

Responsible Banking through Climate Action initiatives– evidence from Emerging Economies

Abstract

Motivated by the growing attention on climate change acceleration, we examine the interrelationships among corporate governance disclosure index, bank ownership structures, and bank climate change initiatives through the lens of multi-theoretical framework. We conduct a fixed-effects and dynamic two-step system generalized method of moments models over an extensive dataset. Based on a panel data of 220 banks (2,785 observations) from 16 Sub-Saharan Africa emerging economies between 2007 and 2022, the study observes that banks with higher levels of corporate governance disclosure index engage in more climate change initiatives. The study shows that ownership by institutional and foreign investors is associated with more bank climate change initiatives, while government ownership reduces climate change initiatives. Further, we document that director ownership has no impact on climate change initiatives. The study documents that the association between bank ownership structures and bank climate change initiatives is positively moderated by the extent of corporate governance disclosure index. This moderating impact improves for banks with high corporate governance mechanisms. Finally, we show that the bank ownership structures-climate change initiatives linkage and the moderating effect of corporate governance mechanisms on this nexus vary significantly across banks' operating periods. We identify corporate governance disclosure as the potential channel through which bank ownership structures and climate change initiatives are interlinked. Our findings call for banks to adopt and implement good governance disclosure to improve climate change initiatives. The findings make significant theoretical and regulatory contributions.

Keywords: Corporate governance; Bank ownership structures; Climate change initiatives; Environmental policy; Sustainable development goals.

1. Introduction

With the accelerating climate change discussions, and the increasing pressure from international organizations towards responsible banking and lower emissions in banking operations, shareholders of banks are confronted with ethical and regulatory challenges to consider their investment emissions and climate change engagement (Adu, 2022a; Benlemlih et al., 2022). Global climate change, which is as a result of the emission of greenhouse gases (GHG), is currently a top concern for organisations, governments, and other stakeholders (Bui et al., 2020; Adu, 2022a). For instance, over the past two decades, climate change has received increasing attention from academics, professionals, regulators and environmental activists (Adu et al., 2022a; Haque & Ntim, 2020), and has assumed a leading spot on the agendas of business, politics, and the economy (Orazalin et al., 2023).

Climate change has a negative impact on the environment, socioeconomic systems, and ultimately human lives (Adu, 2023a; Orazalin et al., 2023; Sun et al., 2020). In order to address global warming and climate change, international organisations and national governments are progressively implementing a number of projects, policies, and practices (Baboukardos, 2018). For instance, the Sustainable Development Goals (SDGs) are a set of 17 overarching objectives set by the United Nations for 2030. The SDGs are among the most crucial international initiatives that aim to mitigate GHG emissions and enhance resilience to climate change (Orazalin et al., 2023; Adu, 2022a).

Such global concerns have become particularly important for banks, especially after the 2008-2009 global financial crisis, as the long-term decisions of banks are usually conditioned by growing economic challenges, such as climate change (Alessi et al., 2021), stressing the need for banks' climate change initiatives (Adu, 2022a). For instance, Moufty et al. (2021) argue that banks can play a crucial role in the context of sustainable economic development including protecting the planet. At the same time, banks are under enormous pressure from stakeholders to respond to climate change by reporting their environmental impacts and engage in significant initiatives in order to reduce their GHG emissions (Haque & Ntim, 2020). In responding to this emerging global threat and pressure from stakeholders, banks are increasingly recognising climate change initiatives as means to increase their reputation, and also to promote trust and credibility

(Chiaramonte et al., 2022; Schultz et al., 2013). For instance, investors who constitute one of the key stakeholders of banks are pressuring banks that they have invested to engage in responsible behaviour by considering the effects of climate change and put in place strategies to combat global warming to guarantee long-term value creation (Benlemlih et al., 2022).

Despite the steadily expanding body of literature on climate change, limited attention has so far been paid to banking-based climate change action aimed at improving banks commitment to reduce carbon emissions (Adu, 2022a; Chiaramonte et al., 2013). Various scholars have progressively studied the beneficial implications of ownership structures of banks on sustainable decisions (Lopatta et al., 2017; Oh et al., 2011). Nevertheless, the existing literature has rarely investigated the moderating role of internal governance mechanisms on the link between bank ownership and climate change initiatives.

Motivated by the expanding discussion on this topic, our paper sheds light on the role that ownership structures may play in dealing with climate change in Sub-Saharan Africa (SSA) countries. We reason that banks' engagement in climate change initiatives is driven primarily by the quality of their internal governance mechanisms. Consequently, we distinctively explore the moderating effect of the internal governance mechanisms on the association between ownership structures and climate change initiatives. Specifically, in this paper, we seek to make a number of new contributions to the extant literature by (a) examining the impact of broad corporate governance disclosure index (CGDI) on bank-based climate change initiatives (BCCIs); (b) investigating the effect of bank ownership structures (BOS) on bank-based climate initiatives (BCCIs); and (c) consequently, ascertaining whether the link between bank ownership structures (BOS) and bank climate change initiatives (BCCIs) is moderated by broad corporate governance disclosure index (CGDI).

To assess these relationships, the study draws theoretical insights from agency theory (AT) (Ntim & Soobaroyen, 2013), stakeholder theory (SHT) (Jones, 1995), resource-dependence theory (RDT) (Pfeffer & Salancik, 1978; Branco & Rodrigues, 2006), and neo-institutional theory (NIT) (Haque & Ntim, 2020; Shahab et al., 2020). Briefly, AT perspective maintains that increased engagement in accountability and transparency through sustainable practices can reduce agency

problems and enhance sustainable banking investments such as climate change initiatives (Adu, 2022aa; Ntim et al., 2013). In tandem, SHT posits that sustainable board initiatives such as climate change action can give an indication of trust, cooperation and enhanced business ethics (Orazalin et al., 2023; Adu et al., 2022b). This can potentially minimise agency conflicts and related costs among shareholders, corporate executives and the stakeholders of the banks (Lopatta et al., 2017; Jones, 1995). In this case, climate change initiatives can serve as a credible way to win the support of influential stakeholders such as investors and regulators (Donaldson & Preston, 1995; Ntim et al., 2013).

Following previous studies (Adu et al., 2023b; Abdou et al., 2021; Elamer et al., 2020), we adopt the above-mentioned multi-theoretical perspective because the ability of any one of the individual theories to completely capture the relationship among broad CG mechanisms, BOS and BCCIs is limited. In particular, Adu et al. (2023b) suggest that it is important for researchers to employ a multi-theoretical framework by adopting insights from different theories in order to deepen the investigation. More importantly, with exception of NIT (that proposes a positive or a negative impact), the adoption of multi-theoretical perspective can enhance the explanatory power of the theories by complementing each other with regard to their strengths and weakness (Adu, 2023; Adu, 2021). Moreover, we investigate the complex interrelationships among broad CG mechanisms, BOS and BCCIs, which intrinsically involves various organizations and stakeholders with diverse interests.

Admittedly, prior studies have focused on examining the effect of BOS on sustainable banking initiatives and, to a large extent, CSR/environmental performance (Oh et al., 2011; Block & Wagner, 2014; Lopatta et al., 2017). However, these previous research appears to have some limitations. First, the evidence of prior studies shows that quality corporate governance (CG) mechanisms can enhance sustainable corporate outcomes, along with climate change initiatives (Adu, 2022a). Yet, prior banking research has mainly concentrated on assessing the effect of individual CG variables (such as board size and independence) on CSR (Jizi et al., 2014; Bose et al., 2018). In the interim, researchers contend that CG is a complex idea to operationalize (Adu, 2022a). Thus, the use of individual measures such as board size may not serve as valid indicators for the complex construct of CG that the scholars strive to measure (Elmagrhi et al., 2020; Adu,

2022a). In particular, Larcker et al. (2007) suggest that the use of single CG measures can lead to measurement errors and inconsistent regression coefficients. To address this potential measurement errors related with the use of single CG indicators, scholars are increasingly calling for the use of CG indices that can capture broad CG dimensions (Elmagrhi et al., 2020; Zhou & Chen, 2021; Adu, 2022a). Our study responds to such calls by utilizing a broad CG index in the SSA banking sector.

Second, existing studies investigating the impact of CG mechanisms on CSR/environmental performance in the banking sector have not yet explored the probable moderating influence of CG mechanisms on this association (e.g., Oh et al., 2014; Block & Wagner, 2014; Cheng et al., 2022). Noticeably, this limits our understanding of how CG mechanisms may interact with this relationship. This is regrettable because understanding these important associations can help regulators and policymakers to undertake CG reforms that can have more beneficial effect on climate change initiatives. To illustrate, previous studies largely examined how different ownership structures including family ownership influence sustainable banking initiatives (Block & Wagner, 2014), whereas, others focus on the effect of common institutional ownership on CSR (Cheng et al., 2022). Others also investigate the impact of foreign, managerial and institutional ownership on CSR (Oh et al., 2014). In this case, we uniquely explore the moderating effect of broad CG disclosure index on the BOS-BCCIs relationship.

Third, prior literature has widely addressed the relationship between BOS and different aspects of sustainable banking initiatives (e.g., Adu, 2022a; Adu et al., 2023b; Oh et al., 2014). These studies measure banks' sustainable practices based on an average of dimensions such as employee disclosures, human rights, environment, service quality, social disclosures and community involvement. Nonetheless, no study has focused on the relationship between bank ownership structures and climate change initiatives. Climate risk is increasingly significant to businesses around the world including banks, with costly litigation risk and substantial attention from the media, environmental activists and policymakers (Benlemlih et al., 2022). Accordingly, banks are at the moment more concerned with environmental and climate-related issues at the expense of social dimensions (Adu, 2022b; Benlemlih et al., 2022) and our study provides new insights on how ownership structures may drive banks' climate change initiatives. In doing so, we

respond to recent calls for more research into the role of governance and ownership structures in climate change initiatives rather than general CSR issues (e.g., Benlemlih et al., 2022; Zaman et al., 2020).

Fourth, prior studies that aim at exploring how governance structures interact with climate change initiatives mainly focus on developed countries (e.g., Orazalin et al., 2023; Benlemlih et al., 2022; Benlemlih & Cai, 2020), with little attention on emerging markets. Meanwhile, ownership structures, as well as banks' governance structures, differ from developed countries to emerging markets. So far, a few studies have focused on emerging market such as SSA countries that have different governance mechanisms and ownership structures (Adu et al., 2023b). Our study bridges this gap in the literature by investigating the role of CG disclosures and BOS in climate change initiatives in the SSA, a region known to have unique governance structures.

Fifth, some prior studies on ownership structures and environmental performance (eg., Benlemlih et al., 2022; Ntim & Soobaroyen, 2013) mainly employ a single theoretical framework. Meanwhile, utilising multiple contrasting or complementary theories can aid in better explaining the different facets of CGDI, BOS and BCCIs. For example, individually, theories such as agency theory, stakeholder theory, resource dependence theory and neo-institutional theory provide different perspectives on the impact of CGDI on BOS-BCCIs metrics. In this study, we adopt a multi-theoretical framework involving all these theories to fully comprehend the interrelationship among CGDI, BOS and BCCIs. By doing so, our study responds to recent calls for CG studies to utilize multi-theoretical approach in order to offer new insights (e.g., Orazalin et al., 2023; Haque & Ntim, 2020).

Finally, our study employs the under-researched context of the banking sector in the SSA countries where there has been extensive financial sector and CG reforms over the past two decade (Adu, 2022a; Ntim & Soobaroyen, 2013). In brief, the financial sector liberalization undertaken in the SSA region was mainly regarded as a crucial catalyst for accelerated economic growth, and with several countries considering it as remedy for boosting capital accumulation and other developmental problems (Adu, 2022b; Ntim & Soobaroyen, 2013). Starting in the mid-

1980s, this expectation formed the foundation of a number of crucial regulatory reforms in favour of financial sector liberalization in the SSA countries (Adu, 2022b). The outcome of the financial sector reforms in the SSA countries is a considerable change in the shareholding structure of banks (Adu, 2022a; Ntim & Soobaroyen, 2013a). In a similar vein, countries in the SSA region have undertaken key CG and climate change action reforms over the past two decades. Crucially, the period after these major reforms in the SSA countries, scholars and banking practitioners stress that it is paramount for policymakers and regulators in search for increased climate change initiatives in the banking sector to empirically investigate the effect of BOS on sustainable banking decisions including climate change initiatives (Adu, 2022a; Kim & Jo, 2022).

The study focused on 16 emerging economies in SSA region. These countries are Botswana, Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Mauritius, Namibia, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe. The decision on the countries was influenced by the similar CG and integrated sustainability/climate change reforms carried out in each nation over the past ten years. This helps in assessing whether the CG and climate change reforms have helped in improving CG standards particularly with regards to influencing climate change initiatives in the region. Nevertheless, the 16 emerging economies have the most matured banking and capital markets in the region. For instance, the total gross domestic product (GDP) of the 16 emerging economies stood at US\$2,885.78 billion as of 2018 as compared to the GDP of the entire SSA of US\$4,200.85 billion and accounted for over 70% of the total GDP in the region (Adu, 2022a). We also focused on these emerging economies because they all share English as their official language. Due to the hand-collection nature of the CGDI and BCCIs variables, this helps data collection by removing the language barrier (e.g., Adu, 2022a; Ntim, & Soobaroyen, 2013a).

Fourth, to the best of our knowledge, our study is one of the early studies that begin to contribute to the moderating effect of CG mechanisms on BOS-BCCIs relationship literature through the lens of a multi-theoretical framework. Specifically, we consider both the direct effect of BOS on BCCIs and the moderating effect of broad CGDI on the BOS-BCCIs link. Prior scholars have not examined the role of probable moderators in the association between BOS and BCCIs.

Precisely, while there is limited studies on CGDI, BOS, and BCCIs (Block & Wagner, 2014; Oh et al., 2014), examination of the impact of CGDI on the BOS-BCCIs sensitivity metric in a single study remains uncommon. Considering that CG mechanisms and BOS can act as complements and/or substitutes (Shahab et al., 2020), we distinctively ascertain whether CGDI can moderate the BOS-BCCIs sensitivity metric in the SSA banking sector.

Finally, we examine BOS and BCCIs in an emerging economies context by developing and theorizing the impact of broad CGDI on the BOS-BCCIs in two samples. We distinctively divide the sample into banks with high mechanisms and banks with low CG mechanisms to provide new insights. We maintain that the effect of BOS on BCCIs will be reinforced in banks with high CG mechanisms. The evidence shows that engaging in high levels of BCCIs is one credible channel through which banks with high CG mechanisms may distinguish themselves in a competitive banking system (Ntim et al., 2013). Our study is among the first to conduct this investigation in banks with high CG mechanism and banks with low CG mechanisms. Insights from this study stress the crucial role of CG mechanisms in the banking sector and contribute to our understanding of under-researched domains of CG impact on this relationship and guiding not only banking practitioners but also regulators in the SSA countries.

The rest of this paper is organized as follows. Section 2 provides the background to the study. Section 3 highlights the theoretical framework, followed by a review of previous literature and hypotheses development in Section 4. Section 5 describes the research methodology. Section 6 provides the results, and Section 7 concludes the study.

2. Background: Corporate governance and climate change initiatives around the SSA countries

The SSA banking sector was chosen for the study because, in comparison to developed economies, the region has weak institutional structures (Adu, 2022a). The governments in these nations are also extremely bureaucratic, corrupt, and have low levels of "voice and accountability" in addition to lax regulation (Adu, 2022b; Ntim & Soobaroyen, 2013a). Additionally, the Basel accords are still being implemented inconsistently across the region, with

only a few countries (like South Africa) adopting stricter standards. Due to a lack of financial safety nets in the area, the situation is complicated (Adu et al., 2022b). For example, the banks are unable to cover 80% of deposits in the event of bank failures, as shown by the recent banking crisis in the region (e.g., Ghana, 2018, Kenya, 2016, and Nigeria, 2009).

The necessity for effective internal governance, transparency, accountability, and responsible banking was underlined by several global banking crises in the 1990s and 2000s (Ntim et al., 2013; Mallin, 2002). In view of these developments, several countries have since implemented CG reforms (Nguyen et al., 2020). It is important to note that these CG reforms, particularly those implemented in Anglo-Saxon nations, have generally focused on financial factors (Ntim & Soobaroyen, 2013). However, the non-financial and financial aspects of CG, including climate change initiatives, have been the main focused of the SSA region's CG reforms (Adu, 2022a; Ntim et al., 2013). We maintain that this creates an ideal context for researching the interactions among CGDI, BOS, and BCCIs.

