encompasses emissions directly coming from resources that are owned or controlled by the corporation, while Scope 2 includes indirect emissions from sources such as purchased power, cooling, heat, steam, and similar sources. Greater positive total corporate carbon emissions (CCE) scores denote higher levels of carbon emissions, suggesting weaker carbon performance and vice versa.

[4] For every variable, the Variation Inflation Factor (VIF) is estimated. A VIF score greater than 10 indicates the presence of multicollinearity (Vatcheva et al. 2016). The results (unpublished) show that the greatest VIF is 2.31 and the mean VIF is 1.43, demonstrating that multicollinearity is not an issue in the estimations.

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Appendix

TABLE A1 | Sample distribution by industry.

Industry	Firms	Observations	Percentage (%)	Cumulative (%)
Aerospace & Defense	1	21	0.37	0.37
Automobile Components	1	21	0.37	0.74
Automobiles	2	42	0.74	1.48
Beverages	7	147	2.59	4.07
Broadline Retail	4	84	1.48	5.56
Chemicals	10	210	3.7	9.26
Construction & Engineering	7	147	2.59	11.85
Construction Materials	6	126	2.22	14.07
Consumer Staples Distribution & Retail	11	231	4.07	18.15
Containers & Packaging	3	63	1.11	19.26
Diversified Consumer Services	2	42	0.74	20
Diversified REITs	8	168	2.96	22.96
Diversified Telecommunication Services	6	126	2.22	25.19
Electric Utilities	13	273	4.81	30
Electrical Equipment	2	42	0.74	30.74
Electronic Equipment & Instruments	2	42	0.74	31.48
Energy Equipment & Services	2	42	0.74	32.22
Food Products	22	462	8.15	40.37
Gas Utilities	2	42	0.74	41.11
Ground Transportation	2	42	0.74	41.85
Health Care Providers & Services	4	84	1.48	43.33
Hotels, Restaurants & Leisure	9	189	3.33	46.67
Household Durables	3	63	1.11	47.78
Household Products	2	42	0.74	48.52
IT Services	2	42	0.74	49.26
Independent Power and Renewable Electricity	8	168	2.96	52.22
Industrial Conglomerates	9	189	3.33	55.56
Industrial REITs	1	21	0.37	55.93
Marine Transportation	1	21	0.37	56.3
Media	4	84	1.48	57.78
Metals & Mining	21	441	7.78	65.56
Multi-Utilities	2	42	0.74	66.3
Oil, Gas & Consumable Fuels	18	378	6.67	72.96
Paper & Forest Products	4	84	1.48	74.44
Passenger Airlines	4	84	1.48	75.93
Personal Care Products	1	21	0.37	76.3
Pharmaceuticals	6	126	2.22	78.52
Professional Services	2	42	0.74	79.26

(Continues)

TABLE A1 | (Continued)

Industry	Firms	Observations	Percentage (%)	Cumulative (%)
Real Estate Management & Development	11	231	4.07	83.33
Retail REITs	3	63	1.11	84.44
Specialty Retail	11	231	4.07	88.52
Tobacco	1	21	0.37	88.89
Trading Companies & Distributors	2	42	0.74	89.63
Transportation Infrastructure	11	231	4.07	93.7
Water Utilities	4	84	1.48	95.19
Wireless Telecommunication Services	13	273	4.81	100
Total	270	5670	100	

TABLE A2 | Assessment scales for energy transition initiatives.

