

Climate Change Initiatives, Environmental Management Training, and Firm Performance: The Trickle-Down Effect of Board-Level Gender Diversity on Gender Diversity in the top Management Team

Mushtaq Hussain Khan[†]

Cardiff School of Management,
Cardiff Metropolitan University, Cardiff, UK
mkhan3@cardiffmet.ac.uk

Inam Ul Haq

Léonard de Vinci Pôle Universitaire, Research Center,
92 916 Paris La Défense, France
Ph: +33748113425
Inam.ul_haq@devinci.fr

Muhammad Umer Azeem

ESSCA Business School
Lyon, France
Muhammad-umer.azeem@essca.fr

Abdul Ghafoor

Birmingham City Business School, UK
Abdul.ghafoor@bcu.ac.uk

Abstract

We examine the interrelationships among climate change initiatives, environmental management training, and firm performance while considering the trickle-down effect of board-level gender diversity on gender diversity in the top management team (TMT). Using an unbalanced panel dataset of 117,410 firm-year observations from five regions, representing 11 industries and operating in 71 countries from 2013 to 2022, our findings reveal that climate change initiatives significantly enhance firm performance. Our results further exhibit that the interaction effects of gender diversity at the board and TMT levels (the trickle-down effect) support climate change initiatives by encouraging environmental management training (EMT), thereby improving firm performance. To address the potential endogeneity issues, we employed a two-step system generalized method of moments (GMM) approach. Our empirical results are robust to endogeneity and alternative measures. Overall, our evidence supports the Resource-Based View Theory and Upper Echelon Theory to demonstrate how a diverse TMT and board members can contribute to

more robust climate change strategies by using EMT as a resource to achieve performance objectives. Hence, we make important contributions to the corporate governance and environmentalism strands of the literature by highlighting the role of gender in shaping climate change initiatives and influencing firm performance.

Keywords: Climate change initiatives; Environmental management training; Firm performance; Gender diversity; Trickle-down effect

1. Introduction

Climate change has been declared a significant challenge of our era, necessitating sustainable economic, political, and corporate practices ([Darus et al., 2020](#)). Climate change-induced environmental devastation has grabbed the attention of scholars, professionals, governments, and regulators in recent years ([Ardia et al., 2023](#)). However, the problem's magnitude, causes, and potential solutions are the subject of disagreement among stakeholders. The disagreement is due to the extensive efforts required to integrate sustainability practices with organizational strategic goals ([Danso et al., 2019](#)). These differences have led to strong preferences for sustainable solutions and investments to address the climate change issue among some organizations, while others remain oblivious to its impact ([Ardia et al., 2023](#); [Orazalin et al., 2024](#)).

Organizations with a strong preference for sustainable practices acknowledge the current global climate decline due to the diminution of natural resources and the increase in greenhouse gas (GHG) emissions ([Ben-Amar et al., 2017](#)). These emissions harm the environment, socioeconomic systems, and planet life ([Caby, Ziane, & Coron, 2022](#)). To tackle the problem, worldwide organizations and various governments have implemented several policies and procedures ([Veldman, 2023](#)). European Green Deal, Emissions Trading Systems (ETS), Kyoto Protocol (2007),

Paris Agreement (2015), and other similar policies are approved to ease the effects of climate change ([Ardia et al., 2023](#)). By reducing greenhouse gas emissions, promoting renewable energy, and encouraging sustainable practices, these regulations aim to balance the effects of climate change ([Orazalin et al., 2024](#)). At the same time, there are numerous expectations from investors toward organizations to address climate change issues by disclosing their ESG score and relevant initiatives to decrease their GHG emissions and fossil fuel consumption ([Darus et al., 2020](#)). Contemporary environmental studies increasingly focus on the factors that connect these initiatives with firm performance ([Khatib et al., 2023](#)).

Climate change initiatives taken by the organization are publicized through its media channels, such as websites, press releases, sustainability reports, and annual reports ([Orazalin et al., 2024](#)). These publications reflect the outcomes of the implementation of organizational climate change practices and its influence on the firm's sustainability performance ([Chong et al., 2018](#); [Khatib & Al Amosh, 2023](#)) and global ecological benefits ([Darus et al., 2020](#)). Moreover, by adopting green practices, the market share and profitability can be aligned with the sustainability and performance goals ([Afum et al., 2021](#)). The organizations prioritizing sustainability practices tend to outperform those that do not, indicating a clear link between sustainability and performance ([Khatib et al., 2023](#); [Mattera & Alba Ruiz-Morales, 2021](#)). Nevertheless, certain factors, such as gender diversity of management teams ([Ben-Amar & McIlkenny, 2015](#)), board members ([Chen et al., 2019](#)), and environmental management training (EMT) ([Khatib & Al Amosh, 2023](#)) enhance management effectiveness and promotes the adoption of sustainability initiatives.

Tackling carbon emissions and achieving a high ESG score has become the organizations' top priority, as indicated by the extent of studies conducted in this domain ([Ardia et al., 2023](#); [Khatib & Al Amosh, 2023](#)). The majority of the prior studies addressing sustainability concerns are focused on the impact of diversity on the disclosure side of the ESG performance of the firm and resulted in non-conclusive mixed findings ([Ben-Amar & McIlkenny, 2015](#); [Prado-Lorenzo & Garcia-Sanchez, 2010](#); [Tingbani et al., 2020](#)). By focusing too much on carbon emission and its disclosure, scholars give limited attention to ascertaining the determinants of carbon performance ([Ben-Amar et al., 2017](#); [Khatib & Al Amosh, 2023](#)). There exists no decisive consensus on the impact of diversity on governance, and studies exploring the influence made by the diversity of management teams ([Caby, Ziane, & Coron, 2022](#); [Issa & In'airat, 2024](#)) and its impact on the actual climate change initiatives

taken by the organization are scarce ([Ben-Amar et al., 2017](#); [Orazalin et al., 2024](#)), and waste management ([Gull et al., 2023](#)). The relationship between a top management team (TMT) and its board of directors requires examining how diversity at these two levels affects results through interactive effects ([Abidin et al., 2022](#)). Moreover, the role of EMT on overall firm performance has been explored in only a few studies ([Jabbour, 2015](#); [Khatib et al., 2023](#)) but needs additional research evidence to associate environmental training with a firm's performance ([Khatib & Al Amosh, 2023](#); [Khatib et al., 2023](#); [Singh et al., 2019](#)). The current study acknowledges the research gap pointed out by ([Caby, Ziane, & Coron, 2022](#); [Issa & In'airat, 2024](#); [Khatib et al., 2023](#); [Orazalin et al., 2024](#)) to explore the impact of diversity both at the top management team and board level along with the role of EMT on the sustainability initiatives taken by the organization and its overall performance. Though the studies have established the role of environmental management training on employee performance ([Singh et al., 2019](#)), the influence of EMT on organizations with gender-diverse board members and TMT remains unknown.