The need to improve CG standards in the SSA countries has been more urgent since the late 1990s, especially in the wake of numerous big financial failures like the collapse of Nedbank businesses in South Africa (Adu et al., 2022b; Ntim & Soobaroyen, 2013). At that time, there were weak CG procedures, including insufficient accountability, transparency, and environmental risk management (Adu, 2022a; Ntim et al., 2013). The region's CG reforms got its start with the well-known Kings Report of South Africa, which was released in 1994 in response to persistent concerns about the need for greater transparency in financial reporting and accountability.

Growing issues over the increasing levels of GHG emissions globally have led the worldwide community to respond to climate change and global warming by engaging in different initiatives and reforms (Orazalin et al., 2023). For instance, in the SSA region, the Combined Code has important provisions on (i) commitment to emission reduction, (ii) commitment to improve energy/resource efficiency, (iii) product and service improvement, (iv) process and supply improvement, (v) environmental management, (vi) organizational involvement, (vii) research and development, and (viii) external relationships. The possibility that effective CG mechanisms can

enhance ownership structures and the involvement of firms in climate change initiatives is a core expectation of the Combined Code in the SSA region.

More importantly, the Combined Code concentrates on four crucial CG disclosures, namely (i) director and board, (ii) audit, accounting, and transparency, (iii) risk management and internal control, and (iv) compliance and shareholder enforcement, in order to enhance the quality of CG mechanisms in the SSA region. In conclusion, in comparison to other Anglo-American nations, the SSA region has arguably and differently adopted a combination of CG and climate change reforms. However, there are still significant questions surrounding the effectiveness of improving CG and climate change standards in the region through a voluntary compliance regime like the Combined Code. In this case, we explore the link between BOS and BCCIs, and establishes whether CGDI moderates this relationship.

3. Theory and review of the literature

3.1 Theoretical framework

Despite the fact that academics and businesses have grown more interested in BCCIs over the past decade (Adu et al., 2022b; Xing et al., 2021; Ntim et al., 2013; Nandy & Lodh, 2012), a comprehensive and unified theoretical framework for analysing and interpreting corporate motivations for engaging in BCCIs has not yet been developed (Adu, 2022a). Prior studies frequently reference a variety of social-and economic-based theories, such as resource dependence theory, stakeholder and legitimacy theory (Lopatta et al., 2017; Oh et al., 2011). In particular, socio-and economic-based theories have mainly been employed to elucidate the reasons for bank's engagement in BCCIs (Adu, 2022a; Dam & Scholtens, 2012), however the theories have not been able to adequately explain the various drivers of BCCIs (Adu et al., 2022a; Ntim et al., 2013).

By contrast, some scholars maintain that the variations in BCCIs could be explained through a multi-theoretical lens (Adu et al., 2023b; Orazalin et al., 2023). Accordingly, the study employs a multi-theoretical framework as a direct response to the recent calls for multi-theoretical approaches to investigating CG, BOS and BCCIs relationships (Adu et al., 2023b; Orazalin et al.,

2023; Abdou et al., 2021; Alshbili et al., 2020; Haque & Ntim, 2020). One reason is that individual theories may not be able to offer a comprehensive understanding of how BOS mechanisms may affect BCCIs on their own. However, linking insights from a multi-theoretical framework may offer distinctive insights towards interpreting and explaining BCCIs in a unique regulatory and institutional context, such as the SSA region. Furthermore, a multi-theoretical framework may facilitate the investigation of the potential interactions among CGDI, BOS and BCCIs (Adu et al., 2023b; Abdou et al., 2021; Elamer et al., 2020).

From the above arguments and specifically, a joint theoretical insights from agency, resource dependence, stakeholder, and neo-institutional theories may help in improving the relevance of CGDI and BOS mechanisms in explaining the varied motivations for engaging in BCCIs. This is predominantly important given the regulatory, and socio-demographical diversity of the SSA countries, where multi-theoretical framework may help in elucidation results concerning to the association among CGDI, BOS and BCCIs (Adu et al., 2023b; Abdou et al., 2021).

First, agency theory (AT) calls for the establishment of innovative contracts and effective oversight mechanisms to protect the interests of shareholders (Ntim & Soobaroyen, 2013a). In this regard, AT predicts that, bank's climate change actions may be influenced by CG mechanisms (Adu, 2022a). In a nutshell, AT expects CG mechanisms to have beneficial effects on BCCIs. Within this theoretical framework, a net reduction in agency costs originating from effective monitoring due to the establishment of good CG mechanisms by powerful owners of banks can lead to an increase in BCCIs (Adu et al., 2022b; Ntim & Soobaroyen, 2013a). Further, AT perspective offers a crucial channel through which CGDI can moderate BOS-BCCIs sensitivity metric. The theory maintains that CG mechanisms can be regarded as strong pillar or dimension of BCCIs (Adu, 2022a). The implication is that, in banks with high CGDI score, the executives of the bank may engage in BCCIs as credible means of reducing conflict with bank shareholders who may be interested in the long-term value of their investments (Adu et al., 2022b; Ntim & Soobaroyen, 2013a). In this case, banks with high CGDI environment, the executives of the bank may concentrate on climate change initiatives as a win-win strategy, signifying that CGDI can have positive moderating influence on the BOS-BCCIs relationship.

Secondly, and closely linked to AT, resource-dependence theory (RDT) posits that banks that undertake increased climate change action decisions such as high levels of BCCIs tend to gain competitive advantage by obtaining essential resources such as capital and highly skilled workforce (Branco & Rodrigues, 2006; Pfeffer & Salancik, 1978). In this context, RDT calls for banks to engage in increased BCCIs. Arguably, it is costly to undertake BCCIs investments, at least in the short-term (Barnett & Salomon, 2006). Nonetheless, the gains from engaging in BCCIs investments can accrue to the bank in the form of a flow of vital resources including corporate image, reputation, contracts and human capital (Adu, 2022a; Ntim et al., 2013; Branco & Rodrigues, 2006), and lower deposit and cost of capital (Mallin, 2002).

Third and closely related to RDT, stakeholder theory (SHT) underscores why it is critical for banks to manage the conflicting and complex relationship with their stakeholders. Within SHT perspective, banks can minimise agency and transaction costs by embracing in climate change initiatives that impact on the various stakeholders including bank owners (Dam & Scholtens, 2012; Jones, 1995; Freeman & Reed, 1983). Noticeably, these initiatives can impact on stakeholders if such investments have beneficial contribution to the goals of the stakeholders. To illustrate, banks with substantial pro-environmental shareholders may engage in climate change actions standards above what is legally required (Dam & Scholtens, 2012). Further, when bank's climate change initiatives are considered as an indication of operating responsibly, there is the potential for an indirect beneficial effect on BCCIs (Dam & Scholtens, 2012). Consequently, BCCIs can serve as a crucial channel for "neutralizing" agency issues as it can be utilized as a mechanisms for dealing with conflicts (Harjoto & Jo, 2011). In this context, SHT anticipates a beneficial associations among CGDI, BOS, and BCCIs.

Finally, the neo-institutional theory (NIT) perspective suggests that banks can attain community acceptance by voluntarily adopting and/or adhering to recognized institutional norms, guidelines, standards and rules (Scott, 2001; DiMaggio & Powell, 1983). For instance, integrating climate change initiatives highlighted in the Combined Code in the region can improve legitimacy by enhancing the banks' image and foster economic efficiency by offering access to important assets. Based on this notion, banks might conform to BCCIs strategies outlined in their national regulatory bodies. Furthermore, the banks might conform with global obligations

(including principles of responsible banking, SDGs and Global Reporting Initiatives) or learn best practices from their peers (Haque & Ntim, 2020). For example, embedding the SDGs can enhance the legitimacy of the bank by improving their reputation and economic efficiency due to access to critical assets. Essential assets include access to low cost deposits through establishing enduring relationships with powerful stakeholders. Within NIT framework, banks may achieve these by engaging in BCCIs (Adu et al., 2022b). Thus, we maintain that banks may gain legitimacy and community acceptance by undertaking BCCIs investments. Given the interdependencies and overlaps among the four theories, we reason that a combined theoretical framework can offer a comprehensive basis for explaining and highlighting the motivations for BCCIs in the SSA banking context.

4 Literature Review and Hypothesis Development

4.1 Broad Corporate governance disclosure index and bank climate change initiatives

According to AT, good CG mechanisms help in aligning the interests of bank executives with the wider interests of shareholders (Jensen & Meckling, 1976). Based on agency theoretical framework, better governed banks may engage in climate change initiatives more than poorly governed banks (Adu, 2022a). The stakeholder theoretical perspective considers CG as a set of mechanisms that can guarantee banks are accountable to broader stakeholder groups (Gangi et al., 2019). Resource dependence theoretical perspective postulates that, good CG mechanisms can bring valuable economic resources, information, skills, knowledge and recommendations for organizational success (Pfeffer & Salancik, 1978). Neo-institutional theory maintains that conforming with good CG guidelines either through coercive or regulatory pressures in the form of improved BCCIs investments can enhance the legitimacy of banks' operation and services (Orazalin et al., 2023; Haque & Ntim, 2020). In this context, bank executives will be expected to provide more sustainability disclosures, including climate change initiatives, to satisfy shareholders as influential bank stakeholders (SHT) (Adu, 2022a; Ntim et al., 2013; Ntim & Soobaroyen, 2013b), as well as to win their support to legitimize (NIT) or guarantee their continued stewardship of the bank and its resources (RDT) (Ntim et al., 2013; Chen & Roberts, 2010).

Prior literature also suggests that CG mechanisms can impact on banks' engagement with sustainability initiatives, as well as all the components captured under the broad umbrella of BCCIs (e.g., Adu, 2022a; Gangi et al., 2019). Possibly, because good CG is concerned with effective supervision and monitoring, it can be reasoned that CG mechanisms can serve as a stimulus for climate change initiatives (Ntim & Soobaroyen, 2013a). Consequently, it has been proposed that banks with good CG mechanisms tend to operate in such a way that it sustains good dealings with various stakeholders who interact with the bank even in the absence of recognized agreements (Adu, 2022a; Gangi et al., 2019).

Synthesis of literature reveals that empirical evidence linking broad CGDI on BCCIs is largely uncommon, and therefore, this offers a fertile ground for further studies. In particular, prior studies mainly explore the effect of individual board structures on sustainable banking disclosures (Adu, 2022a; Gupta & Bala, 2020; Orazalin, 2019; Das et al., 2015; Jizi et al., 2014; Barako & Brown, 2008). For instance, Gangi et al. (2019) document a positive effect of CG variables measured by board size and independence on banks' environmental initiatives and conclude that banks with quality CG mechanisms tend to engage in increased environmental initiatives. By contrast, Jizi et al. (2014) find negative relationship between CEO duality and sustainable banking initiatives. As highlighted above, previous banking research on the relationship between CG mechanisms and sustainable banking initiatives link have largely focused on the effect of individual board structures. In particular, banking research that focus on the association between broad CGDI and BCCIs remain uncommon (Adu, 2022a).

Within the SSA context, the Combined CG codes suggest that good CG structures including board disclosures, accounting and transparency, risk management, shareholder rights and activism can enhance sustainable value creation (Adu, 2022a; Ntim & Soobaroyen, 2013a). The CG codes therefore incorporate the expectation that effective internal governance mechanisms can determine the level of climate change initiatives in the regions' banking system. In particular, the codes have integrated sustainability section that focuses on promoting the engagement of firms in environmental and climate change initiatives. Therefore, we argue that quality CG may serve as a key motivator of higher sensitivity to climate change initiatives of banks in the region. Consistent with the expectation of the Combined Code in the region, the study predicts that CGDI

can enhance the extent of BCCIs. Based on the theoretical insights, as well as the discussion above, the study develops the following hypothesis:

H1. There is a positive association between broad corporate governance disclosure index (CGDI) and bank-based climate change initiatives (BCCIs).

4.2. Bank ownership structures and bank climate change initiatives

Institutional ownership represents the stock market investments of institutional investors (Dam & Scholtens, 2012). Agency theoretical perspective asserts that due to the significant ownership stakes, institutional investors tend to have more motivation to monitor banking disclosures effectively (Ntim et al., 2013). In this regard, institutional investors can play a vital role in the governance of banks through their superior external monitoring capacity (Bose et al., 2017). From this perspective, the executives of banks can be expected to increase banking disclosures, including BCCIs, as a credible means of satisfying institutional investors who are powerful stakeholders of the bank (SHT) (Adu, 2022a; Ntim et al., 2013), and thereby winning their support in legitimizing their operations (NIT) and ensuring the continuous flow of critical resources to the bank (RDT) (Ntim et al., 2013; Chen & Roberts, 2010).

In addition, because institutional owners invest mainly on behalf of ultimate shareholders including pension funds, insurance firms and employees, they are largely considered as delegated monitors (SHT and AT) (Ntim et al., 2013). Within this context, institutional investors will have the prime goal of increasing the value of their shareholders' investments and thus leading them to be keen on quality governance and sustainable value creation (Dam & Scholtens, 2012). In the light of this, institutional shareholders can be expected to be more likely to be actively involved in the strategic decisions of the bank including climate change initiatives investments, than small investors because institutional investors usually hold substantial shares that may be difficult to quickly sell (Adu et al., 2022b; Ntim et al., 2013).

Synthesizing literature shows that a number of scholars have examined the association between institutional investors and CSR/environmental performance (Cheng et al., 2022; Dam

& Scholtens, 2012; Ntim & Soobaroyen, 2013a; Oh et al., 2011). For instance, Oh et al. (2011) document that institutional ownership has positive effect on CSR. Similarly, Ntim and Soobaroyen (2013a) show that institutional ownership is associated with increased CSR disclosures. By contrast, Dam & Scholtens (2012) observe that institutional ownership has no significant effect on CSR. However, Cheng et al. (2022) find that common institutional ownership has detrimental impact on CSR. Further, Bose et al. (2017) report of a positive relationship between institutional ownership and the philanthropy constituent of CSR of banks. In a closely related study, Bose et al. (2018) show that institutional ownership has beneficial effect on green banking disclosures. Observably, prior research investigating the association between institutional ownership and BCCIs is limited. In this context, Bose et al. (2018) is a rare exception, with the analysis revealing that institutional investors have positive impact on environmental performance.

The Combined CG code in SSA region is reinforced with prospect that institutional shareholders could possibly play a vital role in augmenting CG mechanisms, including promoting climate change initiatives in the banking sectors. Notably, institutional stockholders such as public pension funds, mutual funds and insurance corporations are the major players in the SSA banking sector accounting for about 75% stakes in banks (Andrianova et al., 2008). It can be argued that such institutional investors with significant voting power can influence BCCIs through their voting rights by imposing their pro-environmental initiatives on managers which might increase BCCIs. The inference of this is that institutional owners are more likely to serve as crucial drivers of BCCIs. In particular, Ntim et al. (2013) stress that institutional investors are anticipated to play a substantial role in promoting sustainable initiatives, as in the banks in the SSA region, owing to its diverse institutional ownership, primarily demonstrated in pyramidal structures and intricate cross-ownerships (Adu et al., 2023b; Ntim et al., 2013). Therefore, we expect that institutional investors in the SSA banks will use their voting rights to influence climate change initiatives and reduce GHG emissions. Stated more formally as our second hypothesis:

H2: There is a positive relationship between institutional ownership and bank-based climate change initiatives (BCCIs).

Government ownership relates to stock investments by state institutions (Adu et al., 2023b). Around the world, several governments are striving to boost the quality of sustainable business decisions with particular emphasis on climate change initiatives (Adu, 2022a; Dam & Scholtens, 2012). Consistent with the provisions of the Combined Code concerning BCCIs (Adu, 2022a; Ntim et al., 2013), this study assumes that in banks where government has significant stakes, the bank will engage in activities in such a way that it can gain the support of the various governments as influential stakeholders (SHT) (Ntim et al., 2013; Gray et al., 1995; Freeman & Reed, 1983), by conforming with the provisions of the Combined code (NIT) (Hague & Ntim, 2020; DiMaggio & Powell, 1983) through either substantive/ or symbolic BCCIs that can enhance their operational legitimacy (NIT) (Suchman, 1995; Ashforth & Gibbs, 1990). Especially, this can guarantee the flow of critical resources to the bank (RDT) (Branco & Rodrigues, 2006; Pfeffer & Salancik, 1978). For instance, NIT advances that government has coercive force to assess and regulate the environmental engagements of banks where the government has considerable shares (Jain & Jamali, 2016).

Despite the fact that AT argues that increased BCCIs engagements can help resolve agency concerns between bank executives and the government as a significant shareholder (Jensen & Meckling, 1976), other scholars maintain that government ownership can lead to exacerbation of agency problems by reducing the effectiveness of managerial monitoring, including disclosure mechanisms (Ntim et al., 2013; Jia et al., 2009). The reasoning behind this argument is that banks with strong political ties associated with significant government ownership may lead the executives of the bank to seek self-centered political agenda that might have detrimental impact on sustainable outcome including BCCIs.