General initiatives	Specific initiatives
Energy emission reduction commitments	1. Does the company have a policy to improve emission reduction?
	2. Has the company set targets or objectives to be achieved on emission reduction?
	3. Does the company report on its impact on biodiversity or on activities to reduce its impact on the native ecosystems and species, as well as the biodiversity of protected and sensitive areas?
	4. Does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulphur oxides) or NOx (nitrogen oxides) emissions?
	5. Does the company report on initiatives to reduce, substitute, or phase out volatile organic compounds (VOC)?
	6. Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out total waste?
	7. Does the company report on initiatives to reduce, substitute, or phase out particulate matter less than ten microns in diameter (PM10)?
	8. Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out e-waste?
	9. Does the company have a policy for reducing the use of natural resources or to lessen the environmental impact of its supply chain?
Energy and resource efficiency	10. Does the company have a policy to improve its water efficiency?
	11. Does the company have a policy to improve its energy efficiency?
	12. Does the company have a policy to improve its use of sustainable packaging?
	13. Does the company set specific objectives to be achieved on resource efficiency?
	14. Has the company set targets or objectives to be achieved on water efficiency?
	15. Has the company set targets or objectives to be achieved on energy efficiency?
	16. Does the company make use of renewable energy?
	17. Does the company report about environmentally friendly or green sites or offices?
	18. Does the company report on at least one product line or service that is designed to have positive effects on the environment, or which is environmentally labelled and marketed?
	19. Does the company provide details on the amount of electricity it produces and purchases?
	20. Does the company report on specific products which are designed for reuse, recycling or the reduction of environmental impacts?
	21. Does the company develop new products that are marketed as reducing noise emissions?
	22. Does the company develop products and services that improve the energy efficiency of buildings?
	23. Does the company report about take-back procedures and recycling programmes to reduce the potential risks of products entering the environment or does the company report about product features or services that will promote responsible and environmentally preferable use?
	24. Is the company aware that climate change can represent commercial risks and/or opportunities?
	25. Does the company report about product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use?
Energy process and supply chain management	26. Does the company use environmental criteria (ISO 14000, energy consumption, etc.) in the selection process of its suppliers or sourcing partners?
	27. Does the company conduct surveys of the environmental performance of its suppliers?
	28. Does the company report or show to be ready to end a partnership with a sourcing partner, if environmental criteria are not met?

(Continues)

TABLE A2 | (Continued)

General initiatives	Specific initiatives
Energy environmental team management	29. Does the company have an environmental management team?
	30. Does the company train its employees on environmental issues?
Energy organisational practices	31. Does the company report or provide information on company-generated initiatives to restore the environment?
	32. Does the company report on initiatives to reduce the environmental impact on land owned, leased or managed for production activities or extractive use?
	33. Does the company report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances?
Energy technological advancement	34. Does the company develop products or technologies for use in the clean, renewable energy (such as wind, solar, hydro and geo-thermal and biomass power)?
	35. Does the company develop products or technologies that are used for water treatment, purification or that improve water use efficiency?
	36. Does the company report on its environmental expenditures?
	37. Does the company report on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities?
Energy economy market mechanisms	38. Does the company have an internal price on carbon?
	39. Does the company report on its participation in any emissions trading initiative?
Energy collaborations and external relations	40. Does the company report on partnerships or initiatives with specialized NGOs, industry organizations, governmental or supra-governmental organizations, which are focused on improving environmental issues?
	Possible total score of an organisation (0 to 40)

TABLE A3 | Assessment scales for board sustainability committee index.

General issues	Specific initiatives
Committee existence and structure	Does the company have a sustainability committee or team? - board level or senior management committee responsible for decision making on CSR (Corporate Social Responsibility) strategy
Reporting and transparency	Does the company publish a separate CSR/Sustainability report or publish a section in its annual report on CSR/Sustainability?
	Does the company's extra-financial report consider the global activities of the company?
	Does the company have an external auditor of its CSR/Sustainability report? – these include data on external audit of the company's CSR data or extra financial report is considered - consider an audit in the form of a review done by a university, academic, expert, external panel or a research centre—web-based CSR reports that are externally audited—integrated annual report having external audit statements for its environmental and social data
	The name of the external auditor of the sustainability report.—name of the audit firm or independent person who endorses the extra-financial audit statement—name of the body reviewed such as university, academic, expert, external panel or a research centre—(1 if external auditor is a big 4 firm or affiliate, zero if otherwise)
	Does the company's CSR strategy category score communicate the integration of economic, social, and environmental dimensions into its day-to-day decision-making processes?
Reporting framework	Is the company's CSR report published in accordance with the GRI (Global Reporting Initiative) guidelines? - in focus on CSR report or data published within the framework or guidelines of GRI principles
	Possible total score of a firm (0 to 7)