Team diversity is an imperative aspect of governance that is believed to significantly improve overall company performance ([Caby, Ziane, & Coron, 2022](#); [Havrylyshyn et al., 2023](#); [Tingbani et al., 2020](#)). By striving for gender diversity, the organizations seek to emphasize the contribution of individuals with diverse backgrounds, personality traits, and experiences ([Singh et al., 2019](#)). United Nations Development Program (UNDP) 2030 has also marked gender equality as its priority for achieving sustainable development goals as women exhibit distinct traits and values compared to men ([Ardia et al., 2023](#); [Veldman, 2023](#)). Previous studies have primarily investigated the influence of gender diversity on organizational outcomes, specifically within board compositions, and less attention is paid to its influence on managerial or top management teams ([Caby, Ziane, & Coron, 2022](#); [Lu et al., 2022](#)). A significant number of studies examine board gender diversity, as some countries, such as France, have enacted mandatory measures requiring companies to improve the representation of women on their boards ([Issa & Hanaysha, 2023](#); [Veldman, 2023](#)). Similarly, The European Commission has advocated a binding minimum quota of 30% for female board members by 2015, increasing to 40% by 2020 ([Veldman, 2023](#)). However, the findings are inconsistent, particularly concerning the impact of having women board members on organizational success ([Abdullah et al., 2016](#); [Dang & Nguyen, 2016](#); [Rixom et al., 2023](#)).

Research indicates that having a gender-diverse workforce gives the organization the knowledge and abilities to address the multifaceted business challenges ([Estélyi & Nisar, 2016](#); [Nekhili et al., 2020](#)). As the TMT has the authority to implement sustainability practices, thus the organizational climate change initiatives are influenced by the composition and diversity of its top management team ([Issa & In'airat, 2024](#)). The advantages of gender diversity in TMT, as highlighted by earlier studies, include enhanced problem-solving abilities, organizational innovation, and board effectiveness, leading to improvements in organizational performance ([Caby, Ziane, & Coron, 2022](#); [Chen et al., 2019](#); [Mungai et al., 2020](#); [Yang et al., 2019](#)). Gender-diverse top management teams express social responsiveness by actively responding to the demands of various investors (Glass et al., 2016; Nuber and Velte, 2021) with their comprehensive sustainability measures within organizations ([Nekhili et al., 2020](#)). According to Upper Echelon Theory, the decision-makers' commitment to climate change initiatives can drive the organization toward sustainable practices ([Mungai et al., 2020](#)). Such committed upper management serves as environmental stewardship and is more likely to allocate resources toward curbing greenhouse gas emissions, adopting eco-friendly energy solutions, and promoting sustainable operations ([Konadu et al., 2022](#)).

Environmental Management Training (EMT) emerged to respond to climate change's compelling socioeconomic and ecological challenges ([Khatib et al., 2023](#)). Acknowledging the lack of education and training in environmental management, the European Environment Agency (EEA) stresses the inevitable need to successfully implement environmental legislation and practices ([Veldman, 2023](#)). The United Nations Framework Convention on Climate Change (UNFCCC) has also emphasized the importance of building local, national, and international capacity building to counter the impact of climate change ([Ardia et al., 2023](#); [Veldman, 2023](#)). EMT equips managers and employees with the skills and information they need to adapt climate change initiatives and proactively deal with the issues of sustainability and carbon efficiency ([Singh et al., 2019](#); [Stefanelli et al., 2020](#)).

As per the Resource-Based View (RBV), EMT can become a reliable resource for organizations to manage and reduce their carbon footprint (Khatib et al., 2023). Through EMT, the organization may incorporate its climate change activities into its core strategy to achieve overall performance and operational efficiencies ([Khatri, 2024](#); [Singh et al., 2019](#)). EMT enhances managerial environmental proactiveness and compliance with climate change initiatives ([Jabbour, 2015](#); [Singh et al., 2019](#)). Research indicates that EMT improves employees' environmental awareness and

adoption of eco-friendly and sustainable alternatives - resulting in more energy conservation ([Jabbour, 2015](#)). It further enables managers to gauge the consequences of their actions on environmental outcomes, prompting them to be more eco-conscious ([Jabbour, 2015](#); [Khatib et al., 2023](#)).

The current study offers several research contributions to the current literature on corporate governance and climate change initiatives. First, while previous studies largely focused on the association between ESG performance, carbon emission disclosure, and financial outcomes ([Khatib et al., 2023](#)), scholars have paid limited attention to the actual climate change initiatives taken by the organization and its overall performance outcomes ([Orazalin et al., 2024](#)). This study explored the impact of climate change initiatives on overall firm performance. Second, only a few previous studies compared the diversity influence on both TMT and board members ([Abidin et al., 2022](#); [Gould et al., 2018](#); [Luanglath et al., 2019](#); [Opstrup & Villadsen, 2015](#)), however, those studies ignored the climate change initiatives. This current study has included gender diversity at both the board and TMT levels as a moderator between climate change initiatives and firm performance and has also indicated how diversity at these levels affects interactive effects. Exploring gender diversity at the TMT and board level presents a comprehensive view of the implications of gender diversity in the organization. Third, the role of EMT as a moderating variable has been explored in the current study to compensate for the lack of research evidence concerning climate change initiatives. The current study offers a unique research contribution that focuses on the context of developed and underdeveloped countries to explore EMT as the determinant of firm performance. The study furthers the insights into the significance of gender-diverse boards and TMT in impacting environmental management training in improving company performance in climate change. Fourth, the current study extends the Resource-Based View (RBV) Theory and Upper Echelon Theory to indicate how diverse TMT and board members can contribute to more comprehensive climate change strategies and implement EMT as a resource for achieving their performance goals. This study has practical and social implications for climate change initiatives, such that policymakers and organizations can ultimately leverage these findings to promote gender diversity and enhance sustainability practices to achieve organizational performance.

This study is organized as follows. Section 2 reviews the literature, hypotheses development and the theoretical framework. Section 3 explains the data and research method. Section 4 presents the results, and Section 5 concludes.

2. Literature review and hypotheses

2.1. Climate change initiatives and firm performance

Climate change within a certain region is defined as a variation in the temperature or the amount of rainfall within a given year ([Darus et al., 2020](#)). The issue of climate change is not isolated for some geographical regions, rather, developed and underdeveloped countries are grappling with climate change concerns ([Ardia et al., 2023](#)). It is no longer a future problem for the protection of species and ecosystems but rather a threat that exists today, and its consequences have sparked much controversy among politicians, economists, activists, and other individuals with a vested interest ([Rawat et al., 2024](#)). Global warming is a direct result of climate change caused by reckless use of fossil fuels, resulting in the emission of greenhouse gases into the atmosphere ([Darus et al., 2020](#); [Rawat et al., 2024](#)). Thus, the problem of climate change has emerged as a pressing and detrimental situation that demands a coordinated policy approach ([Rawat et al., 2024](#)).