Nevertheless, banking reforms in the SSA region through the privatisation of state banks have lowered government stakes to a minimal level but with strategic focus on promoting CG, employment and growth (Ntim et al., 2013; Ntim & Soobaroyen, 2013b). However, most of these economic and political goals often clash with the objective of private investors who may seek to maximise their profits (Ntim et al., 2013). At the same time, prior scholars contend that the greater the level of such conflicts among powerful stakeholders (SHT) including private investors

and government, the higher the need for resolution through increased disclosure, including BCCIs (Ntim et al., 2013; Dam & Scholtens, 2012).

As established earlier, the various governments in the SSA region have low stakes in the banking sector. Various governments in the SSA region are increasingly recognizing and agreeing on the threat posed by climate change and the urgency to structure their actions towards best practices in favour of the climate. It is therefore important to uncover to what extent government ownership in the SSA region drives their investments' climate change initiatives in the banking sectors. In addition, the CG reforms undertaken in the SSA region encourage shareholders including government to ensure businessess integrate climate change initiatives into their operations and services. Although government ownership in the banking sector is low, the various governments have maintained strategic shares in the SSA banks with clear interest in encouraging CG, responsible banking, and disclosures including BCCIs (Ntim et al., 2013), hence, regardless of the mixed findings and based on the unique role of the provisions of the Combined Code, we state our third hypothesis as follows:

H3: There is a positive relationship between government ownership and bank-based climate change initiatives (BCCIs).

It has been suggested that internal corporate policies may be influenced by foreign investors (Jeon et al., 2011). According to NIT, banks continuously pursue both legitimacy and 'economic efficiency (Scott, 2001) to gain competitive advantage. For example, foreign owners regularly employ social engagement (SHT) to establish a competitive advantage (McGuinness et al., 2017). Additionally, it has been asserted that the presence of foreign owners may result in the establishment of quality CG mechanisms, such as sustainable board decisions, which may stimulate banks to undertake environmental initiatives including BCCIs (Oh et al., 2011). In support, Huafang and Jianguo (2007) also note that due to their experience and skills in environmental related initiatives, US and European investors characteristically put pressure on overseas holdings to make similar investments in host countries. Other researchers also find that foreign owners have the habit of encouraging domestic firms where they have significant investments to implement "clean" technology (McGuinness et al., 2017). Based on these, it can

be deduced that foreign investors may provide a direct and effective pathway for banks engagement in climate change initiatives (McGuinness et al., 2017).

Empirically, a few prior research has investigated the impact of foreign ownership on CSR/environmental performance (McGuinness et al., 2017; Oh et al., 2011). For instance, Oh et al. (2011) document that foreign ownership is positively associated with increased CSR ratings. Within the SSA region context, foreign investors actively engage in decision-making to protect their investments in the banking sector (Adu et al., 2023b). The active engagement of foreign investors tend to create pressure for the executives of the bank to embrace responsible banking as a credible means of gaining legitimacy. In this regards, with foreign investors in the SSA countries seeking to enhance their legitimacy may promote enhanced environmental engagement, and ensure that bank executives act in favour of the climate (Adu et al., 2023b), thereby responding to institutional pressure and managing their climate-related risk (Benlemlih et al., 2023). This is likely to facilitate the compliance of their portfolios with SSA sustainability guidelines/ Combined CG Code in the SSA region (e.g., Ghana, 2018, 2010; Nigeria, 2018, 2011; Kenya, 2014, 2002 and South Africa, 2016, 2010) and enhance their reputation. Based on the SHT and NIT perspectives, as well as the discussion above, we develop the following hypothesis:

H4: There is a positive relationship between foreign ownership and bank-based climate change initiatives (BCCIs).

Director ownership refers to the percentage of ordinary and deemed shares held by the directors of the firm (Eng & Mak, 2003). The influence of director ownership on BCCIs can be explained from two main viewpoints (Jain & Jamali, 2016). Theoretically, bank director ownership may motivate executives to forego short-term gains in favour of long-term sustainable value generation, such as BCCIs activities (Johnson & Greening, 1999; Hansen & Hill, 1991). For instance, directors who hold substantial stakes in banks may have even more motivation to articulate, represent and align the interests of the executives of the bank with that of shareholders (AT), and other stakeholders (SHT) (Jain & Jamali, 2016; Walsh & Seward, 1990), which can have a beneficial effect on BCCIs.

By contrast, director ownership may stimulate directors' economic self-interest with negative effect on BCCIs (Jain & Jamali, 2016). Based on arguments premised on managerial entrenchment, director ownership can enhance managerial choice in decision-making (Hayward & Hambrick, 1997). In this case, directors can be expected to typically uphold their moral commitments (Quinn & Jones, 1995); nonetheless, entrenchment is known to encourage socially and environmentally irresponsible conduct (Jain & Jamali, 2016). In particular, McGuinness et al. (2017) expound that entrenched director ownership can work against engagement in environmental initiatives, resulting in lower BCCIs. Further, director ownership can also stimulate the desire to keep the bank operating at all costs, leading to the selection of conventional operation methods with no support for resource-saving technologies (Dam & Scholtens, 2012), with a detrimental effect on BCCIs. In support, Ghazali (2007) maintains that bank executives with substantial shares may not be willing to undertake increased socially and environmentally responsible initiatives because the potential benefits far outweigh the costs of the investment in these activities in their opinion.

Prior research reveals that director ownership has negative impact on the extent of corporate disclosures (Ghazali, 2007; Eng & Mak, 2003). For instance, Ghazali (2007) and Haji (2013) observe that banks with significant director ownership tend to disclose substantially less CSR engagements. In a related study, Oh et al. (2011) document that ownership by corporate directors has detrimental effect on CSR rating of firms, whereas outside director ownership has no effect on firms' CSR ratings.

Within the SSA banking context, regulators encourage insider owners to abide by the provisions in the Combined CG Code in the SSA region (e.g., Ghana, 2018, 2010; Nigeria, 2018, 2011; Kenya, 2014, 2002 and South Africa, 2016, 2010) to improve corporate disclosure, including BCCIs. According to the abovementioned discussion, and the combined CG Code in the SSA region which clearly calls for insiders including owners who are directors to engage in improving firms' transparency and governance, and caring about environmental agenda, we would expect director ownership to have a beneficial impact on the climate change initiatives of banks. Consequently, the fifth hypothesis of our study is stated as follows:

H5: There is a positive relationship between director ownership and bank-based climate change initiatives (BCCIs).

4.3. Corporate governance: bank ownership structures and bank climate change initiatives

Agency theoretical perspective states that CG mechanisms may possibly improve or lessen the effect of BOS on BCCIs (Adu, 2022a; Ntim & Soobaroyen, 2013a). Evolving empirical evidence suggests that even though the stock market value quality CG and climate change disclosures, CG mechanisms are valued much greater than BCCIs (Adu, 2022a; Ntim & Soobaroyen, 2013a). In this regard, the potential benefits of BOS on BCCIs may originate from the beneficial effect of CG mechanisms on BOS, and hence, an improvement in BCCIs may be stimulated by CG mechanisms rather than by BOS.

More importantly, prior studies offer a critical pathway through which CGDI can reinforce the relationship between BOS and BCCIs. Based on the evidence of recent research, CG mechanisms may act as key dimensions, and/or complements of BCCIs (Adu, 2022a; Ntim & Soobaroyen, 2013b). Within this framework, good CG mechanisms can be extended to cover BCCIs. In this case, the executives of banks may work to improve BCCIs investments as a critical strategy for preventing conflicts with stakeholders (SHT) in banks with high levels of CGDI (Adu, 2022a). Because of the decline in conflicts of interest with the different stakeholders, especially influential shareholders, through effective, good CG mechanisms, BOS can in this context lead to increased beneficial effect on BCCIs (Adu et al., 2022b; Ntim & Soobaroyen, 2013a).

In contrast, banks with poor governance are more likely to have less BCCI engagements (i.e., banks displaying low levels of transparency, accountability, fraud, corruption, and managerial violation), which can intensify conflicts among the larger stakeholders of the banks including influential shareholders (Adu, 2022a; Jo & Harjoto, 2012). The outcome of such banking environment include consumer boycotts, regular labour strikes, and more regulatory or governmental action (Ntim & Soobaroyen, 2013a), with a detrimental effect on BCCIs.

Nonetheless, previous research (Cheng et al., 2022; Dam & Scholtens, 2012; Ghazali, 2007) only investigates the direct impact of BOS on CSR without taking into account the probable moderating effect of CG mechanisms on this association. Within the SSA context, we argue that

effective internal corporate governance mechanisms as measured by compliance with the regional Combined corporate governance Code (e.g., Nigeria SEC 2011; 2018; Ghana SEC 2010; Kenya, 2016) can influence the relationship between ownership structures and environmental initiatives in the banking system in the SSA countries. In particular, the Combined Code seek out to decrease agency conflicts between senior managers and owners of banks by enhancing transparency, accountability and the supervisory role of the board of the bank. Thus, we reason that the association between BOS and BCCIs in the SSA banks can be expected to be impacted by CG mechanisms as emphasized in the Combined Code. We also expect that the BOS-BCCIs relationship will be more significant in banks with high CDGI levels (better-governed banks) and lower in banks with low CDGI levels (poorly-governed banks). Therefore, our final hypothesis to be examined is stated as follows:

Hypothesis 6: Corporate governance disclosure index (CGI) moderates the relationship between the various components of bank ownership structures (BOS) and bank-based climate change initiatives (BCCIs), with the association being stronger in banks with high corporate governance disclosure index scores.

5 Data and methodology

5.1. Sample selection

Our sample is based on all banks in 16 Sub-Saharan Africa (SSA) countries. These countries include Botswana, Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi and Mauritius. The rest of the countries are Namibia, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe. The decision on the countries was influenced by the similar CG and banking reforms carried out in each nation over the past ten years. Nevertheless, the 16 SSA countries have the most matured banking and capital markets in the region. For instance, the total GDP of the selected countries stood at US\$2,885.78 billion as of 2018 as compared to the GDP of the entire SSA of US\$4,200.85 billion and accounted for over 70% of the total GDP in the region. We also chose these countries because they all share English as their official language. Due to the hand-collection nature of the corporate governance disclosure index (CGDI) and bank-based climate change initiatives (BCCIs) variables, this helps data collection by removing the language barrier (e.g., Adu, 2022a; Ntim & Soobaroyen, 2013a). The sampled banks' annual reports, obtained from

the institutions' websites, were used to compile the CGDI and BCCIs. Bank financial information was gathered from BankScope and supplemented with information from annual reports where necessary. The country-level data, including GDP, was collected from the website of the World Bank, while inflation came from the International Monetary Fund's website.

The study sample period starts in 2007 and ends in 2022. The sample timeframe spans the pre-, during, and post-CG reforms periods in the SSA countries. This helps assess whether the CG reforms have helped improve CG standards, particularly regarding influencing BOS and BCCIs in the countries. The sample period ends in 2022, the most recent year for which data was available for the sampled banks during the study period. Table 1 provides the final dataset, which includes 220 banks with 2,785 bank-year observations.

[Insert table 1 about here]

We excluded banks with missing data or whose annual reports were not published in line with prior banking literature (Adu, 2022a). Next, consistent with existing studies, we removed foreign-owned banks that released their annual reports as consolidated financial statements globally (Adu et al., 2022b). Additionally, specialized financial institutions with characteristics and practices comparable to those of commercial banks were included in the study's sample. As in earlier research in the SSA countries, this was done to establish uniformity in the sampled banks (Adu, 2022b).

5.2 Definition of variables and model specification

We classify the variables into four main types, with full definitions provided in Table 2. First, following prior research (Orazalin et al., 2023; Giannarakis et al., 2017; Eleftheriadis & Anagnostopoulou, 2015), we develop the bank climate change initiative (BCCI) index to measure BCCIs. The index is constructed based on 40 bank-specific initiatives that assess BCCI¹. Following prior studies, we develop the BCCI based on disclosures manually collected from the annual

¹ As climate change represents a global environmental crisis, banks effect on the environment and ecosystems should be assessed at the planet level rather than at the national level (Atkins & Maroun , 2018; Dumay et al., 2010). Therefore, we assess BCCIs based on a wide range of climate change activities/initiatives designed to address ecological and environmental issues that are common in any part of the world.

reports of the banks (Adu, 2022a; Adu et al., 2022b). This is because rating agencies have limited coverage of banks in the SSA region. We identified and selected the 40 bank-specific initiatives that capture BCCI based on areas set out by the Combined integrated sustainability codes and guidelines in the SSA countries (Ghana, 2010; Nigeria, 2011; South Africa, 2010; and Kenya, 2014). In addition, the BCCI dimensions were selected based on the 2016 Global Reporting Initiative guidance. More importantly, the identification and selection procedure adopted in this study is also consistent with well-established line of scoring of sustainability disclosures (Orazalin et al., 2023; Adu et al., 2022b; Giannarakis et al., 2017; Eleftheriadis & Anagnostopoulou, 2015; Ntim, 2009; Ntim & Soobaroyen, 2013). Appendix A provides the measurement of all the 40 BCCIs. To assess the validity and reliability of the index, Cronbach's alpha of individual dimensions of the BCCIs is estimated.² In addition, we follow Oyewumi et al. (2018) and use the natural log of the actual amount invested in executing climate change activities (BICCI) as reported in the annual reports of the banks as second measure of BCCIs.

Following well-established literature concerning scoring of CG disclosures in annual reports (e.g., Adu et al., 2022b; Ntim & Soobaroyen, 2013a; Ntim, 2009; Beiner et al., 2006), the study employs a binary coding scheme to compute CGDI. For instance, Beiner et al. (2006) construct an aggregate CG index based on 38 provisions from the Swiss Code of Best Practice in 2002 in a sample of 109 Swiss listed. The authors divide 38 CG provisions into five key subsections. The subsections include board of directors and executive management, reporting and auditing, shareholders' rights, transparency and CG commitment. In constructing the aggregate CG index, the authors award each firm a point for the existence of any of the 38 good CG provisions, zero otherwise. Similarly, the CGDI of this study is an aggregation of 100 comprehensive set of CG provisions. The selection of the 100 CG provisions is informed by the Combined CG Code and disclosures in the annual reports of the banks. Thus, the CGDI is a collection of 100 detailed set of CG provisions contained in the Combined Code (Ghana, 2018, 2010; Nigeria, 2018, 2011; Kenya, 2014, 2002; and South Africa, 2016, 2010). Specifically, the provisions capture four wide areas: (i) directors and board disclosures (43); (ii) accounting, auditing and transparency

² The obtained alpha coefficient of 0.845, which is greater in magnitude than the cut-off level of 0.700, indicating that the instrument is reliable and that the dimensions of the BCCIs have high internal consistency.

disclosures (22); (iii) risk management, internal audit and control disclosures (13); and (iv) compliance, shareholder rights and enforcement disclosures (22).

A dichotomous method is then applied, whereby a bank is assigned a score of '1' if a CG item is disclosed; otherwise, '0' is awarded (Adu et al., 2022b). This is consistent with prior studies that employ either national (e.g., Cadbury Report, 1992; Combined Code 1998; Swiss Code of Best Practice, 2002) or international codes of CG (e.g., Commonwealth Association for Corporate Governance, 1999; OECD Principles, 1999), in constructing composite CG indices (e.g., Adu et al., 2022; Zhou et al., 2021; Beiner et al., 2006; Ntim, 2009; Ntim & Soobaroyen, 2013a). The total score is then expressed as a percentage, ranging from a minimum (0%) to a maximum (100%). Appendix B contains the four broad themes and the various variables that make up the CGDI. It also offers clear descriptions of the coding instruments and how the variables have been assessed as applied by Adu et al. (2022b) and, Ntim and Soobaroyen (2013b).

Two main notable methodological challenges that are associated with employing researcher-constructed aggregate CG indices are the issue of reliability and validity (Adu, 2022a; Ntim, 2009; Marston & Shrives, 1991). Briefly, reliability denotes the “the extent to which a measuring method yields the same results on repeated trials” (Hassan & Marston, 2008, p.27). Regarding the CGDI, there are two reliability challenges that must be addressed. These are stability and reproducibility. The CGDI is reliable if it can be replicated by the same researcher over time (stability), as well as by another researcher (reproducibility), when coding the same content with higher levels of accuracy (Beattie & Thompson, 2007, p.139; Beattie et al., 2004, p.214). Concerning stability, we follow Adu (2022a) and Ntim (2009) in coding each annual report twice over a period of 14 months. The first set of coding takes 10 months starting in March 2022 and ending in December 2022. The second set of coding takes 4 months starting in January 2023 and ending in April 2023. Essentially, the second set of coding allows the author to cross-check the first set of coding with subsections comprehensively re-analyzed as suggested by Ntim (2009) and, Beattie and Thompson (2007). Any inconsistencies in the first set of coding were corrected during the second round of coding. Regarding reproducibility, for each CG provision, a comprehensive spreadsheet covering the page number(s) of what was coded, where it was coded from and, why it was coded in that way (Adu, 2022a; Ntim, 2009). Notably, the adoption of this

systematic approach makes it simple and easy to replicate the constructed CGDI by other researchers.