Various important initiatives are being implemented to protest the insufficient awareness and comprehension of climate change ([Ardia et al., 2023](#)), such as ESG and carbon emissions disclosure, international agreements setting targets for carbon reduction, and conferences focused on addressing climate change ([Darus et al., 2020](#)). Most of the blame for the emission of GHG is placed on corporations because of their larger-scale operations than individual beings ([Darus et al., 2020](#); [Orazalin et al., 2024](#)). As a result, it has attracted much attention from society, regulatory bodies, and corporations ([Caby, Ziane, & Coron, 2022](#)). Firms are gradually implementing sustainability efforts in their organizational procedures to ensure the integration of sustainable operations in their goods and services ([Darus et al., 2020](#); [Orazalin et al., 2024](#)).

A firm's performance indicates its efficiency and market reputation ([Mungai et al., 2020](#)). For a performance measure to be considered suitable, it must be clearly defined and measurable so that it is communicated across the entire organization and its departments to achieve objectives ([Samuel et al., 2019](#)). However, in management studies, performance is typically seen as a dependent

variable and is also recognized as having several dimensions ([Khatib et al., 2023](#)). Financial and non-financial aspects must be considered to evaluate the firm's performance compared to its competitors ([Mungai et al., 2020](#)). Moreover, to optimize the firm's performance to benefit the stakeholders, it is necessary to fully leverage the resources, capabilities, and knowledge through sustainability efforts ([Ben-Amar et al., 2017](#)).

Organizations undertake several climate change initiatives to mitigate environmental impact, promote sustainability, and enhance eco-friendliness ([Samuel et al., 2019](#)). Examples of these measures include ESG disclosure, reduction in energy consumption, investment in green resources such as increased usage of recyclable resources, and imparting green training to employees ([Arayssi et al., 2020](#)). Barney (2001) states that resources are the relatively immobile bundle of valuable resources that determines the firm performance and has included other firm assets such as eco-friendly strategies and sustainability practices. The distinctive competencies (e.g., environmentally-conscious corporate culture) and capabilities (e.g., environmental control systems and processes) hold value and provide benefits over other competitors when these competencies are utilized to take advantage of market opportunities or to counter competitive threats ([Darus et al., 2020](#)). These valuable and unusual resources and competencies can provide the basis of organizational performance and competitive edge unless competitors possess them or create strategically similar substitutes ([Barney, 2001](#)).

Climate change initiatives aimed at enhanced sustainability practices benefit firms enormously ([Centobelli et al., 2019](#)) and increase their performance ([Arda et al., 2023](#); [Chong et al., 2018](#)). Adopting climate change initiatives is beneficial for the organization and society ([Darnall et al., 2010](#)), as integrating climate change initiatives into operations can lead to changes in production processes, ultimately impacting firm performance ([Khatib et al., 2023](#)). By incorporating green practices in manufacturing operations, the firm's market share and profitability can be increased, corresponding with its sustainability goals ([Afum et al., 2021](#)). Moreover, the employee's capacity, commitment, motivation, and involvement toward firms' climate change initiatives and sustainability goals can be enhanced through eco-friendly organizational policies, which, over time, translates into improved organizational performance ([Paillé & Valéau, 2021](#); [Singh et al., 2019](#)). It is hypothesized that

H1: There is a positive relationship between climate change initiatives and firm performance.

2.2. *The moderating role of top management team diversity*

Creating an inclusive, diverse organizational climate within organizations is essential for providing employees equal opportunity in the work environment ([Estélyi & Nisar, 2016](#)). Effective governance through management teams and boards can offer valuable resources for the profitability and long-term viability of the organization ([Khatib & Al Amosh, 2023](#)). Gender heterogeneity can influence the valuation of diversity, such that when organizations encourage a culture that appreciates individuals with diverse viewpoints, experiences, and values differences – they are more likely to see positive outcomes ([Konadu et al., 2022](#)). Evidence suggests that women display greater concern for ecological issues than men and contribute positively toward its well-being ([Issa & Hanaysha, 2023](#)). Women inherently have a greater capacity for care and compassion towards others, making them more attuned to the damaging consequences of certain organizational decisions on the ecology ([Moreno-Gómez et al., 2018b](#)). This compassionate nature of women and their tendency to be more cautious toward the potential dangers that may occur due to climate change make them distinctly valuable human capital compared to males ([Issa & Hanaysha, 2023](#); [Konadu et al., 2022](#)).

Amid the different aspects of diversity, the presence of women in upper management (CEO) and board positions has been argued to have a more substantial influence on ensuring ethical decision-making and initiatives to avoid underperforming investments ([You, 2021](#)). However, a lack of consensus exists regarding the impact of women in board or executive positions ([Abdullah et al., 2016](#)). The varying reporting on the influence of gender diversity can be credited mainly to the variability in the approaches adopted to evaluate gender diversity and organizational effectiveness ([Kramer et al., 2006](#)).

Several academics prioritize the examination of women's presence on committees rather than solely considering the general representation of women on boards, while other researchers confirm the presence of a "critical mass," which denotes the minimal level of female representation required ([Abdullah et al., 2016](#); [Kramer et al., 2006](#)). When the number of women falls below this threshold, their presence does not have the same effects as when it is above this level ([Seebeck & Vetter, 2021](#); [Veldman, 2023](#)). The current study has focused on the representation of women in top

management positions, performing as senior managers around the firm's CEO. Such a high-level position gives women a definite say and influence in strategic decision-making ([Mungai et al., 2020](#)). Although gender diversity in TMT is no different than in other work groups, it provides an interesting case because of the direct impact of TMT on the business's overall performance ([Khatib & Al Amosh, 2023](#)).

The Upper Echelon Theory suggests that top management teams' characteristics and demographics impact firm performance ([Nielsen & Nielsen, 2013](#)). This framework classifies the organization's top executives based on age, educational background, years of experience, and service ([Nishii et al., 2007](#)). These characteristics are the basis of the leadership's beliefs, values, and attitudes that underlie their collective abilities, actions, and performance ([Kokot et al., 2021](#)). Though gender as a characteristic was initially not included in the upper echelon structure, contemporary studies have reported it as a comprehensive demographic variable ([Nishii et al., 2007](#)). The theory further indicates that women may improve the cognitive diversity of top management teams (TMTs), as their values, socio-cognitive perspectives, and skill sets result in more practical decision-making ([Dezsö & Ross, 2012](#); [Fernando et al., 2020](#)). The theory emphasizes the role of TMTs in shaping organizational outcomes ([Egerová & Nosková, 2019](#)) and underscores the pressing impact of diversity on organizational success ([Fernando et al., 2020](#)).

Studies have reported the positive association of women in TMTs with employee productivity ([Luanglath et al., 2019](#)) and business performance ([Caby, Ziane, & Coron, 2022](#)). A positive correlation is reported between a higher representation of women in senior leadership positions and improved environmental performance of companies ([Issa & Hanaysha, 2023](#); [Moreno-Gómez et al., 2018a](#); [Van Knippenberg et al., 2011](#)). This correlation between women in senior management and a firm's environmental performance aligns with the inherent predisposition of women towards compassion ([Wille et al., 2018](#)). Women's heightened worries over the impact of company policies contribute to corporations making more informed decisions that consider the negative environmental externalities they cause ([Pickering & Dale, 2023](#)). Women may not directly cause an increase in company performance, but they play a role in advancing a more sustainable economy ([Issa & Hanaysha, 2023](#); [Van Knippenberg et al., 2011](#)).

Studies have reported that females express more significant consideration of stakeholders due to their high universalism and low power orientation ([Arayssi et al., 2020](#)). Thus, such women

executives take greater environmental care by opting for advanced environmentally-friendly products and processes and dedication to achieving targets for reducing resource consumption to avoid environmental lawsuits ([Liu, 2018](#)). Moreover, diversity at the CEO and top management team levels positively influences performance metrics such as Return on Assets (ROA) and Return on Equity (ROE), stressing the importance of gender representation across various leadership positions for overall organizational success ([Moreno-Gómez et al., 2018a](#)). Consequently, we propose that women occupying high-level managerial roles are more inclined to advocate for environmentally beneficial policies, which ultimately moderate the relationship of climate change initiatives to organizational performance.

H2: TMT gender diversity positively moderates the relationship between climate change initiatives and firm performance, such that when TMT gender diversity is high, this relationship will be stronger.

2.3. *Moderating role of environment management training*

In the current global call for climate conservation, firms face pressure from various stakeholders to display eco-friendly practices ([Ardia et al., 2023](#)). It makes it crucial for them to respond to these external pressures by leveraging their internal capabilities through providing environmental training to employees, which ultimately impacts the organization's environmental performance and competitive advantage in the markets ([Jabbour, 2015](#); [Khatib & Al Amosh, 2023](#); [Longoni et al., 2018](#)). An environmental sustainability philosophy guides the employees' environmental training, and through comprehensive EMT, the companies ensure that their staff stays informed about evolving environmental practices ([Singh et al., 2019](#)). Training has been proposed as a crucial determinant for the successful implementation of new improvement programs ([Khatib et al., 2023](#)). Given that most suppliers, consumers, and other stakeholders lack knowledge of relevant environmental and sustainability principles, firms should provide the required training at the beginning of sustainable development planning (([Longoni et al., 2018](#))).

Environmental training is essential for employee and managerial roles to improve the organization's "eco-literacy" and environmental competence ([Singh et al., 2019](#)). These programs aim to enhance employees' skills, knowledge, attitudes and dedication toward environmental

issues, thereby improving the company's environmental performance and competitiveness over other organizations ([Singh et al., 2019](#)). Environmental training impacts employee's adherence to environmentally friendly practices within their job responsibilities ([Stefanelli et al., 2020](#)) and contributes to overall organizational performance ([Khatib et al., 2023](#); [Rawat et al., 2024](#)).

Environmental values, motives, and behavior of its employees are the main factors that improve an organization's environmental performance and competitiveness ([Jabbour, 2015](#); [Stefanelli et al., 2020](#)). These factors support the employees in applying ideas relating to the environmental sustainability of products, processes, and materials recycling ([Afum et al., 2021](#)). When a firm spends time and resources involving its employees in environmental training exercises, it builds up their skills, attitudes, and performance ([Stefanelli et al., 2020](#)). For organizations, these steps improve financial and environmental performance and thus increase the firm's competitive advantage ([Jabbour, 2015](#); [Khatib et al., 2023](#); [Singh et al., 2019](#)).

Based on RBV, this study maintains that EMT boosts employees' cognitive and affective environmental skills, which are valuable, scarce, and irreplaceable ([Barney & Mackey, 2005](#)). Due to this deliberate attempt by the organization to train its employees, they gain a comprehensive understanding of the organization's environmental and ethical policies and the importance of environmental conservation ([Singh et al., 2019](#)). Training and implementing environmentally sustainable methods leads to decreased resource utilization, less waste production, adoption of cleaner manufacturing practices, and reduced carbon footprint ([Khatib & Al Amosh, 2023](#)). These combined efforts align with the organizational dedication to environmental stewardship and to enhance carbon performance to gain a competitive advantage ([Jabbour, 2015](#); [Khatib et al., 2023](#); [Singh et al., 2019](#)). This study responds to the void in climate initiatives and organizational performance, as pointed out by ([Khatib et al., 2023](#); [Singh et al., 2019](#)), and proposed a cohesive research framework to ascertain the moderating influence of environmental training between climate change initiatives on organizational performance. We proposed that EMTs influence the organization's environmental practices to build and improve their environmental attitudes and knowledge to achieve better organizational performance ultimately.

H3: Environment management training positively moderates the relationship between climate change initiatives and firm performance, such that when environment management training is high, this relationship will be stronger.

2.4. *Moderated moderation of TMT gender diversity in environment management training*

The cognitive processes, beliefs, personality traits, and ethical standards of women are more inclined toward social matters than men, leading to a desire to establish corporate entities that prioritize social responsibility ([Issa & Hanaysha, 2023](#)). Studies have confirmed women's beneficial role in corporate decision-making, primarily due to their greater risk aversion, lower competitiveness, and higher levels of care compared to men ([Konadu et al., 2022](#)). The decision of TMT is heavily influenced by its composition, and Upper Echelon Theory posits that gender diversity brings the diversity of the TMT's psychological attributes that influence and eliminate bias in decision-making ([Mungai et al., 2020](#)). TMTs having gender diversity indicate a beneficial impact on both strategy and corporate social responsibility compared to non-gender diverse TMTs ([Caby, Ziane, & Coron, 2022](#)).

EMT provides employees with the knowledge, skills and attitude needed for adopting and implementing climate change initiatives and when firms integrate and implement the knowledge gained from EMT programs – its influence goes beyond their internal operations ([Khatib et al., 2023](#)). The organization can reduce its carbon footprint and resource consumption by adopting climate change initiatives to achieve low waste generation and better carbon performance ([Orazalin et al., 2024](#)). This study proposes that by having a gender-diverse TMT, the organization would be better able to manage the external and societal norms of governance without compromising its commitment to environmental stewardship. Due to their gender-diverse TMT, there would be a stronger emphasis on engaging in EMT programs for their employees, yielding better adherence to climate change initiatives and bringing positive organizational performance.