The second crucial concern that is addressed is the validity of the CGDI. In particular, Hassan and Marston (2008, p.30) define validity as “the extent to which any measuring instrument measures what it is intended to measure”. The external validity of the CGDI is achieved through the use of conventional CG provisions covered in the Combined CG Code in the SSA region (Ghana, 2018, 2010; Nigeria, 2018, 2011; Kenya, 2014, 2002 and South Africa, 2016, 2010) that are rigorously grounded in prior empirical research (Adu et al., 2023b; Adu, 2022a; Ntim & Soobaroyen, 2013b; Ntim, 2009).

Third, we follow previous research (e.g., Benlemlih et al., 2022; Zamanet al., 2021) and measure the percentage of institutional ownership (PCT_INST) as the number of shares held by institutional investors for a bank scaled by total shares outstanding. Similarly, we measured the percentage of government ownership (PCT_GOVE) as the number of shares held by government scaled by the total shares outstanding for a bank (Ntim & Soobaroyen, 2013a). Further, the study assessed the percentage of foreign ownership (PCT_FORE) as the number of shares held by foreign investors scaled by total shares outstanding for a bank (Oh et al., 2011). In addition, we measured the percentage of director ownership (PCT_DIRE) as the number of shares held by directors of the bank scaled by the total shares outstanding (Ghazali, 2007).

Finally, we added several control variables to control for possible omitted variables bias (Ntim et al., 2013). Following well-established literature (Adu et al., 2022b; Cheng et al., 2022; Ntim & Soobaroyen, 2013a), we control for board size (BSIZE), board gender diversity (BGEN), firm size (FSIZE), leverage (LEV), age (AGE), capitalization (CAP), audit firm size (BIG4), research and development (R&D), return on assets (ROA) and return on equity (ROE). Finally, consistent with previous studies (Adu, 2022a), we also control country-level variables such as GDP, and inflation (INFL). We also include country dummies (CDU) for the sixteen countries and year dummies (YDU) for the financial years from 2007 to 2022. Table 2 presents the abbreviations and definitions of the variables.

[Insert table 2 about here]

5.3 Econometric models

The association among CGDI, BOS and BCCIs is jointly and dynamically determined (Guest, 2009). Hence, several endogenous problems could arise due to possible omitted variables that can simultaneously affect CGDI, BOS and BCCIs (Sarhan et al., 2019). Additionally, endogenous problems may arise from bank specific characteristics including managerial skills, challenges, opportunities and leverage, which change overtime (Sarhan et al., 2019; Guest, 2009). Hence, and given the panel nature of the data and following well-established literature (e.g., Orazalin, 2020; Sarhan et al., 2019; Gyapong et al., 2016), we estimate a fixed-effects (FE) regression model in order to account for potential omitted variables and unobserved firm-specific heterogeneities. We carry out the Hausman test, which suggests that a fixed-effects model is appropriate for our unbalanced panel dataset. First, in order to assess the direct effects of broad corporate governance disclosure index (CGDI) on bank climate change initiatives (BCCIs), we employ FE regression model employed is specified as follows:

$$BCCIs_{it} = \alpha_0 + \beta_1 CGDI_{it} + \beta_2 CONTROL_{it} + \beta_3 YDU_{it} + \beta_4 CDU_{it} + \varepsilon_t \quad (1)$$

Where:

BCCIs is the bank-based climate change initiatives measures depending on the specification, which is either BCCI or BICCI. All other variables are defined/measured in Table 2.

Second, to examine the direct effect of bank ownership structures (BOS) on bank-based climate change initiatives (BCCIs), we employ FE regression model as specified as follows:

$$BCCIs_{it} = \alpha_0 + \beta_1 BOS_{it} + \beta_2 CONTROL_{it} + \beta_3 YDU_{it} + \beta_4 CDU_{it} + \varepsilon_t \quad (2)$$

Where BOS refers to bank ownership structures which is either PCT_INST, PCT_GOVE, PCT_FORE and PCT_DIRE depending on the specification. All other variables remain the same as specified in equation (1).

Finally, in order to assess the direct moderating effect of CGDI on the BOS-BCCIs relationship, we employ the following FE regression model:

$$\begin{aligned}
BCCIs_{it} = & \alpha_0 + \beta_1 BOS_{it} + \beta_2 BOS_{it} * CGDI_{it} + \beta_3 CGDI_{it} + \beta_4 CONTROL_{it} \\
& + \beta_5 YDU_{it} + \beta_6 CDU_{it} + \varepsilon_t
\end{aligned} \tag{3}$$

Where $BOS_{it} * CGDI_{it}$ is the interaction variable between BOS and CGDI. All other variables remain the same as specified in equation (1). All variables are defined in Table 2.

5. Empirical results and discussion

5.1 Descriptive statistics and univariate analysis

Panel A of Table 3 summarizes descriptive statistics of the bank-based climate change initiatives (BCCIs) measures. The BCCI variable has a mean score of 36.55% and varies between 2.20% and 81.48%. The disclosure is relatively low compared to those documented in developed countries. For example, Orazalin et al. (2023) report climate change initiatives of 50% in an international sample. The BICCI scores vary between 0 and US\$8.12 million, with a mean value of US\$3.80 million. Table 3 also presents an overview of the broad CGDI. The CGDI score is an indicator of how well the banks are governed. The results in Panel B of Table 3 show that the average CGDI score is 66.73%, which indicates that most banks have high CGDI scores, implying good CG mechanisms in most banks. This result is lower than the evidence of Ntim and Soobaroyen (2013a). However, the CGDI is slightly higher than the findings of Adu (2022a) who recorded CG disclosure index of 64.56%. Concerning the bank ownership structures, the results in Panel B reveal that PCT_INST has widespread variation ranging from 10.47% to 100%, with an average of 77.57%. The evidence suggests that institutional investors hold substantial stakes in the banks. The result is relatively high when compared to past studies in the regions (Adu et al., 2023b; Adu, 2023b; Ntim & Soobaroyen, 2013a; Andrianova et al., 2008). Adu (2023b) documents institutional ownership of 75.54% in the region. Concerning PCT_GOVE, PCT_FORE, and PCT_DIRE, the results in the table report a mean of 6.13%, 22.76%, and 5.95%, respectively. The evidence in the table also shows that some banks in the region were 100% owned by the government. Together, bank ownership figures are consistent with the findings reported in the SSA countries' banking system (e.g., Adu et al., 2023b; Adu, 2023b; Andrianova et al., 2008). For instance, Adu (2023b) reports a mean of 5.46% and 17.62% for government ownership and

foreign ownership, respectively, in the region's banking sector. Further, Adu et al.(2023b) find that directors in the banking sector in the region hold 5.29% ownership, an evidence that is slightly lower than the result of this study.

Insert Table 3 about here

The correlation matrix for the variables used in the regression analysis is shown in Table 4. The correlation coefficients in Table 4 reveal that CGDI and the BOS variables are correlated with BCCIs. For example, PCT_INST has positive correlation with the two BCCIs variables (BCCI and BICCI). Multicollinearity issues arise if correlation coefficients among predictors are above 0.80 (Gujarati, 2004). The matrix shows that none of the coefficients exceeds 0.80, suggesting the absence of any serious multicollinearity.

Insert Table 4 about here

5.2. Multivariate results and discussion

Table 5 presents the estimated FE regression results of the effect of CGDI and the BOS variables on BCCIs. First, Model (1) shows that the broad corporate governance disclosure index (CGDI) is positively related to bank climate change initiatives (BCCI) ($p < 0.01$). Similarly, Model 6 indicates that CGDI has positive impact on bank investment in climate change initiatives (BICCI). Together, these findings suggest that banks with good CG mechanisms are associated with increased climate change initiatives. This evidence offers empirical support to H1 and corroborates the findings of Adu et al. (2023b), Adu (2022a) and Gangi et al. (2019) that CG mechanisms react positively to increased levels of environmental performance of banks. The evidence is consistent with the theoretical predictions that in better-governed banks, the executives will be expected to provide more sustainability disclosures, including climate change initiatives, to satisfy shareholders (AT) and other influential bank stakeholders (SHT) (Adu, 2022a; Ntim et al., 2013), as well as to win their support to legitimize (NIT) or guarantee their continued stewardship of the bank and its resources (RDT) (Ntim et al., 2013; Chen & Roberts, 2010). The evidence lends empirical support to the recommendations of CG codes in the SSA region that incorporate the expectation that effective CG mechanisms will be linked with increased climate change investments.

Second, Table 5 provides the estimated FE regression results of the impact of BOS on BCCIs. Overall, the results imply that ownership structures are essential in explaining differences in BCCIs. Model (2) reveals that institutional ownership (PCT_INST) is positively associated with BCCI ($p < 0.01$). Model 7 indicates that PCT_INST has positive impact on bank investment in climate change initiatives (BICCI), suggesting that SSA banks with high institutional investors are more likely to make significantly greater climate change initiatives. The positive association between PCT_INST and BCCIs is consistent with the assumption that institutional investors reduce agency conflicts by acting as alternative CG mechanisms, thus supporting AT. In this setting, there is a greater need for bank executives to engage in increased climate change disclosures to legitimize their actions/decisions to the owners of the bank (i.e., offering support to NIT). These findings offer empirical support for H2, and prior studies (Adu et al., 2023b; Bose et al., 2017; Ntim & Soobaroyen., 2013a; Oh et al., 2011), which document that PCT_INST has a positive impact on environmental performance/CSR. For example, Adu et al.(2023b) observe that institutional investors in the regions' banking sector are associated with increased engagement in sustainable banking initiatives.

Third, Table 5 reports the FE regression results of the effect of government ownership (PCT_GOVE) on BCCIs. The results in Model (3) show that PCT_GOVE is negatively associated with BCCI ($p < 0.05$), thereby offering strong empirical support to H3. This evidence suggests that banks with government ownership tend to engage in less climate change related investments/projects. Our results are consistent with prior studies that document a negative association between government ownership and sustainable banking initiatives (e.g., Adu et al., 2023b). Further, Model (8) shows that PCT_GOVE has negative impact on BICCI, but the association is found to be insignificant. This evidence does not provide empirical support to H3. By contrast, the negative association between PCT_GOVE and BCCI does not offer empirical support to the findings of prior research (Khan et al., 2013; Ntim & Soobaroyen, 2013a), which document that PCT_GOVE has a positive effect on CSR/environmental performance. Nevertheless, our evidence supports prior studies documenting an inverse link between PCT_GOVE and CSR/environmental performance (Dam & Scholtens, 2012; Van der Zee, 2012). Our results confirm the reasoning that government ownership exacerbates agency issues by

undermining the effectiveness of managerial monitoring, including disclosure mechanisms (Ntim et al., 2013; Jia et al., 2009). The inference is that solid political ties related with considerable levels of government stakes can lead executives of banks to pursue self-centered political goals that may have a detrimental impact on the sustainable corporate outcome and, to an extent, BCCIs.

Fourth, Table 5 reports the FE regression results of the impact of foreign ownership (PCT_FORE) on BCCIs. The results in Model (4) reveal that PCT_FORE is positively associated with BCCI ($p < 0.05$), thereby offering strong empirical support to H4. In addition, Model (9) shows that PCT_FORE has positive impact on BICCI ($p < 0.10$). The evidence provides empirical support to H4 and suggests that banks with substantial foreign investors are likely to have high climate change related projects. The positive connection between PCT_FORE and BCCIs is in line with the theoretical prediction that the presence of foreign investors leads to the establishment of transparent CG and consequently drives banks to undertake BCCIs. In addition, the results offer empirical support to our multi-theoretical framework that incorporates insights from NIT, SHT, and RDT. A crucial theoretical implication of our evidence is that foreign investors (mainly foreign banks) in the SSA region are powerful stakeholders (SHT) for banks with high PCT_FORE. Thus, banks undertake high levels of BCCIs to signal their congruence with foreign investors' guidelines, norms, values and initiatives (NIT), enabling the banks to gain access to critical assets, such as external funding and advanced technology (RDT). This appears to be the case in banking sector of SSA, where foreign investors are powerful stakeholders with strategic investments and exhibit intense interest in climate change action (Adu et al., 2023b; Adu, 2022a; Ntim et al., 2013; Ntim & Soobaroyen, 2013a). Our results corroborate the findings of prior studies in the region that detect positive relationship between foreign investors and sustainable banking initiatives in the region (Adu et al., 2023; Ntim & Soobaroyen, 2013a).

Fifth, Table 5 provides the estimated FE regression results of the effect of director ownership (PCT_DIRE) on BCCIs. Model (5) reveals that PCT_DIRE is negatively and insignificantly associated with BCCI, thus implying that H5 is rejected. In a similar vein, the results in Model 10 of Table 5 reveal that PCT_DIRE has a negative but statistically insignificant relationship with BICCI and fails

to offer empirical support for H5 or to the findings of prior studies such as Adu et al. (2023b), Haji (2013), Ghazali (2007) and, Eng and Mak (2003).

Insert Table 5 about here

Moving on to our final hypothesis, we have reasoned that because of the key role of CG mechanisms in the SSA banks, the corporate governance disclosure index (CGDI) may moderate the association between BOS and BCCIs. In order to empirically investigate this, we include an interaction term between the CGDI and BOS variables (PCT_INST*CGDI, PCT_GOVE*CGDI, PCT_FORE*CGDI, and PCT_DIRE*CGDI) by estimating Equation 2. Table 6 and 7 provide the FE estimation results exploring the possible moderating impact of CGDI on the BOS-BCCIs link. The results in Models 1-3 in Table 6 show that the moderation variables PCT_INST*CGDI, PCT_GOVE*CGDI and PCT_FORE*CGDI have a positive and significant impact on BCCI, respectively, thereby offering empirical support to H6 and the findings of prior studies (Adu et al., 2023b; Ntim & Soobaroyen, 2013a). Similarly, the estimated results in Models 1-3 of Table 7 reveal that moderation variables PCT_INST*CGDI, PCT_GOVE*CGDI and PCT_FORE*CGDI are positively and significantly associated with BICCI, respectively, hence providing further support to H6. This evidence provides strong empirical support to H6 that CG mechanisms positively moderate the link between BOS and BICCI. The results corroborate the findings of past studies in the regions' banking sector (Adu et al., 2023b; Ntim & Soobaroyen, 2013a). The findings suggest that the relationship between BOS and BCCIs is contingent on the quality of the internal governance mechanisms of the SSA banks. Theoretically, effective managerial monitoring associated with powerful ownership structures can encourage sustainable corporate investments (Ntim & Soobaroyen, 2013a). For instance, compliance with shareholder rights and enforcement mechanisms can limit agency problems (Adu, 2022a). In this context, good CG mechanisms, such as greater activism by influential pro-environmental owners, can enhance banks' engagement in climate change initiatives with a beneficial impact on BCCIs (Adu et al., 2023b; Adu, 2022a). By contrast, the results in Model 4 of Table 6 show that the moderation variable PCT_DIRE*CGDI has positive but insignificant impact on BCCI, implying H6 is rejected. Likewise, the results in Model 4 of Table 7 reveal that the moderation variable PCT_DIRE*CGDI

has positive and insignificant effect on BICCI, thereby indicating that H6 is not empirically supported.

Insert Table 6 about here

In more depth, Models 5-8 and 9-12 of Table 6 and 7 offer additional insight into the moderating impact of CGDI on the BOS-BICCI in the subsample based on the average CGDI score. We follow Adu (2022a) and perform this analysis in the two subsamples; banks with high CG mechanisms (better-governed) and banks with low CG mechanisms (poorly-governed banks). Within this investigation, banks with high CG mechanism sub-sample (1,658 observations) contains banks with a CGDI score greater than the mean value of 66.73%. Alternatively, the subsample (1,127 observations) for banks with low CG mechanism consists of all banks with CGDI score below the mean score of 66.73%. We perform this analysis to draw more informative inferences concerning the data (Adu, 2022a; Elmagrhi et al., 2020). Our estimated results in Models 5-8 in Table 6 and Table 7 indicate that banks with higher CG mechanism have a greater positive and significant moderating effect on BCCIs than banks with lower CG mechanism in Models 9-12 of Table 6 and Table 7. Overall, these findings are consistent with H6 that CGDI positively moderates the association between BOS and BCCIs, with the link being stronger in banks with high CGDI. The evidence theoretically support NIT's expectations, highlighting BOS's efficiency and legitimacy impact on BCCIs. The inference is that powerful owners can encourage executives of banks to engage in climate change projects in banks with high CG mechanism, which helps legitimize the banks' actions. Based on the efficiency NIT purview, the evidence implies that powerful owners can motivate executives to engage in more long-term value-creation investments in banks with high CG mechanism, which can enhance corporate efficiency and BCCIs. Hence, CGDI can serve as a crucial pathway for the relationship between BOS-BCCIs by lowering conflict of interest among the diverse stakeholders of the banks.

Insert Table 7 about here

5.3 Additional analyses

First, the study estimates Equations (1) – (2) for two subsamples, namely SDGs (2015-2022) and pre-SDGs (2007-2014), to ascertain the impact of global climate change initiatives/reforms

such as the SDGs. The results in Table 8 show that CGDI, PCT_INST and PCT_FORE have positive and significant impact on BCCIs (BCCI and BICCI) in the SDGs subsamples, and no association in the pre-SDGs subsamples. These results demonstrate the importance of global reforms/initiatives in raising awareness in the banking system concerning the detrimental effect carbon emissions and climate change (Orazalin et al., 2023). The results are also consistent with the findings of past studies that conducted similar investigation on the impact of global climate change initiatives/reforms on climate change initiatives (e.g., Orazalin et al., 2023).

Insert Table 8 about here

Second, we estimate Equation (3) for two subsamples, namely SDGs (2015-2022) and pre-SDGs (2007-2014), to establish the effect of SDGs reforms the moderating relationships. The estimated FE results in Table 9 reveal that CGDI has a strong positive moderating effect on the BOS-BCCI and BOS-BICCI relationships in the SDGs subsamples. By contrast, the results in Table 9 shows that the CGDI has positive but weak moderating impact on the BOS-BCCI and BOS-BICCI relationships in the pre-SDGs subsample. These results offer additional support to the crucial role of global climate change reforms (especially SDGs) in raising awareness of the need to protect the planet in the SSA banking sector.

Insert Table 9 about here

5.4 Sensitivity analysis and endogeneity check

We conduct additional investigations to address endogeneity concerns in the results. We follow prior studies and use an instrumental variable regression approach to account for endogeneity (Orazalin et al., 2023; Adu, 2022a; Orazalin, 2020). Specifically, we conduct a dynamic two-step system generalized method of moments (GMM) to minimize the potential impact of omitted sample bias and dynamic endogeneity in our results (Blundell & Bond, 1998; Arellano & Bond, 1991). In particular, Blundell and Bond (1998) maintain that a dynamic two-step

system GMM can fix these two types of endogeneity. Prior studies observe ownership to be impacted by directors who are appointed by shareholders (Adu, 2022a; Adu et al., 2022b). We use two approaches. First, motivated by previous literature (Benlemlih et al., 2022; Ntim & Soobaroyen, 2013a; Ntim & Soobaroyen, 2013b), we use the percentage of directors appointed by institutional, foreign, government, and director shareholders as instruments for institutional ownership, foreign ownership, government ownership, and director ownership, respectively. The intuition behind this is that the directors who are appointed by institutional, foreign, government, and director ownership would be significantly correlated with PCT_INST, PCT_GOVE, PCT_FORE and PCT_DIRE, respectively, but would not have any impact on BCCIs.

Second, following previous literature (Ntim et al., 2013), we use a dummy variable that takes the value of 1 if there is a director on the board who is appointed by institutional, foreign, government, and director ownership of the bank, and 0, otherwise is employed. We reason that it is theoretically unlikely that BCCIs would be determined by these instruments, and thus should serve as valid instruments in our GMM estimations. Data on directors who are appointed by the institutional, foreign, government, and director shareholders in the SSA banks is manually collected from the annual reports of the banks. In all our GMM estimations, the Hansen J statistic of over-identifying limitations, and the Arellano-Bond test of serial autocorrelation absence, are used to assess the instruments' validity.

Table 10 provides the GMM estimation results regarding the effect of the BOS on BCCIs. We find similar results in Table 10 as were documented in the FE analysis in Table 5. For example, the results in the table show that PCT_INST and PCT_FORE have a positive and significant impact on BCCI and BICCI in Models 1 and 3, and Models 5 and 7, respectively.

Insert Table 10 about here

The results of the GMM estimation on the moderating effect of CGDI on the BOS-BCCIs relationship are reported in Table 11. Once again, the coefficients on the interaction variables PCT_INST*CGDI, PCT_GOVE*CGDI and PCT_FORE*CGDI, are positive and significant, indicating that our initial results are robust to endogeneity issues. In addition, the results in Table 11 are comparable to our earlier FE findings in Table 6. These findings indicate that banks' CG

mechanisms significantly enhance the BOS-BCCIs nexus. Similarly, we carried out additional test to check the robustness of the results of the moderating effect of CGDI on the BOS-BICCI link. Precisely, we re-estimated the FE results in Table 7 using GMM approach, which for brevity not reported, but will be available upon request. The results of these investigations were consistent with our main FE results.

Insert Table 11 about here

The findings of these additional analyses demonstrate that our results do not appear to be driven by any potential endogenous sample selection problems.

5.5 Related studies

We investigate whether different owners have distinct influences on the bank's climate change initiatives, and ascertain whether CG disclosure index has a moderating effect on this association. We observe that, as hypothesized, influential institutional and foreign owners support banks' climate change activities. Our evidence corroborates the findings of prior research (Adu et al., 2022b; Ntim & Soobaroyen, 2013a; Dam & Scholtens, 2012) as highlighted in Table 12. This indicates that institutional and foreign investors may have a stronger appetite for implementing climate change initiatives that are generally long-term projects, for instance, moving from fossil fuels to renewable energy sources (Benlemlih et al., 2022). In particular, institutional investors in the SSA banks are predominantly pension funds, insurance firms, and banks. The positive impact of institutional and foreign ownership on BCCIs provides empirical support for the provisions of the Combined Code in the SSA region. By contrast, our evidence is different from related studies that observe a negative association between institutional ownership and CSR (e.g., Cheng et al., 2022). Our evidence reveals that ownership by the government does not lead to active engagement in BCCIs, offering empirical support to previous related studies (Adu et al., 2023b; Ntim & Soobaroyen, 2013a). The result of our study suggests that ownership by directors in the banking system has no impact on BCCIs in the SSA emerging economies. Our evidence provides empirical support to prior research in the field that documents no significant relationship between director ownership and bank environmental initiatives (e.g., Adu et al., 2023b).

Finally, our research provides evidence that indicates that a combination of bank ownership structures and CGDI has a stronger positive effect on BCCIs than bank ownership alone, with the moderating impact increasing in banks with greater CGDI scores. This implies that the association between bank ownership structures and BCCIs is contingent on the quality of the banks' CG disclosure, indicating that CGDI reinforces the bank ownership structures-BCCIs nexus. In this regard, banks can rely high CG disclosure as a crucial catalyst for increased BCCIs. This is a critical observation because, as earlier recognised, in the last 10 years, SSA countries have been making more efforts toward attaining sustainable banking initiatives through responsible and transparent governance structures (Adu et al., 2023b). Our evidence provides empirical support to related studies in the field (e.g., Adu et al., 2023b; Ntim & Soobaroyen, 2013a).

Insert Table 12 about here

6 Conclusion

Over the past few decades, academics, banking practitioners, and regulators have become increasingly concerned in climate change acceleration due to the rising levels of GHG emissions and their negative effects on the planet, and ultimately human lives. Following various governance scandals at the turn of the century, numerous national governments, regulators, environmentalists, and banks started to examine CG mechanisms more carefully than they had previously done. As a result, numerous CG reforms have been implemented with the goal of improving corporate boards' responsibility. Many CG codes have been issued in the SSA region to protect the rights and duties of corporate owners. The SSA codes, for instance, outline the principles of effective investor stewardship. For instance, effective bank ownership structures (BOS) are receiving more attention from the region's banking regulators as a crucial CG mechanism to drive bank-based climate change initiatives (BCCIs). Regrettably, there is limited research regarding the role of CG structures such as CGDI and BOS in addressing climate change challenges especially in the banking sector. In particular, it is unclear whether BOS strategies and reforms, which regulators are progressively implementing in the countries, can lead to an enhancement in BICCIIs. This is lamentable because understanding these key connections can help policymakers and banks to design climate change strategies that can have a beneficial impact on BICCIIs. Accordingly, this study sought to bridge this gap in literature by empirically

exploring the interrelationships among CGDI, BOS and BCCIs based on a data of 220 banks operating in 16 SSA countries from 2007 to 2022.

We contribute to the literature in several ways. We offer new evidence that shows that higher levels of CG disclosure have a positive effect on BCCIs in the SSA countries. Further, our findings show that high BOS, as measured by institutional and foreign ownership, is associated with increased BCCIs levels. By contrast, we provide new insights that show that significant government ownership is associated with low levels of BCCIs in the SSA banks, whereas director ownership has no impact on BCCIs in the region. Departing from the prior studies, we identify the potential pathway through which BOS and BCCIs relationship, and the moderating effect of the broad corporate governance disclosure index (CGDI) on this link. Finally, the result of the study shows that the predicted associations vary across different operating periods (pre-SDGs and post-SDGs).

Our study also offers crucial theoretical, empirical and practical policy implications. First, we make a few theoretical contributions. Specifically, our study contributes to agency, resource dependence, stakeholder, and neo-institutional theories by examining how CGDI and BOS attributes impact on BCCIs. Prior studies stress that CG mechanisms can influence sustainable board decisions (e.g., Adu et al., 2023b; Ntim & Soobaroyen, 2013a) and can determine banks' strategic choices (Adu, 2022a). Nevertheless, these scholars do not employ the above multi-theoretical framework to investigate how CGDI can influence BOS and BCCIs. In this case, this study makes theoretical contribution by applying agency, resource dependence, stakeholder, and neo-institutional theories in testing and interpreting the results on the relationship among CGDI, BOS and BCCIs. Evidence from this study is consistent with the multi-theoretical predictions of that quality CG structures can interact with BOS attributes to enhance BCCIs in the SSA banking sector.

Second, and in addition to the findings' theoretical and empirical contributions, we also offer important practical policy implications. Precisely, the evidence from this study has crucial practical regulatory implications, especially linked to governance reforms regarding CG disclosures. In particular, we call for banks to adopt and implement good governance disclosures

as such CG mechanisms are proven to improve sustainable board decisions including BCCIs. To that effect, when policymakers are revising and implementing CG reforms, policymakers in the SSA have incentives to include CG disclosures which will lead to increased corporate monitoring. In practice, increasing mandated level of CG disclosure within the banking sector will be a step in the right direction. Further, our research indicates that in order to increase efficacy, policy changes in the SSA banks should be undertaken jointly in the areas of monitoring (CG) and aligning shareholders' interests (BOS). One practical way of enhancing decision-making, including setting and assessing the effectiveness of ownership structures may be ensuring quality CG disclosure. Next, by identifying new factors and channels that can impact on BCCIs and helping bank executives and regulators in strategically managing climate change investments, our findings contribute to our understanding of ethical/responsible banking behaviour. Based on our findings that CGDI has a positive moderating influence on the relationship between BOS and BCCIs, banking executives should be strongly motivated to use high-quality CG mechanisms and view bank owners as a vital catalyst for promoting climate change action. For instance, world leaders and policymakers reaffirmed their commitment to taking decisive action to counter global warming and avert 2° scenarios at the COP26 meeting in Glasgow, UK. In this regard, because institutional and foreign owners are keen on taking action in support of responsible banking initiatives, they should be considered when designing and implementing climate-related reforms (Benlemlih et al., 2022). In particular, based on the findings of the study, it is recommended that banking regulators should encourage more institutional investors in the region's banking sector. Practically, this may be achieved by encouraging individuals to invest through institutional investors. Moving on, our findings demonstrate that regulators should encourage less government ownership in the banking system. In practice, this may be achieved by putting in place extensive requirements and restrictions on government ownership in the SSA region (Adu, 2023b).

The study has some limitations that should be explicitly addressed by future studies. First, the study is based on banks in an emerging market. Hence, the findings may not be generalizable to small- and medium-sized enterprises. Thus, future researchers may offer new insights by investigating whether these associations hold in small- and medium-sized enterprises. Second,

the research focused on internal CG mechanisms due to data restrictions. Yet, future studies may enhance their analysis by examining how external CG mechanisms, like regulation and media, influence BCCI practices. Third, despite the fact that our sample is only comprised of banks from emerging economies, future research can apply our multi-theoretical framework within a developed cross-country context, guaranteeing a more explicit generalisation of the findings. Fourth, the study investigates data on corporate governance, bank ownership structures and bank climate change initiatives reported by the sampled banks and do not consider other information that might reflect actual practices in the bank. In this case, future researchers may conduct inclusive case studies and interviews with bank senior managers, directors of the bank, investors and other stakeholders to provide new insights on climate change initiatives in the banking sector. Fifth, the study could not investigate the impact of the existence and composition of certain board sub-committees including auditing, risk and sustainability as well as the structure of incentive compensation systems for bank executives or the educational level of board members on bank climate change initiatives, which is an issue that future research could explore as such data become available. The study's final limitation is that the data is limited to SSA banks, thus the conclusions must be understood in this perspective. The results, for instance, might or might not be comparable to those of developed economies with different institutional and climatic policies.

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Table 1: Composition of the sample by countries

Country	Bank Population	Sample	Representation (%)
Botswana	10	10	100
Gambia	12	8	67
Ghana	24	24	100
Kenya	41	30	73
Lesotho	4	4	100
Liberia	9	6	67
Malawi	9	5	56
Mauritius	21	15	71
Namibia	8	5	63
Nigeria	20	19	95
Sierra Leone	12	4	33
South Africa	21	20	95
Tanzania	38	25	66
Uganda	25	20	80
Zambia	17	13	76
Zimbabwe	13	12	92
Total	284	220	77

Notes: Population and Sample refer to count, and representation refers to sample as a percentage of population.

Table 2. Variables definitions

Variable	Symbols	Operationalization	Source
Panel A: Dependent variables			
Bank climate change initiatives	BCCI	The index is calculated based on 40 bank-specific items (see Appendix A) related to bank climate change initiatives. The index ranges between 0% (no climate change initiatives and practices) and 100% (fully instituted bank climate change initiatives)	Annual report
Bank investment in climate change initiatives	BICCI	The natural logarithm of the actual amount spent in executing climate change activities/initiatives.	Annual report
Panel B: Independent variable			
CG disclosure index	CGDI	CGD index containing 100 provisions derived from the commonwealth CG code, individual country CG codes and annual report of the sampled banks. The CG provision take a value of 1 if is disclosed in the annual report, otherwise 0 and scaled to a value between 0% and 100%.	Annual report
Institutional ownership	PCT_INST	The percentage of shares owned by institutions in the banks	Annual report
Government ownership	PCT_GOVE	The percentage of shares held by government	Annual report
Foreign ownership	PCT_FORE	The percentage of shares held by foreign investors	Annual report
Director ownership	PCT_DIRE	The percentage of shares held by the directors of the bank	Annual report
Panel C: Bank control variables			
Board size	BSIZE	The natural logarithm of the number of board directors	Annual report
Board gender diversity	BGEN	The percentage of female directors on the board	Annual report
Firm size	FSIZE	Natural logarithm of total assets of the bank	Bankscope/Annual report
Leverage	LEV	Ratio of total debt to total assets	Bankscope/Annual report
Age	AGE	Natural logarithm of the number of years since inception	Annual report
Capitalization	CAP	Equity capital divided by total assets	Bankscope/Annual report
Audit firm size	BIG4	1 if a bank is audited by the big four audit firm (PricewaterCoopers, Deloitte & Touche, Ernest & Young and KPMG), 0 otherwise.	Annual report

Research and development	R&D	Natural logarithm of research and development cost of the bank scaled by total assets	Bankscope/Annual report
Return on assets	ROA	Percentage of operating profit to total assets	Bankscope/Annual report
Return on equity	ROE	Ratio of net income to shareholder's equity.	Bankscope/Annual report
Panel D: Country Control variables			
Gross domestic product	GDP	Natural log of GDP relates to changes in national income	World Bank
Inflation	INFL	Natural log of annual rate of inflation as a percentage of GDP	IMF

Notes: This table provides the definitions of the main variables employed in the analysis

Table 3. Descriptive Statistics of all variables for all the 2,785 bank years

Variable	Mean	Median	Std. Dev.	Minimum	Maximum
Panel A: Dependent variables					
BCCI (%)	36.55	34.60	18.32	2.20	81.48
BICCI (\$m)	3.80	3.57	4.12	0.00	8.12
Panel B: Independent variables					
CGDI	66.73	67.23	15.11	23.00	92.26
PCT_INST	77.57	89.63	23.84	10.47	100.00
PCT_GOVE	6.13	36.55	21.32	0.00	100.00
PCT_FORE	22.76	21.52	8.97	0.00	42.37
PCT_DIRE	5.95	5.05	14.60	0.00	83.25
Panel C: Bank control variables					
BSIZE	9.80	9.00	3.20	4.00	24.00
BGEN	26.74	25.00	14.45	0.00	84.34
FSIZE (\$m)	15.66	10.48	4.32	2.32	45.49
CAP	0.27	0.19	0.46	0.05	0.98
LEV	0.86	0.87	0.26	0.07	0.97
AGE	39.00	29.24	32.47	2.00	182
R&D (\$m)	2.67	1.75	2.73	4.78	15.76
BIG4	0.95	1.00	0.26	0.00	1.00
ROA	3.52	2.07	0.22	6.46	92.52
ROE	18.74	15.52	0.19	1.23	98.86
Panel D: Country control variables					
GDP	8.65	7.08	3.62	-16.42	37.54
INFL	9.78	10.67	19.43	3.08	78.56

This tables provides the summary statistics of all the variables used in the regression analysis. Notes: Please see Table 2 for variable definitions.