H4: TMT gender diversity positively moderates the moderation effect of environment management training on climate change initiatives and firm performance, such that when TMT gender diversity is high, the moderation effect of environment management training will be stronger.

2.5. *Moderated moderation of board gender diversity on TMT gender diversity*

Gender diversity in TMT is reported to positively influence climate change initiatives ([Liu, 2018](#)) and organizational performance ([Moreno-Gómez et al., 2018a](#)). However, the effect of gender diversity in TMT on the relationship between climate change initiatives and organizational performance can further be influenced by the diversity in the corporate board ([Caby, Ziane, & Coron, 2022](#)). This study has indicated that the moderating influence of board diversity on gender diversity in TMT impacts the strength of this relationship, such that the organizations having diversity both on board and TMT would have stronger enforcement of climate change initiatives to achieve optimum organizational performance.

Studies have confirmed that organizations that promote diversity among their work teams across the organization can lead to positive spillover effects, triggering institutional changes that support diversity and inclusivity in various aspects of operations, including climate change initiatives ([Brahma et al., 2021](#); [Cho et al., 2021](#)). The positive potential impact of gender diversity on TMT is based on the same inherent capacity of women as found in any work unit involving gender diversity ([Amorelli & García-Sánchez, 2021](#); [Fernando et al., 2020](#)). It suggests that women have different human capital from men due to their different personality traits and values, which increases environmentally responsible organizations practices for organizations with diverse teams rather than having gender-homogenous work teams ([Brahma et al., 2021](#); [Fernando et al., 2020](#)).

According to Agency Theory ([Jensen & Meckling, 2019](#)), the directors reflect stakeholders' interests, yet their self-interest may distract them from serving the broader interest. Separating organizational ownership from its control raises conflict between the stakeholders and policymakers ([Meckling & Jensen, 1976](#)). Detailed and transparent monitoring systems can be employed through diverse corporate boards to eliminate these agency issues, as gender-diverse boards perform their oversight and monitoring functions better based on their expertise and experience ([Cao et al., 2024](#); [Khatib et al., 2023](#); [Orazalin et al., 2024](#)) to achieve sustainable environmental performance ([Amorelli & García-Sánchez, 2021](#)).

Board gender diversity has been explored in extensive studies and has indicated a positive influence on the firm's performance and its relationship with stakeholders ([Brahma et al., 2021](#); [Khatib et al., 2023](#)). Due to their greater concern for the environment, female board members focus

more on environmental concerns than male board members ([Huang, 2021](#)). Unlike their male counterparts, female directors often achieve directorship positions due to their diverse backgrounds, education, and involvement in community service and academic organizations ([Brahma et al., 2021](#); [Khatib et al., 2023](#)). These jobs enhance females' understanding and conscientiousness of the concerns and expectations of various stakeholders more than males ([Brahma et al., 2021](#); [Orazalin et al., 2024](#)). Incorporating a more significant number of women on the board enhances decision-making and governance procedures as it brings higher levels of innovation and creativity compared to boards with less gender diversity ([Amorelli & García-Sánchez, 2021](#); [Ben-Amar et al., 2017](#); [Luanglath et al., 2019](#)).

Very few studies have previously reported the moderating influence of board diversity on TMT ([Abidin et al., 2022](#); [Luanglath et al., 2019](#); [Opstrup & Villadsen, 2015](#)). These studies have indicated that gender diversity on the board and TMT can enhance creativity and invention. By combining a varied range of expertise and skills, the gender-diverse board minimizes the possibility of groupthink and promotes higher-level decision-making ([Luanglath et al., 2019](#)). These organizations with diverse boards and TMT can better understand diverse customer orientations, leading to potential beneficial impacts and financial performance ([Abidin et al., 2022](#); [Luanglath et al., 2019](#); [Opstrup & Villadsen, 2015](#)). We proposed that organizations with gender diversity at the board and TMT level can better resolve the complexities of climate change initiatives and organizational performance. The gender diversity in these organizations helps them to steer away from environmental issues compared to organizations with non-gender diverse boards and TMT.

H5: Board gender diversity positively moderates the moderation effect of TMT gender diversity on climate change initiatives and firm performance, such that when board gender diversity is high, the moderation effect of TMT gender diversity is stronger.

2.6. Moderated moderation of board gender diversity on TMT gender diversity – environment management training link

The success and survival of the firm rely widely on the policy-setting role of the board of directors as their decisions determine how effectively the organization tackles its environmental and climate-related risks, as well as monitoring its involvement in carbon programs ([Khatib & Al Amosh,](#)

[2023](#)). Implementing climate-related programs often becomes challenging due to stakeholders' financial and non-financial conflicts of interest ([Ardia et al., 2023](#); [Khatib & Al Amosh, 2023](#); [Konadu et al., 2022](#)). However, competent and gender-diverse boards are more likely to overcome these conflicts due to their impartial approach, as the eco-conscious board of directors can encompass environmental concerns and financial matters ([Ben-Amar et al., 2017](#); [Caby, Ziane, & Coron, 2022](#)). The board can prioritize environmentally friendly decisions by aligning management goals with shareholder interests ([Ardia et al., 2023](#)). Autonomous, independent and diversified board of directors show a stronger dedication to fulfilling their company's social and environmental responsibilities and offer efficient supervision of management's environmental efforts ([Rawat, 2021](#)).

According to Agency Theory ([Meckling & Jensen, 1976](#)), the self-interest of the board of directors may delineate the organizational policies from its strategic goals. However, these agency issues can be mitigated by aligning the ownership and control of the firm through a unified agenda established by gender diverse board ([Jensen, 2000](#)). Studies have indicated that gender-diverse boards, due to their impartiality and decision-making transparency, reduce information asymmetry to achieve better climate performance ([Caby, Ziane, & Coron, 2022](#); [Khatib & Al Amosh, 2023](#)). The importance of environmental training for employees and managers cannot be emphasized enough as it improves the organization's "eco-literacy" and environmental competence ([Singh et al., 2019](#); [Teixeira et al., 2012](#)). EMT supplements the organization's environmental performance and competitiveness by improving employees' skills, knowledge, attitudes, and commitment toward environmental issues ([Khatib et al., 2023](#); [Singh et al., 2019](#)). This study proposed that the presence of a gender-diversified board of directors further moderates the influence of EMT on climate change initiatives and organizational performance. The preference towards environmental sustainability of gender-diverse boards adds to the effectiveness of EMT on the firm's climate change initiatives and performance.

H6: Board gender diversity positively moderates the moderation effects of TMT gender diversity and environment management training on climate change initiatives and firm performance, such that when board gender diversity is high, the moderation effect of TMT gender diversity on environment management training will be stronger.

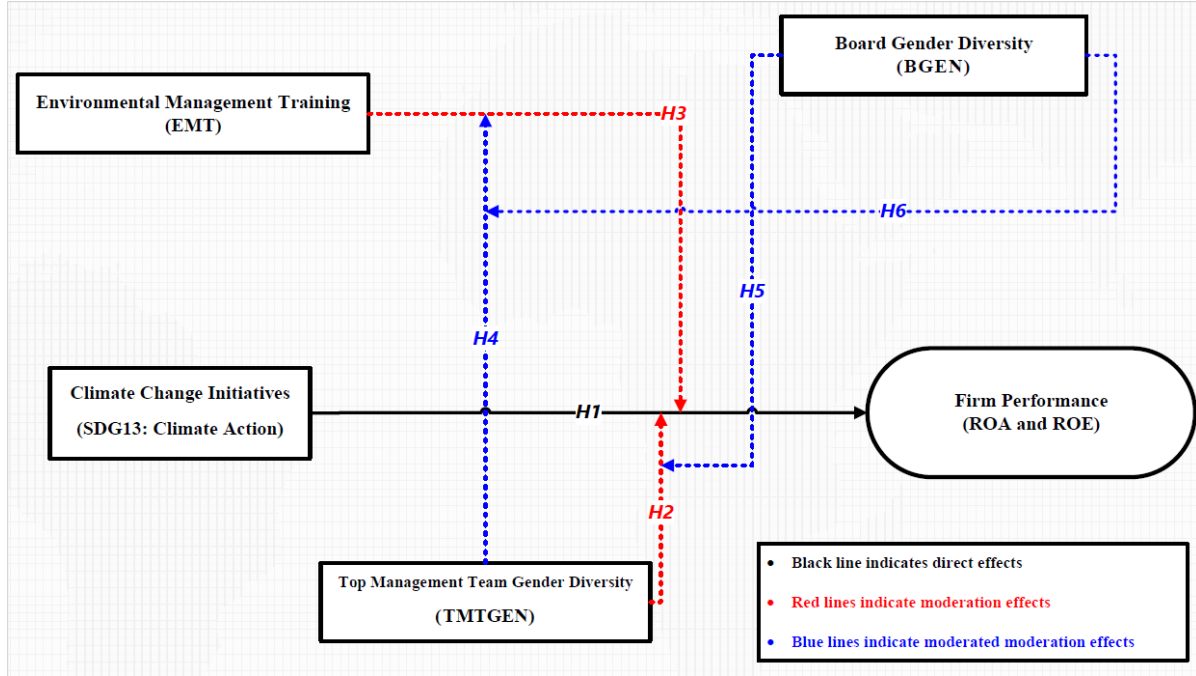


Figure 1. The conceptual framework

3. Data and methodology

3.1. Sample and data description

In order to test our hypotheses, our sample considered all firms worldwide with the required data available from 2013 to 2022. We followed [Orazalin et al. \(2024\)](#) and selected firms with required data for at least five consecutive years. Table A1 and table A2 in Appendix A present the sample selection process, which yields an unbalanced panel of 117,410 firm-year observations from five regions representing 11 industries and operating in 71 countries. Using unbalanced panel data helps overcome the survivorship bias problem ([Hillier et al., 2011](#)); moreover, the estimations based on unbalanced panel data are as reliable as those obtained using balanced panel data ([Arellano, 2003](#)).

Data on climate change initiatives, TMT and board-level indicators are obtained from the LSEG Refinitiv database. The financial data are obtained from the Worldscope database. Moreover, to account for the country-specific heterogeneity, data on GDP growth rate are gathered from the World Bank database. Table A1 shows that the United States, with 36,930 observations (31.45%), is the most represented country. Likewise, table A2, Panel A, shows that the American region, with 45,100 observations (38.41%), is the dominated region, followed by Asia, with 41,510

observations (35.35%) and Europe, with 24,070 observations (20.5 %). Table A2, Panel B, further reports that the industrial, financials, and consumer discretionary sectors have the most observations, namely 21,010 (17.89%), 17,710 (15.08 %), and 17,320 (14.75 %), respectively. Finally, we winsorize all variables used in the analysis at the top and bottom 1% and 5% levels ([Lang et al., 2003](#); [Ma et al., 2023](#); [Morris et al., 2016](#)) to avoid outliers.

3.2. *Econometric model*

In order to test the direct effects of climate change initiatives on firm performance and the moderating effects of environmental management training and gender diversity at the top management team and board levels on the climate change initiatives – firm performance relationships, we utilize the following baseline model:

$$Y_{i,t} = \alpha_0 + \beta_1 \text{SDG13}_{i,t} + \beta_2 X_{i,t} + \phi_j + \phi_t + \varepsilon_{i,t} \quad (1)$$

Where $Y_{i,t}$ is the firm performance for firm " i " at time " t ". $\text{SDG13}_{i,t}$ is our main explanatory variable, firm climate change initiatives. $X_{i,t}$ is the vector of control variables. ϕ_j and ϕ_t represent the industry and year effects, respectively. All variables are defined in table 1.

Table 1. Variables description.

Dependent variables	Symbols	Description	Source
Return on Assets – WC08326	ROA	"(Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1 - Tax Rate))) / Average of Last Year's and Current Year's Total Assets * 100"	LSEG Refinitiv database
Return on Equity –WC08301	ROE	"(Net Income – Bottom Line - Preferred Dividend Requirement) / Average of Last Year's and Current Year's Common Equity * 100"	LSEG Refinitiv database
Independent variables			
SDG13 Climate Action – CGVSDP054	SDG13	"A dichotomous variable that takes the value of one if the firm is supporting Goal 13 of SDG to take urgent action to combat climate change and its impacts, and zero otherwise."	Author's calculations using LSEG Refinitiv data
Environment Pillar Score – ENSCORE	EPS	"Refinitiv's Environment Pillar Score is the weighted average relative rating of a company based on the reported environmental information and the resulting three environmental category scores."	LSEG Refinitiv database
Moderating variables			
TMT Gender Diversity – CGBSO19	TMTGEN	"Percentage of female executive members in total executive members."	LSEG Refinitiv database
Environment Management Training – ENRRDP008	EMT	"A dichotomous variable that takes value of one if the firm train its employees on environmental issues, and zero otherwise."	Author's calculations using LSEG Refinitiv data
Board Gender Diversity – CGBSO03V	BGEN	"Percentage of female on the board."	LSEG Refinitiv database
Control variables			
Firm Size	SIZE	"Natural logarithm the firm's total assets (WC02999)."	Author's calculations using LSEG Refinitiv data