Table 4. Pearson's correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
BCCI (1)	1.00																		
BICCI (2)	0.03	1.00																	
PCT_INST (3)	0.05***	0.03**	1.00																
PCT_GOVE (4)	-0.03**	-0.02**	0.06	1.00															
PCT_FORE (5)	0.07**	0.04**	0.08	-0.02*	1.00														
PCT_DIRE (6)	-0.04	-0.03*	0.05*	0.07	-0.03*	1.00													
CGDI (7)	0.22**	0.04**	0.13*	0.18*	0.05	-0.03	1.00												
BSIZE (8)	0.09**	0.07**	0.02*	-0.05*	-0.04*	0.01	0.08*	1.00											
BGEN (9)	0.02**	0.05**	0.16	-0.04	0.02	0.14	0.08*	0.17	1.00										
FSIZE (10)	-0.09**	-0.06*	0.07*	-0.03	-0.06	0.05*	-0.06	0.05*	0.02**	1.00									
LEV (11)	0.08*	0.11**	-0.09*	0.07	0.18*	-0.03	0.15**	0.19*	-0.33	0.09*	1.00								
CAP (12)	-0.22*	-0.18**	-0.08*	-0.06	0.09	-0.04	-0.13*	-0.02	0.08*	-0.17	-0.15*	1.00							
AGE (13)	-0.18***	-0.07	0.17*	0.13**	-0.06	0.09	0.07	0.09	-0.21	0.16	0.08	0.15**	1.00						
BIG4 (14)	0.12	0.09	0.28	0.15*	0.05*	0.02*	0.08	0.02	0.05**	0.13	0.07	-0.36	-0.06	1.00					
R&D (15)	0.07***	0.05**	0.14	0.18*	0.08*	-0.07*	-0.05**	0.08*	-0.01	0.06*	0.29*	-0.18	0.27*	-0.18*	1.00				
ROA (16)	-0.05*	-0.03*	0.12	0.01	0.06	-0.02*	0.05	0.17	0.02	0.04	-0.15*	0.20*	-0.03	-0.16**	0.04	1.00			
ROE (17)	-0.09**	-0.04*	0.08*	0.25	0.05*	0.06	-0.07*	0.09**	0.08	0.09*	0.14	-0.03	0.07*	-0.09	-0.05*	0.02	1.00		
GDP (18)	0.09	0.07*	0.04	-0.03	-0.01*	0.07**	0.07	0.25	0.09*	0.11*	-0.02	-0.09**	0.27	0.06**	0.08	0.03*	0.12	1.00	
INFL (19)	-0.08**	-0.05*	-0.02	0.06*	-0.05	0.01	0.09	0.27*	-0.19	0.07*	-0.05	0.02*	0.07	-0.06	0.08	-0.03*	0.19	-0.07*	1.00

Notes: The figures indicate the Pearson's correlation coefficients. ***, ** and * indicate that the correlation is respectively significant at 1%, 5% and 10% levels

Table 5. The impact of corporate governance disclosure and bank ownership structures on bank-based climate change initiatives

Dep. variable Model	BCCI (1)	BCCI (2)	BCCI (3)	BCCI (4)	BCCI (5)	BICCI (6)	BICCI (7)	BICCI (8)	BICCI (9)	BICCI (10)
Indep. variables										
CGDI	0.035*** (5.38)					0.043*** (3.21)				
PCT_INST		0.015*** (2.70)					0.425* (1.67)			
PCT_GOVE			-0.005** (-2.14)					-0.213 (-0.81)		
PCT_FORE				0.021** (2.26)					0.834* (1.67)	
PCT_DIRE					-0.027 (1.11)					-0.245 (0.14)
Bank-level controls										
BSIZE	0.429*** (2.89)	0.419*** (2.92)	0.416*** (2.90)	0.417*** (2.90)	0.409*** (2.85)	0.230*** (4.59)	0.580* (1.84)	0.007* (1.78)	0.278** (2.31)	0.145* (1.79)
BGEN	0.127*** (3.52)	0.125*** (4.09)	0.126*** (4.12)	0.126*** (4.11)	0.127*** (4.16)	0.026** (2.22)	0.271*** (2.96)	0.77** (2.56)	0.200** (2.17)	0.128*** (2.98)
FSIZE	-0.144*** (-3.80)	-0.156* (-1.70)	-0.160* (-1.68)	-0.159 (-1.03)	-0.165* (-0.17)	-0.055* (-1.73)	-0.044* (-1.89)	-0.788 (-0.77)	-0.459* (-1.80)	-0.407 (-0.04)
LEV	5.365** (2.39)	5.468* (1.69)	5.444* (1.69)	5.478* (1.70)	5.329* (1.64)	4.315*** (4.52)	3.400*** (2.91)	2.005*** (3.93)	3.059*** (3.90)	0.111* (1.73)
AGE	-2.757** (-1.98)	-2.720*** (-3.10)	-2.682*** (-3.06)	-2.685*** (-3.07)	-2.681*** (-3.06)	-1.081*** (-3.41)	-2.449*** (-3.09)	-0.599*** (-2.94)	-0.912*** (-3.18)	-0.275*** (-2.99)
CAP	-3.664*** (-4.78)	-3.578** (-2.00)	-3.631** (-2.03)	-3.648** (-2.04)	-3.618** (-2.03)	-2.547*** (-5.83)	-2.749*** (-3.09)	-2.975*** (-3.13)	-2.142** (-2.18)	-1.767* (-1.70)
BIG4	1.076 (1.05)	1.023 (1.29)	0.979 (1.24)	0.991 (1.25)	1.067 (1.34)	0.647** (2.37)	0.425 (0.81)	0.104 (0.68)	0.439 (0.72)	0.452 (0.70)
R&D	0.497*** (5.246)	0.513** (2.08)	0.514** (2.07)	0.512** (2.08)	0.521** (2.12)	0.682*** (5.11)	0.942** (2.01)	0.684* (1.92)	0.912** (2.00)	0.406** (2.03)
ROA	-1.940*** (-3.284)	-2.189** (-2.31)	-2.156** (-2.30)	-2.166** (-2.30)	-2.175** (-2.31)	-2.996 (-1.48)	-0.164 (-1.00)	-0.983 (-1.56)	-0.646 (-1.01)	-0.796 (-0.99)
ROE	-0.022* (-1.65)	-0.034 (-0.02)	-0.038 (-0.03)	-0.041 (-0.02)	-0.072 (-0.04)	-1.811 (-0.92)	-0.141 (-0.20)	-0.895 (-0.19)	-0.705 (-0.19)	-0.585 (-0.21)
Country-level controls										
GDP	0.475 (0.94)	0.460 (1.23)	0.448 (1.20)	0.449 (1.21)	0.451 (1.22)	0.324 (1.17)	0.786 (1.48)	0.523 (1.40)	0.086 (0.42)	0.042 (0.41)
INFL	-0.664* (-1.73)	-0.614 (-1.45)	-0.616 (-1.46)	-0.621 (-1.46)	-0.641 (-1.51)	-0.191 (-1.06)	-0.660 (-0.07)	-0.608 (-0.05)	-0.595 (-0.02)	-1.039 (-0.03)

Constant	1.784*** (2.83)	1.943*** (3.73)	3.023*** (3.81)	3.369*** (3.87)	3.266*** (3.87)	4.160*** (3.51)	2.655*** (6.51)	3.495*** (6.63)	0.829** (6.81)	0.555 (3.84)
Year & country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	2785	2785	2785	2785	2785	2722	2722	2722	2722	2722
R-squared	0.54	0.61	0.60	0.57	0.54	0.64	0.62	0.60	0.51	0.48
F-value	34.17	22.30	22.11	28.28	22.31	49.6	18.91	18.84	34.17	30.41

Notes: All the variables used are fully defined in Table 2. t-statistics estimated using robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Table 6. Moderating effect of corporate governance disclosure on the link between bank ownership structures and bank-based climate change initiatives

Type of analysis	Main sample				Banks with high CG mechanisms				Banks with low CG mechanisms			
Dep. Variable	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI
Model	(1)	(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Indep. Variables												
CGDI	0.035* (1.67)	0.037* (1.81)	0.035** (2.18)	0.047 (1.51)	0.079* (1.74)	0.013* (1.80)	0.072* (1.76)	0.022 (1.30)	0.024 (0.97)	0.170** (2.06)	0.162* (1.74)	0.173** (2.05)
PCT_INST*CGDI	0.406*** (3.44)				0.981*** (3.88)				0.005* (1.77)			
PCT_INST	0.592 (1.58)				0.471 (1.64)				0.269* (1.76)			
PCT_GOVE*CGDI		0.042* (1.82)				0.200* (1.86)				0.004 (0.01)		
PCT_GOVE		-0.001 (-0.38)				-0.254 (-0.84)				-0.096 (-0.34)		
PCT_FORE*CGDI			0.508** (2.04)				0.875*** (3.29)				0.001* (1.70)	
PCT_FORE			0.029 (0.92)				0.115 (1.29)				0.004 (0.23)	
PCT_DIRE*CGDI				0.173 (1.22)				0.204 (1.52)				0.001 (0.02)
PCT_DIRE				-0.002 (1.03)				0.283 (0.89)				0.015 (0.06)
Bank-level controls												
BSIZE	0.434*** (3.01)	0.429*** (2.98)	0.430*** (3.00)	0.416*** (2.89)	0.381*** (2.94)	0.492*** (3.11)	0.387** (2.09)	0.176** (2.02)	0.681** (2.31)	0.632** (2.11)	0.701** (2.36)	0.690** (2.33)
BGEN	0.128*** (4.18)	0.129*** (4.17)	0.127*** (4.18)	0.127*** (4.14)	0.724** (2.06)	0.765** (2.15)	0.708** (2.01)	0.780** (2.19)	0.140*** (3.49)	0.137*** (3.48)	0.153*** (3.48)	0.140*** (3.49)
FSIZE	-0.145* (-1.70)	-0.147** (-1.95)	-0.144** (-1.93)	-0.157 (-1.02)	-0.155 (-1.36)	-0.060* (-1.89)	-0.057 (-1.37)	-0.064* (-1.71)	-0.706** (-2.22)	-0.730** (-2.29)	-0.770** (-2.42)	-0.776** (-2.41)
LEV	5.392* (1.66)	5.343* (1.65)	5.369* (1.66)	5.358* (1.65)	4.218*** (2.98)	3.678*** (3.03)	3.150*** (2.97)	3.841*** (2.93)	3.301 (0.07)	2.354 (0.08)	2.071 (0.02)	0.117 (0.03)
AGE	-2.750*** (-3.15)	-2.764*** (-3.15)	-2.758*** (-3.14)	-2.757*** (-3.14)	-3.239*** (-3.61)	-3.308*** (-2.67)	-3.272*** (-2.64)	-3.279*** (-2.65)	-2.870* (-1.75)	-1.662 (-0.26)	-1.038 (-0.42)	-1.019 (-0.41)
CAP	-3.654** (-2.05)	-3.696** (-2.06)	-3.664** (-2.05)	-3.617** (-2.03)	-3.959*** (-3.00)	-1.961*** (-3.01)	-2.026** (-2.04)	-2.084** (-2.07)	-2.204 (-1.55)	-2.554* (-1.65)	-2.308 (-1.57)	-1.298 (-1.57)
BIG4	1.078 (1.35)	1.081 (1.36)	1.077 (1.35)	1.032 (1.27)	1.098 (1.39)	0.544 (1.26)	0.406 (1.21)	0.575 (1.27)	0.723 (1.30)	0.575 (1.25)	0.399 (1.19)	0.392 (1.18)
R&D	0.494**	0.499***	0.497**	0.510**	0.538***	0.795***	0.712***	0.686***	0.917**	0.142**	0.941**	0.946**

ROA	(2.01) -1.912**	(2.05) -1.865**	(2.02) -1.939**	(2.07) -1.732**	(3.99) -2.531***	(4.18) -2.698	(4.11) -3.101	(3.93) -3.321	(2.00) -2.128*	(2.36) -1.208**	(2.05) -1.103**	(2.06) -1.150**
ROE	(-2.25) -0.061	(-2.24) -0.004	(-2.26) -0.023	(-2.22) -0.100	(-3.38) -0.918	(1.51) -1.818	(1.44) -0.869	(-0.36) -1.204	(-2.50) -0.600	(-2.51) -0.775	(-2.49) -0.566	(-2.50) -0.587
	(-0.03)	(-0.01)	(-0.02)	(-0.05)	(-0.36)	(-1.32)	(-1.34)	(-1.47)	(-0.53)	(-0.59)	(-0.52)	(-0.53)
Country-level controls												
GDP	0.478 (1.28)	0.475 (1.27)	0.476 (1.28)	0.466 (1.25)	0.989** (2.35)	0.965** (2.29)	0.982** (2.34)	0.998** (2.37)	0.254 (0.42)	0.328 (0.54)	0.255 (0.42)	0.265 (0.44)
INFL	-0.673 (-1.57)	-0.666 (-1.56)	-0.664 (-1.55)	-0.675 (-1.58)	-0.577 (-1.33)	-0.185 (-0.55)	-0.144 (-0.27)	-0.201 (-0.38)	-0.824 (-1.26)	-0.893 (-1.37)	-0.880 (-1.34)	-0.882 (-1.35)
Constant	5.775*** (3.74)	5.084*** (3.71)	5.782*** (3.74)	5.978*** (3.68)	5.158*** (2.70)	3.288** (2.51)	26.084** (2.08)	3.244*** (2.63)	2.898*** (3.69)	3.977*** (3.16)	4.707*** (3.46)	4.037*** (3.50)
Year & country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	2785	2785	2785	2785	1658	1658	1658	1658	1127	1127	1127	1127
R-squared	0.62	0.57	0.63	0.59	0.56	0.49	0.55	0.57	0.50	0.42	0.57	0.48
F-value	34.50	367.59	24.82	31.30	24.20	23.81	28.91	27.97	24.68	28.48	33.64	32.67

Notes: All the variables used are fully defined in Table 2. t-statistics estimated using robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Table 7. Moderating effect of corporate governance disclosure on the link between bank ownership structures and bank investment in climate change initiatives