Leverage – WC08236	LEV	“(Short Term Debt & Current Portion of Long-Term Debt + Long Term Debt) / Total Assets * 100”	LSEG Refinitiv database
Capital Expenditures – WC08416	CE	“Capital Expenditures / Last Year’s Total Assets * 100”	LSEG Refinitiv database
CEO Duality – CGBSO09V	CEOD	“A dichotomous variable that takes the value of one if the CEO simultaneously chairs the board or if the chairman of the board has been the CEO of the company, and zero otherwise.”	Author’s calculations using LSEG Refinitiv data
Board Tenure – CGBSO05V	BT	“Natural logarithm the average number of years each board member has been on the board.”	LSEG Refinitiv database
Executives’ compensation – CGCPDP0541	EC	“Natural logarithm the total compensation paid to all senior executives as reported by the company divided by net sales or revenue in local currency in millions.”	Author’s calculations using LSEG Refinitiv data
TMT member Experience – CGBSO02V	TMTE	“A dichotomous variable that takes the value of one if the TMT members have either an industry specific background or a strong financial background, and zero otherwise.”	Author’s calculations using LSEG Refinitiv data
Audit Committee Independence – CGBFO01V	ACI	“A dichotomous variable that takes the value of one if the company report that all audit committee members are non-executives, and zero otherwise.”	Author’s calculations using LSEG Refinitiv data
Gross Domestic Product	GDP	“Annual percentage growth rate of GDP for each country.”	World Bank

We augment our baseline model as follows to assess the moderating effects:

$$Y_{i,t} = \gamma_0 + \gamma_1 SDG13_{i,t} + \gamma_2 TMTGEN_{i,t} + \gamma_3 EMT_{i,t} + \gamma_4 (SDG13_{i,t} * TMTGEN_{i,t}) + \gamma_5 (SDG13_{i,t} * EMT_{i,t}) + \gamma_6 (SDG13_{i,t} * EMT_{i,t} * TMTGEN_{i,t}) + \gamma_7 (SDG13_{i,t} * TMTGEN_{i,t} * BGEN_{i,t}) + \gamma_8 (SDG13_{i,t} * EMT_{i,t} * TMTGEN_{i,t} * BGEN_{i,t}) + \gamma_9 X_{i,t} + \phi_j + \phi_t + \varepsilon_{i,t} \quad (2)$$

Where $SDG13_{i,t} * TMTGEN_{i,t}$ and $SDG13_{i,t} * EMT_{i,t}$ are the interaction terms that capture the moderating impact of TMTGEN and EMT on SDG13 – firm performance relationships. Also, $SDG13_{i,t} * EMT_{i,t} * TMTGEN_{i,t}$, $SDG13_{i,t} * TMTGEN_{i,t} * BGEN_{i,t}$ and $SDG13_{i,t} * EMT_{i,t} * TMTGEN_{i,t} * BGEN_{i,t}$ are the interaction terms that capture the moderated moderation effects of TMTGEN and BGEN.

As demonstrated in figure 1, our conceptual framework contains five main variables, namely SGD13, TMTGEN, EMT, BGEN, and firm performance (ROA and ROE). First, based on existing literature ([Ahmed et al., 2024](#); [Ofori et al., 2023](#)) and LSEG Refinitiv description, we compute a dichotomous variable to measure firm climate change initiatives using SDG13 (Climate Action) data for each firm. Specifically, the firm climate change initiatives variable takes the value of one if it supports Goal 13 of SDG to take urgent action to combat climate change and its impacts and zero otherwise.

Second, we measure TMTGEN as the percentage of female executive members in total executive members and BGEN as the percentage of females on the board, consistent with existing studies ([Ben-Amar et al., 2017](#); [Dezsö & Ross, 2012](#); [Gould et al., 2018](#); [Khan et al., 2024](#)). Third, we create a dichotomous variable to measure EMT that takes the value of one of the firms that train its employees on environmental issues and zero otherwise. We obtain data from LSEG Refinitiv database to construct the EMT variable. Fourth, firm performance is measured by return on assets (ROA) and returns on equity (ROE), consistent with prior studies ([Alvarez, 2012](#); [Caby, Ziane, & Lamarque, 2022](#); [Jin, 2023](#); [Moreno-Gómez et al., 2018b](#); [Secinaro et al., 2020](#)).

Moreover, to account for the confounding effects of TMT, board, firm and country-specific characteristics on the said relationships, we use control variables from the TMT, board, firm, and country levels. Following ([Homroy, 2023](#); [Orazalin et al., 2024](#); [Ozkan et al., 2023](#)), use several TMT and board-level variables, such as CEO duality, board tenure, executives' compensation, TMT member experience, and audit committee independence. Moreover, following existing studies ([Caby, Ziane, & Lamarque, 2022](#); [Jo et al., 2015](#); [Ozkan et al., 2023](#); [Reboredo & Ugolini, 2022](#)), we include several firm attributes, including firm size, leverage, and capital expenditures. Finally, we also use GDP growth as country-level control variable, following previous studies ([Caby, Ziane, & Coron, 2022](#); [Huang et al., 2018](#)).

4. Empirical results

4.1. Descriptive statistics and multicollinearity checks

Table 2 presents the descriptive statistics of the variables. The mean values of performance indicators (ROA and ROE) are 3.188 and 7.251, ranging from -28.99 to 19.22 and -48.53 to 39.28, respectively. Moreover, our sample, on average, has slightly higher gender diversity at the board level (19%) compared to the gender diversity at TMT level (15%). However, this is far below the minimum of 30% for female board members by 2015, increasing to 40% by 2020 ([Veldman, 2023](#)). Importantly, we did not use dummy variables in descriptive statistics but included dummy variables in all regression specifications.

Table 2. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
ROA	3.188	10.53	-28.99	19.22
ROE	7.251	19.486	-48.53	39.28
SIZE	15.634	3.113	0	28.314

LEV	23.532	19.068	0	63.34
CE	4.395	4.641	0.05	17.12
BT	1.833	0.557	0	3.707
EC	8.342	2.092	-10.925	22.513
ACI	85.447	24.385	0	100
TMTGEN	14.812	15.157	0	87.5
BGEN	18.953	14.171	0	85.71
GDP	2.393	3.168	-29.1	24.475

Table 3 provides the multicollinearity checks. Regarding the correlation coefficients, SDG13 positively correlates with firm performance. We do not observe any serious multicollinearity issue, but the correlation matrix shows that none of the coefficients exceed a cut-off value of 0.80 ([Gujarati, 2021](#)). These results are confirmed by the Variance Inflation Factor (VIF) test, which shows that all variables have VIF values lower than the threshold point of 5 ([Kalnins, 2018](#)).

Table 3. Multicollinearity checks.