Type of analysis	Main sample				Banks with high CG mechanisms				Banks with low CG mechanisms			
Dep. Variable Model	BICCI (1)	BICCI (1)	BICCI (3)	BICCI (4)	BICCI (5)	BICCI (6)	BICCI (7)	BICCI (8)	BICCI (9)	BICCI (10)	BICCI (11)	BICCI (12)
Indep. Variables												
CGDI	0.289 (1.64)	0.064*** (4.89)	0.332*** (4.94)	0.578*** (4.80)	0.617*** (5.70)	0.027*** (7.71)	0.029*** (5.88)	0.404*** (7.46)	0.595** (2.28)	0.452* (1.69)	0.370* (1.83)	0.114* (0.76)
PCT_INST*CGDI	0.189* (1.74)				0.521** (1.97)				0.009* (1.83)			
PCT_INST	0.896** (2.07)				0.427* (1.92)				0.506 (0.03)			
PCT_GOVE*CGDI		0.076* (1.66)				0.302** (2.54)				0.039 (1.09)		
PCT_GOVE		-0.193 (-0.77)				-0.225** (-2.53)				-0.628 (-0.24)		
PCT_FORE*CGDI			0.002** (2.27)				0.168*** (3.43)				0.017 (0.36)	
PCT_FORE			0.074 (1.56)				0.116 (1.43)				0.719 (0.38)	
PCT_DIRE*CGDI				0.079 (1.52)				0.179 (1.31)				0.065 (0.12)
PCT_DIRE				-0.327 (-0.53)				-0.106 (-1.41)				-0.544 (-0.02)
Bank-level controls												
BSIZE	0.948*** (2.98)	0.562* (1.90)	0.720* (1.86)	0.658** (1.95)	0.617** (2.52)	0.803*** (3.76)	0.502*** (3.50)	0.731*** (2.61)	0.224** (2.35)	0.370* (1.75)	0.344 (1.48)	0.830* (1.70)
BGEN	0.607** (2.21)	0.479** (2.15)	0.489** (2.04)	0.481** (2.15)	0.907** (2.48)	0.959* (1.67)	0.896* (1.85)	0.857** (2.37)	0.913** (2.02)	0.620 (1.02)	0.550* (1.80)	0.472** (2.02)
FSIZE	-0.276* (-1.83)	-0.807 (-1.44)	-0.645 (-0.43)	-0.241* (-1.89)	-0.527* (-1.84)	-0.341* (-1.70)	-0.310* (-1.82)	-0.299* (-1.72)	-0.223* (-1.74)	-0.968* (-1.95)	-0.299* (-1.71)	-0.748 (-0.51)
LEV	4.060*** (4.75)	3.711*** (2.82)	2.591*** (3.76)	2.238*** (2.84)	4.456** (2.24)	4.817*** (3.29)	2.331*** (3.25)	2.265** (2.26)	0.042* (1.67)	0.493 (0.70)	0.650 (0.57)	0.757 (0.64)
AGE	-1.565*** (-3.66)	-2.711*** (-3.82)	-0.945*** (-2.66)	-0.352*** (-2.84)	-2.060*** (-2.67)	-0.439*** (-2.71)	-0.876*** (-2.74)	-0.501*** (-2.68)	-0.696** (-2.46)	-0.957* (-1.85)	-0.357 (-0.53)	-0.884* (-1.80)
CAP	-2.145*** (-4.01)	-2.210*** (-3.05)	-2.720*** (-3.32)	-2.586** (-2.14)	-1.365** (-2.91)	-1.571* (-1.92)	-1.869** (-1.94)	-1.579** (-2.00)	-1.837* (-1.84)	-2.053* (-1.77)	-2.082 (-1.55)	-0.678 (-0.27)

BIG4	0.588*	0.724	0.780	0.219	0.552	0.827	0.719	0.764	0.589	0.454	0.600	0.587
	(1.77)	(0.17)	(0.19)	(0.27)	(0.12)	(0.11)	(0.14)	(0.06)	(0.29)	(0.23)	(0.30)	(0.44)
R&D	0.846*	0.831*	0.309*	0.537*	0.453***	0.662**	0.570***	0.945**	0.869**	0.591*	0.735**	0.401**
	(1.84)	(1.71)	(1.87)	(1.85)	(3.33)	(2.16)	(3.28)	(2.44)	(2.39)	(1.80)	(2.43)	(2.37)
ROA	-1.644	-0.983	-0.428	-0.545	-2.266***	-0.407	-0.781	-0.389	-0.557	-0.830	-0.146	-0.342
	(-1.18)	(-1.17)	(-1.15)	(-1.20)	(-3.99)	(-0.97)	(-0.96)	(-0.97)	(-0.10)	(-0.09)	(-0.10)	(-0.11)
ROE	-1.815	-0.502	-0.091	-0.535	-0.177*	-0.531*	-0.147*	-0.603*	-0.776	-0.438	-0.170	-0.523
	(-1.10)	(-0.08)	(-0.13)	(-0.09)	(-1.65)	(-1.66)	(-1.65)	(-1.72)	(-0.11)	(-0.05)	(-0.10)	(-0.11)
Country-level controls												
GDP	0.571	0.560	0.762	0.552	0.423	0.893	0.506**	0.559	0.523	0.468	0.573	0.332
	(1.23)	(1.10)	(0.15)	(0.13)	(1.36)	(1.32)	(2.37)	(0.37)	(0.42)	(0.33)	(0.45)	(0.42)
INFL	-0.284	-0.561	-0.458	-0.472	-0.545*	-0.930	-0.448	-0.751	-0.247	-0.479	-0.742	-0.330
	(-1.41)	(-0.52)	(-0.55)	(-0.48)	(-1.92)	(-0.58)	(-0.56)	(-0.24)	(-0.15)	(-0.18)	(-0.20)	(-0.15)
Constant	5.267***	3.666***	5.783***	3.791**	3.806***	3.504***	4.633***	3.707***	4.872**	2.657*	2.756*	2.044*
	(4.96)	(6.99)	(7.25)	(7.28)	(3.45)	(3.52)	(3.34)	(3.57)	(2.22)	(1.93)	(1.75)	(1.76)
Year & country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	2722	2722	2722	2722	1658	1658	1658	1658	1102	1102	1102	1102
R-squared	0.61	0.54	0.57	0.59	0.55	0.60	0.54	0.62	0.53	0.47	0.50	0.48
F-value	55.74	29.17	25.74	36.17	30.09	28.91	27.20	33.80	24.68	23.39	29.30	34.75

Notes: All the variables used are fully defined in Table 2. t-statistics estimated using robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Table 8. Additional analysis: corporate governance disclosure, bank ownership structures and bank-based climate change initiatives in different periods

Additional analysis	SDGs (2015-2022)					PRE-SDGs (2007-2014)				
Panel A: Impacts of CGDI and BOS on BCCI	BCCI (1)	BCCI (2)	BCCI (3)	BCCI (4)	BCCI (5)	BCCI (6)	BCCI (7)	BCCI (8)	BCCI (9)	BCCI (10)
CGDI	0.030*** (5.86)					0.002 (1.64)				
PCT_INST	0.119** (2.64)					0.014 (0.65)				
PCT_GOVE	-0.011** (-2.03)					-0.104 (-1.43)				
P.CT_FORE	0.038** (2.42)					0.028 (1.41)				
PCT_DIRE	-0.014 (0.37)					-0.029 (0.49)				
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year & country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1473	1473	1473	1473	1473	1312	1312	1312	1312	1312
R-squared	0.58	0.45	0.52	0.53	0.51	0.52	0.48	0.44	0.32	0.33
Panel B: Impacts of CGDI and BOS on BICCI										
	BICCI (1)	BICCI (2)	BICCI (3)	BICCI (4)	BICCI (5)	BICCI (6)	BICCI (7)	BICCI (8)	BICCI (9)	BICCI (10)
CGDI	0.047*** (4.65)					0.015 (1.56)				
PCT_INST	0.420* (1.79)					0.013 (1.08)				
PCT_GOVE	-0.296 (-1.48)					-0.079 (-0.67)				
PCT_FORE	0.837** (2.00)					0.030 (1.44)				
PCT_DIRE	-0.439 (-1.42)					-0.248 (-0.26)				

Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year & country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1468	1468	1468	1468	1468	1254	1254	1254	1254	1254
R-squared	0.68	0.57	0.58	0.65	0.40	0.59	0.43	0.31	0.29	0.36

Notes: All the variables used are fully defined in Table 2. t-statistics estimated using robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Table 9. Additional analysis: corporate governance disclosure, bank ownership structures and bank-based climate change initiatives in different periods

Additional analysis	SDGs (2015-2022)				PRE-SDGs (2007-2014)			
Panel A: Impact of CGI on BOS-BCCI nexus	BCCI (1)	BCCI (2)	BCCI (3)	BCCI (4)	BCCI (5)	BCCI (6)	BCCI (7)	BCCI (8)
CGDI	0.112 (1.54)	0.022**(2.29)	0.225* (1.72)	0.018**(2.21)	0.013 (1.21)	0.030* (1.77)	0.044 (1.02)	0.030* (1.73)
PCT_INST*CGDI	0.665 *** (4.20)				0.001 (0.98)			
PCT_INST	0.078* (1.72)				0.030 (0.97)			
PCT_GOVE*CGDI		0.026* (1.73)				0.001 (0.54)		
PCT_GOVE		-0.185(-0.55)				-0.003 (-0.42)		
PCT_FORE*CGDI			0.005** (2.18)				0.001(0.60)	
PCT_FORE			0.325** (2.20)				0.006 (0.59)	
PCT_DIRE*CGI				0.003 (1.05)				0.001 (0.18)
PCT_DIRE				-0.007 (1.46)				0.002 (0.02)
Controls & dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1473	1473	1473	1473	1312	1312	1312	1312
R-squared	0.52	0.55	0.35	0.34	0.42	0.35	0.37	0.34
Panel A: Impact of CGI on BOS-BICCI nexus	BICCI (1)	BICCI (2)	BICCI (3)	BICCI (4)	BICCI (5)	BICCI (6)	BICCI (7)	BICCI (8)
CGDI	0.638** (2.26)	0.399* (1.84)	0.378* (1.72)	0.615 (1.54)	0.169** (2.06)	0.937** (2.15)	0.234* (1.66)	0.714** (2.85)
PCT_INST*CGDI	0.270*** (2.06)				0.006 (1.37)			
PCT_GOVE	0.145 (0.06)				0.339 (0.34)			
PCT_GOVE*CGDI		0.542** (2.41)				0.221 (1.13)		
PCT_GOVE		0.512 (1.22)				0.229 (1.64)		

PCT_FORE*CGDI			0.044** (2.07)				0.020 (1.33)	
PCT_FORE			0.928 (1.08)				0.825 (1.32)	
PCT_DIRE*CGDI				0.015 (1.01)				0.054 (0.59)
PCT_DIRE				-0.394 (-0.04)				-0.131 (-0.58)
Controls and dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1468	1468	1468	1468	1254	1254	1254	1254
R-squared	35.74	27.12	25.94	32.51	30.42	0.41	0.38	0.34

Notes: All the variables used are fully defined in Table 2. t-statistics estimated using robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Table 10. Impact of corporate governance disclosure and bank ownership structures on bank-based climate change initiatives- addressing endogeneity, GMM

Dep. variable Model	BCCI (1)	BCCI (2)	BCCI (3)	BCCI (4)	BICCI (5)	BICCI (6)	BICCI (7)	BICCI (8)
Indep. variables								
PCT_INST	0.003** (2.22)				0.412** (2.07)			
PCT_GOVE		-0.041** (-2.37)				-0.205 (-0.26)		
PCT_FORE			0.053** (2.38)				0.497* (1.89)	
PCT_DIRE				-0.408 (-1.20)				-0.225 (-1.38)
Bank-level controls								
BSIZE	0.417*** (2.34)	0.414*** (2.74)	0.238*** (2.73)	0.208*** (2.66)	0.926* (1.64)	0.132* (1.82)	0.207** (2.18)	0.187* (1.73)
BGEN	0.078** (2.24)	0.037*** (3.35)	0.121*** (2.94)	0.109*** (3.57)	0.155** (2.37)	0.421** (2.62)	0.382** (2.25)	0.448** (2.16)
FSIZE	-0.030** (-2.18)	-0.116* (-1.76)	-0.635 (-1.40)	-0.013* (-0.04)	-0.765* (-2.03)	-0.984 (-1.25)	-0.517* (-1.68)	-0.251 (-0.68)
LEV	5.492** (2.18)	3.685* (1.89)	4.370 (1.61)	3.619* (1.71)	2.265** (2.76)	2.576** (2.54)	2.220** (2.16)	0.082* (1.83)
AGE	-2.276** (-2.19)	-2.754** (-2.40)	-2.118*** (-3.16)	-2.041*** (-2.97)	-2.642** (-2.00)	-0.554** (-2.02)	-0.710** (-2.55)	-0.394** (-2.41)
CAP	-3.900** (-3.25)	-2.208** (-2.18)	-4.476** (-2.74)	-2.653** (-2.26)	-2.764** (-2.41)	-2.367*** (-2.68)	-1.372* (-1.96)	-1.925* (-1.80)
BIG4	1.184 (1.04)	0.941 (0.85)	0.185 (1.05)	0.584 (1.76)	0.447 (1.31)	0.306 (0.34)	0.508 (0.92)	0.477 (1.03)
R&D	0.286** (2.48)	0.395* (1.89)	0.356** (2.52)	0.875* (1.60)	0.613** (2.43)	0.617 (1.04)	0.709** (2.43)	0.599** (2.86)
ROA	-2.006* (-1.74)	-1.631 (-0.71)	-1.509* (-1.67)	-0.157** (-2.12)	-0.337 (-1.17)	-0.804 (-1.57)	-0.414 (-1.32)	-0.719 (-1.56)
ROE	-0.514 (-0.33)	-0.492 (-0.68)	-0.083 (-0.78)	-0.708 (-1.04)	-0.463 (-0.82)	-0.787 (-0.95)	-0.756 (-0.60)	-0.524 (-1.20)
Country-level controls								
GDP	0.591 (1.51)	0.579 (1.10)	0.656 (1.07)	0.397 (0.93)	0.649 (1.06)	0.678 (1.13)	0.150 (1.29)	0.082 (0.98)
INFL	-0.345 (-0.67)	-0.304 (-1.13)	-0.699 (-1.61)	-0.495 (-1.21)	-0.837 (-0.08)	-0.228 (-0.32)	-0.890 (-0.03)	-0.384 (-0.79)
Constant	2.658***	3.419***	4.504**	3.496***	4.688***	4.134***	1.480**	0.547**

	(4.61)	(4.45)	(2.07)	(2.69)	(4.70)	(3.29)	(2.10)	(2.12)
Year & country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	2785	2785	2785	2785	2722	2722	2722	2722
R-squared	0.54	0.50	0.52	0.50	0.58	0.53	0.47	0.42
AR1	0.002	0.008	0.004	0.007	0.001	0.051	0.004	0.008
AR2	0.320	0.247	0.380	0.284	0.430	0.187	0.220	0.401
Hansen J (Prob)	0.542	0.420	0.571	0.439	0.581	0.320	0.542	0.523

Notes: All the variables used are fully defined in Table 2. t-statistics estimated using robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Table 11. Moderating effect of corporate governance disclosure on the link between bank ownership structures and bank-based climate change initiatives- addressing endogeneity, GMM

Type of analysis	Main sample				Banks with high CG mechanisms				Banks with low CG mechanisms			
Dep. Variable	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI	BCCI
Model	(1)	(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Indep. Variables												
CGDI	0.012* (1.80)	0.022* (1.71)	0.047* (1.84)	0.089 (1.27)	0.052* (1.81)	0.024* (1.75)	0.061 (1.52)	0.085 (1.40)	0.091 (1.03)	0.148* (1.82)	0.125 (1.60)	0.132* (1.83)
PCT_INST*CGDI	0.511** (2.04)				0.720*** (3.04)				0.011* (1.83)			
PCT_INST	0.329 (1.05)				0.513 (1.54)				0.352* (1.67)			
PCT_GOVE*CGDI		0.015* (1.87)				0.320** (2.47)				0.024 (0.45)		
PCT_GOVE		-0.032 (-0.57)				-0.221 (-0.90)				-0.070 (-0.55)		
PCT_FORE*CGDI			0.327** (2.51)				0.732*** (4.20)				0.042* (1.79)	
PCT_FORE			0.042 (0.70)				0.262 (1.08)				0.032 (0.78)	
PCT_DIRE*CGI				0.208 (1.53)				0.354 (1.40)				0.004 (0.07)
PCT_DIRE				-0.012 (-1.46)				-0.487 (-1.29)				-0.025 (-0.09)
Bank-level controls												
BSIZE	0.504*** (2.98)	0.543*** (3.31)	0.494*** (2.87)	0.385** (2.24)	0.487*** (3.52)	0.519*** (3.36)	0.254** (2.43)	0.361** (2.37)	0.425** (2.47)	0.581** (2.55)	0.652** (2.20)	0.422** (2.41)
BGEN	0.248*** (3.45)	0.234** (2.50)	0.250*** (3.32)	0.251*** (3.40)	0.450** (2.51)	0.523** (2.46)	0.645** (2.22)	0.554** (1.98)	0.243** (2.01)	0.324** (2.20)	0.253*** (3.00)	0.238*** (3.27)
FSIZE	-0.082* (-1.82)	-0.354* (-1.80)	-0.208** (-2.14)	-0.173 (-1.45)	-0.187 (-1.51)	-0.075 (-1.62)	-0.089 (-1.01)	-0.025* (-1.86)	-0.714* (-1.82)	-0.871** (-2.09)	-0.820** (-2.28)	-0.400** (-1.97)
LEV	4.10* (1.78)	4.237* (1.82)	4.186* (1.77)	5.850* (1.82)	5.45*** (3.04)	4.220** (2.52)	4.521*** (3.04)	4.504*** (3.47)	2.420 (0.54)	1.311 (0.68)	3.524 (0.71)	0.204 (0.52)
AGE	-3.220*** (-2.94)	-3.186*** (-3.51)	-2.983*** (-3.67)	-2.354*** (-3.86)	-2.405*** (-2.96)	-2.582** (-2.53)	-2.421** (-2.34)	-4.205*** (-3.17)	-3.180* (-1.92)	-1.874 (-0.71)	-1.245 (-0.92)	-1.204 (-0.87)
CAP	-2.137** (-1.98)	-2.981** (-2.42)	-3.254** (-2.51)	-4.524** (-2.47)	-4.215*** (-3.48)	-2.458*** (-3.56)	-2.745** (-2.34)	-3.540** (-2.44)	-3.11 (-1.27)	-1.570* (-1.83)	-1.754 (-1.27)	-1.818 (-1.43)
BIG4	1.182 (1.07)	1.158 (1.19)	1.243 (1.46)	1.152 (1.01)	1.140 (1.31)	0.802 (1.56)	0.680 (1.33)	0.841 (1.09)	0.686 (1.17)	0.824 (1.13)	0.421 (1.33)	0.457 (1.90)
R&D	0.528**	0.582**	0.504**	0.724**	0.602***	0.824***	0.561***	0.879***	0.714**	0.251**	0.542**	0.358**

ROA	(2.44) -1.850** (-2.07)	(2.45) -1.961** (-2.14)	(2.37) -1.740** (-2.57)	(1.98) -1.602** (-2.10)	(2.87) -3.405*** (-3.22)	(3.70) -1.879 (-1.45)	(3.79) -2.524 (-1.20)	(4.52) -2.580 (-0.70)	(2.43) -2.411* (-1.85)	(2.02) -2.523** (-2.14)	(2.45) -2.524** (-2.23)	(2.30) -1.281** (-2.34)
ROE	-0.095 (-0.52)	-0.042 (-0.23)	-0.059 (-0.54)	-0.241 (-0.39)	-0.802 (-0.57)	-1.523 (-1.02)	-0.568 (-1.41)	-1.384 (-1.53)	-0.821 (-0.74)	-0.435 (-0.42)	-0.585 (-0.40)	-0.250 (-0.71)
Country-level controls												
GDP	0.598 (1.17)	0.298 (1.10)	0.327 (1.14)	0.584 (1.60)	0.726** (2.21)	0.854** (2.04)	0.605** (2.51)	0.742** (2.40)	0.580 (0.71)	0.420 (0.81)	0.300 (0.79)	0.524 (0.32)
INFL	-0.432 (-1.24)	-0.432 (-1.27)	-0.508 (-1.19)	-0.511 (-1.35)	-0.560 (-1.61)	-0.172 (-0.65)	-0.250 (-0.32)	-0.342 (-0.55)	-0.437 (-1.10)	-0.351 (-1.53)	-0.754 (-1.92)	-0.478 (-1.14)
Constant	4.364*** (4.35)	5.246*** (4.21)	4.074*** (4.56)	4.082*** (2.95)	3.257*** (3.41)	4.920*** (4.87)	2.952** (2.44)	4.805*** (3.52)	3.224*** (4.20)	4.278*** (4.23)	3.532*** (4.18)	3.540*** (4.22)
Year & country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	2785	2785	2785	2785	2722	2722	2722	2722	2722	2722	2722	2722
R-squared	0.64	0.52	0.57	0.55	0.51	0.37	0.45	0.50	0.43	0.38	0.52	0.50
AR1	0.002	0.024	0.008	0.012	0.008	0.007	0.031	0.007	0.025	0.003	0.009	0.001
AR2	0.254	0.381	0.423	0.354	0.421	0.382	0.452	0.241	0.324	0.487	0.187	0.325
Hansen J (Prob)	0.481	0.542	0.501	0.618	0.537	0.416	0.527	0.650	0.571	0.620	0.574	0.467

Notes: All the variables used are fully defined in Table 2. t-statistics estimated using robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Table 12: Comparison with related studies

Study	Method	Results and findings
Cheng et al. (2022)	Fixed-effects regression model	There is a negative relationship between institutional ownership and the level of CSR.
McGuinness et al. (2017)	Lag panel regression model	Foreign ownership has positive impact on CSR performance
Ntim & Soobaroyen (2013a)	Fixed-effects regression model	The study observed that institutional ownership is associated with increased CSR, whilst government ownership is linked with decreased CSR.
Haji (2013)	Multiple regression analyses	Firms in which directors have a substantial proportion of shares disclose significantly less CSR information.
Dam & Scholtens (2012)	Ordinary least squares	Institutional and government ownership have no influence on CSR.
Oh et al. (2011)	Ordinary least squares	Find that foreign investors are associated with an increase in CSR ratings. The study also observe that shareholding by top managers is negatively associated with CSR rating of firms, while outside director ownership has no influence of CSR ratings.
Ghazali (2007)	Multiple regression analysis	Find that firms in which directors have a substantial proportion of shares disclose significantly less CSR information.
This study	Fixed-effects regression and dynamic two-step system GMM	We observe that corporate governance disclosure index (CGDI) is positively associated with bank climate change initiatives (BCCIs). We find that ownership by institutional and foreign investors is associated with increased BCCIs. By contrast, government ownership is negatively associated with BCCIs, whereas the holdings by directors of the banks appear to be neutral in this relationship. We also find that a combination of CGDI and bank ownership structures has a stronger positive effect on BCCIs than BOS alone, with the moderating effect improving in banks with high CGDI score, implying that CGDI positively influences the bank ownership structures-BCCIs nexus.

Appendix A. Assessment scales for bank-based climate change initiatives

General issues	Specific issues
Commitment to emission reduction	1. Does the bank have a policy to enhance emission reduction? 2. Has the company set targets or objectives to be achieved on emission reduction? 3. Does the bank report on its effect 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 bank report on initiatives to reduce, reuse, recycle, substitute, or phase out SO_x (sulfur oxides) or NO_x (nitrogen oxides) emissions? 5. Does the bank report on initiatives to reduce, substitute, or phase out volatile organic compounds? 6. Does the bank report on initiatives to recycle, reduce, reuse, substitute, treat or phase out total waste? 7. Does the bank report on initiatives to reduce, substitute, or phase out particulate matter less than ten microns in diameter? 8. Does the bank report on initiatives to recycle, reduce, reuse, substitute, treat or phase out e-waste? 9. Does the bank have a policy for reducing the use of natural resources or to lessen the environmental impact of its supply chain?
Commitment to improve energy/resource efficiency	10. Does the bank have a policy to improve its water efficiency? 11. Does the bank have a policy to improve its energy efficiency? 12. Does the bank have a policy to improve its use of sustainable packaging? 13. Does the bank set specific objectives to be achieved on resource efficiency? 14. Has the bank set targets or objectives to be achieved on water efficiency? 15. Has the bank set targets or objectives to be achieved on energy efficiency? 16. Does the bank make use of renewable energy? 17. Does the bank report about environmentally friendly or green sites or offices?
Product and service improvement	18. Does the bank 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 bank report on specific products which are designed for reuse, recycling or the reduction of environmental impacts? 20. Does the bank develop new products that are marketed as reducing noise emissions? 21. Does the bank develop products and services that improve the energy efficiency of buildings?

22. Does the bank 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?
23. Is the bank aware that climate change can represent commercial risks and/or opportunities?
24. Does the bank report about product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use?

Process and supply improvement

25. Does the bank use environmental criteria (ISO 14000, energy consumption, etc.) in the selection process of its suppliers or sourcing partners?
26. Does the bank conduct surveys of the environmental performance of its suppliers?
27. Does the bank report or show to be ready to end a partnership with a sourcing partner, if environmental criteria are not met?
28. Does the bank have a policy to include its supply chain in the company's efforts to lessen its overall environmental impact?

Organizational involvement/Environmental management

29. Does the bank have an environmental management team?
30. Does the bank train its employees on environmental issues?

Initiatives and practices/organizational involvement

31. Does the bank report or provide information on company-generated initiatives to restore the environment?
32. Does the bank report on initiatives to reduce the environmental impact on land owned, leased or managed for production activities or extractive use?
33. Does the bank report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances?

Research and development

34. Does the bank 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 bank develop products or technologies that are used for water treatment, purification or that improve water use efficiency?

- 36. Does the bank report on its environmental expenditures?
- 37. Does the bank report on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities?

Carbon pricing and trading

- 38. Does the bank have an internal price on carbon?
- 39. Does the bank report on its participation in any emissions trading initiative?

External relationship

- 40. Does the bank report on partnerships or initiatives with specialized NGOs, industry organizations, governmental or supra-governmental organizations, which are focused on improving environmental issues?

Source: Based on global climate change initiatives as applied by Orazalin et al. (2023)

Appendix B: Corporate governance disclosure index scoring method

Corporate governance disclosures (CG) index			
CG theme	CG item: information on or reference to	Range of scores	Total score per theme
	Director and board disclosures		
(i) Director and board	1. In case the roles of chairperson and MD/ CEO are split is disclosed	0-1	43
	2. Whether the chairperson of the board is an independent, non-executive director	0-1	
	3. If majority of non-executive directors (NEDs) constitute the board of the bank	0-1	
	4. Does the board meet at least four times in a year	0-1	
	5. Does the bank disclose records of individual directors' meetings	0-1	
	6. Whether the responsibilities of the board of directors is disclosed	0-1	
	7. Classification of board of directors into executive, NED, and independent	0-1	
	8. Disclosure of the performance of the chairperson	0-1	
	9. Disclosure of the effectiveness and performance of the CEO/MD	0-1	
	10. Disclosure of the board's performance and effectiveness.	0-1	
	11. Disclosure of directors' biography, experience and responsibilities	0-1	
	12. Disclosure of a narrative with regards to a policy on the issue of diversity of the board	0-1	
	13. Disclosure of the position of a company secretary filled by a competent person	0-1	
	14. Disclosure of the performance of the company's secretary	0-1	
	15. As to whether directors have access to free independent professional legal advice	0-1	
	16. Narrative relating to induction, training and personal development of directors.	0-1	
	17. Whether the size of the board in terms of number is disclosed	0-1	
	18. Disclosure of the performance of individual board members	0-1	
	19. Narrative on board charter, leadership duties and roles	0-1	
	20. Disclosure of policy on staggered appointment and rotation of directors	0-1	
	21. Disclosure of policy on multiple and alternate directorship of board members	0-1	
	22. Disclosure on board independence, skills, experience and knowledge of the bank	0-1	
	23. If the bank has established remuneration committee	0-1	
	24. If the remuneration committee is made up of independent NEDs	0-1	
	25. If the chairperson of the remuneration committee is an independent NED	0-1	
	26. Disclosure of the remit of the remuneration committee	0-1	
	27. Disclosure of the performance of the remuneration committee	0-1	
	28. Disclosure of the membership of the remuneration committee	0-1	
	29. If the remuneration committee meets at least four times in a year	0-1	
	30. Disclosure of the establishment of nomination committee	0-1	
	31. If the nomination committee is made up of majority of independent NEDs is disclosed	0-1	
	32. As to whether the remit of the nomination committee and performance is disclosed.	0-1	
	33. Whether the nomination committee chairperson is an independent member is disclosed	0-1	
	34. Whether the membership of the nomination committee of the board is disclosed	0-1	
	35. Disclosure meeting attendance records of members of the nomination committee	0-1	
	36. As to whether nomination committee meets at least four times in a year is disclosed	0-1	
	37. Disclosure relating to the issue of technological failure and breakdown	0-1	
	38. Whether share ownership by directors and officers is less than 50% of the total bank shareholdings	0-1	
	39. Whether the performance of all board sub committees' performance and effectiveness is disclosed	0-1	
	40. Whether there is a board statement on the going-concern status of the bank is disclosed	0-1	
	41. Whether directors who hold directorships in other companies is disclosed	0-1	
	42. Whether directors made statements regarding internal controls is disclosed	0-1	

	43. Whether a narrative s relating to directors review of internal controls privately with auditors	0-1	
	Accounting, auditing and transparency disclosures		
(ii) Accounting, auditing and transparency	44. Disclosure of the performance and evaluation of the audit committee	0-1	22
	45. As to whether an audit committee has been established	0-1	
	46. As to if the audit committee is made up of at least three independent NEDs	0-1	
	47. As to whether the chairperson of the audit committee is an independent NED	0-1	
	48. Disclosure of the remit of the audit committee	0-1	
	49. Disclosure of the membership of the audit committee	0-1	
	50. Disclosure of the audit committee members meeting attendance record	0-1	
	51. At least one member of the audit committee has relevant financial training and experience	0-1	
	52. Disclosure of the performance of the individual members of the audit committee	0-1	
	53. Disclosure of director's remuneration, interests, and share options	0-1	
	54. Disclosure of directors' philosophy and procedure	0-1	
	55. Disclosure of a policy on timely and balanced information concerning the bank	0-1	
	56. Disclosure of evaluation of risk management and governance of internal control and audit system	0-1	
	57. Disclosure of a policy on risk management and governance strategy	0-1	
	58. As to whether the audit committee meets at least four times in a year	0-1	
	59. Disclosure of related party transactions or offers such as subsidiaries	0-1	
	60. Policy to inhibits insider share trade before announcement of price sensitive information	0-1	
	61. Existence of policies for appointing and disengaging external auditors	0-1	
	62. Disclosure of annual financial performance of the bank	0-1	
	63. Disclosure of policy on staggered appointment and rotation of directors	0-1	
	64. Disclosure relating to the review of corporate operations	0-1	
	65. Whether a narration relating to audit committees full access to information is disclosed	0-1	
	Risk management, internal audit and control disclosures		
(iii) Risk management, internal audit and control disclosures	66. As to if a risk management committee has been established	0-1	13
	67. Disclosure of the remit of the risk committee	0-1	
	68. As to whether there is a disclosure of risk committee members' meeting attendance	0-1	
	69. Disclosure of the membership of the risk committee	0-1	
	70. As to whether risk management committee meets at least four times a year	0-1	
	71. Disclosure of future systematic and non- systematic risk	0-1	
	72. Disclosure of an existing internal systems	0-1	
	73. Disclosure of how current and future evaluated bank risk will be managed	0-1	
	74. Disclosure on issues relating to IT	0-1	
	75. Disclosure on issues with regards to management and governance	0-1	
	76. Disclosure relating to risk management, governance strategy and policy	0-1	
	77. Disclosure on issues with regards to internal control and audit systems	0-1	
	78. If the risk management committee membership is made up of executives and independent directors	0-1	
	Compliance, shareholder rights and enforcement disclosures		
iv) Compliance, shareholder rights and enforcement	79. Disclosure of the existence of one-share-one vote policy	0-1	
	80. Disclosure of on how the bank encourages shareholder activism (proxy vote)	0-1	
	81. Positive statements with regards to compliance with national CG code	0-1	
	82. Disclosure on shareholder right to attend and also vote at annual general meetings	0-1	
	83. Disclosure of how the bank is contributing to the development of financial journalism	0-1	
	84. Disclosure of shareholders 'right to have their views on pay	0-1	
	85. Disclosure of the issue of general compliance	0-6	
	86. Disclosure of the existence of right of shareholders to call extraordinary meetings	0-1	
	87. Disclosure of right of shareholders to have timely information regards to AGM	0-1	

	88. Disclosure of shareholders right to receive annual report, other relevant communications	0-1	22
	89. Shareholders' right to receive dividends and residual income out of liquidation	0-1	
	90. Disclosure of a narrative with respect to equal treatment of all shareholders	0-1	
	91. Disclosure of the use of modern ways of communication	0-1	
	92. Narrative with regards to shareholders' right to transfer and registration of share ownership	0-1	
	93. Disclosure of provisions of corporate governance	0-1	
	94. Whether a narrative that indicates that the the board is accountable to shareholders is disclosed	0-1	
	95. Whether governance committee is established is disclosed	0-1	
	96. Narrative that states that all shareholders have equal access information about the bank is disclosed	0-1	
	97. Narrative indicating that voting responsibility increases with size of shareholding is disclosed	0-1	
	98. Whether there is disclosure of policy to ensure no block persons have unfettered power	0-1	
	99. Narrative relating to communication among shareholders and other stakeholders is disclosed	0-1	
	100. Narrative relating to policy on how the bank should relate with internal and external stakeholders	0-1	