[illegible]

4.2. Main results and discussion

Table 4 presents the regression results of SDG13 and TMTGEN on firm performance. Models 1-6 report the results regarding ROA as a performance measure, while models 6-12 present the findings based on ROE as a performance indicator.

Table 4. Impact of climate change initiatives and top management team gender diversity on firm performance.

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROE	(8) ROE	(9) ROE	(10) ROE	(11) ROE	(12) ROE
SDG13	0.417*** (0.0959)	0.132 (0.138)	0.484*** (0.110)	0.197 (0.149)	0.388*** (0.110)	0.135 (0.149)	0.960*** (0.226)	0.390 (0.332)	1.269*** (0.252)	0.715** (0.350)	1.268*** (0.253)	0.801** (0.349)
TMTGEN	0.00933** (0.00426)	0.00410 (0.00505)	0.00895** (0.00426)	0.00370 (0.00506)	0.0109*** (0.00424)	0.00634 (0.00500)	0.0289*** (0.00880)	0.0182* (0.0103)	0.0288*** (0.00882)	0.0185* (0.0103)	0.0315*** (0.00873)	0.0228** (0.0101)
SIZE	0.383*** (0.0408)	0.384*** (0.0407)	0.374*** (0.0408)	0.376*** (0.0407)	0.295*** (0.0423)	0.297*** (0.0423)	1.023*** (0.0755)	1.026*** (0.0754)	1.003*** (0.0756)	1.007*** (0.0755)	0.661*** (0.0794)	0.665*** (0.0794)
LEV	-0.105*** (0.00495)	-0.105*** (0.00495)	-0.104*** (0.00494)	-0.104*** (0.00494)	-0.109*** (0.00499)	-0.109*** (0.00498)	-0.241*** (0.0108)	-0.241*** (0.0108)	-0.239*** (0.0108)	-0.239*** (0.0108)	-0.242*** (0.0109)	-0.242*** (0.0109)
CE	0.357*** (0.0172)	0.357*** (0.0172)	0.354*** (0.0173)	0.353*** (0.0173)	0.357*** (0.0185)	0.356*** (0.0185)	0.660*** (0.0338)	0.660*** (0.0338)	0.648*** (0.0337)	0.648*** (0.0337)	0.730*** (0.0361)	0.730*** (0.0361)
CEOD	-0.296* (0.157)	-0.299* (0.157)	-0.287* (0.157)	-0.290* (0.157)	-0.217 (0.155)	-0.219 (0.155)	-0.577* (0.331)	-0.582* (0.331)	-0.550* (0.331)	-0.554* (0.331)	-0.276 (0.326)	-0.280 (0.326)
BT	2.061*** (0.141)	2.060*** (0.141)	2.057*** (0.141)	2.056*** (0.141)	1.911*** (0.141)	1.910*** (0.141)	4.325*** (0.284)	4.321*** (0.284)	4.309*** (0.284)	4.305*** (0.284)	3.923*** (0.281)	3.920*** (0.281)
EC	-1.588*** (0.0615)	-1.589*** (0.0615)	-1.589*** (0.0617)	-1.591*** (0.0617)	-1.446*** (0.0620)	-1.447*** (0.0620)	-2.857*** (0.109)	-2.858*** (0.109)	-2.844*** (0.109)	-2.845*** (0.109)	-2.742*** (0.112)	-2.743*** (0.112)
TMTE	0.362 (0.431)	0.370 (0.432)	0.340 (0.430)	0.348 (0.430)	0.379 (0.425)	0.386 (0.426)	-0.499 (0.968)	-0.484 (0.969)	-0.446 (0.967)	-0.433 (0.968)	-0.317 (0.956)	-0.307 (0.957)
ACI	0.00566* (0.00324)	0.00559* (0.00323)	0.00570* (0.00323)	0.00563* (0.00322)	0.00402 (0.00317)	0.00396 (0.00317)	0.00291 (0.00648)	0.00281 (0.00647)	0.00318 (0.00646)	0.00307 (0.00645)	5.83e-05 (0.00635)	0.000144 (0.00634)
GDP	0.158*** (0.00916)	0.158*** (0.00916)	0.0241 (0.0198)	0.0244 (0.0198)	0.0239 (0.0198)	0.0242 (0.0198)	0.385*** (0.0203)	0.385*** (0.0203)	0.0385 (0.0425)	0.0391 (0.0425)	0.0377 (0.0424)	0.0383 (0.0424)
SDG13XTMTGEN		0.0156*** (0.00580)		0.0157*** (0.00578)		0.0138** (0.00575)		0.0314** (0.0135)		0.0303** (0.0134)		0.0256* (0.0134)
Constant	7.477*** (1.132)	7.538*** (1.132)	7.952*** (1.148)	8.011*** (1.149)	8.071*** (1.214)	8.102*** (1.215)	8.917*** (2.209)	9.035*** (2.211)	9.924*** (2.232)	10.03*** (2.234)	14.15*** (2.414)	14.20*** (2.415)
Year Effects	NO	NO	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES
Industry Effects	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES
R-square	0.208	0.209	0.210	0.210	0.247	0.247	0.180	0.181	0.183	0.183	0.221	0.221
Observations	32,243	32,243	32,243	32,243	32,243	32,243	31,338	31,338	31,338	31,338	31,338	31,338
Number of Firm	9,515	9,515	9,515	9,515	9,515	9,515	9,357	9,357	9,357	9,357	9,357	9,357

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Our results show that SDG13 positively relates to ROA and ROE ($p < 0.01$ in models 1, 3, 5, 7, 9 & 11 and $p < 0.05$ in models 10 & 12), suggesting that the firm's climate change initiatives improve their performance. This evidence supports H1 and corroborates the findings of existing studies ([Arda et al., 2023](#); [Chong et al., 2018](#); [Singh et al., 2019](#)). These studies utilize the lense of resource-based view and explain that integration of climate change initiatives and sustainable practices into operations act as valuable resources, which over time translates into improved firm performance.

Likewise, TMTGEN is positively associated with ROA and ROE ($p < 0.01$ in models 5, 7, 9 & 11, $p < 0.05$ in models 1, 3, & 12 and $p < 0.1$ in models 8 & 10), indicating that inclusion of females in top management team enhance firm performance. These findings confirm the results of Densö and Ross (2012) and Ostrup and Villaden (2015) that female representation in top management enhances firm performance by bringing informational and social diversity benefits to the top management team.

Intriguingly, the coefficient of the interaction term (SDG13XTMTGEN) displays a positive association with ROA and ROE ($p < 0.01$ in models 2 & 4, $p < 0.05$ in models 6, 8, & 10 and $p < 0.1$ in model 12). This evidence supports H2, which assumes that when TMTGEN is high, the relationship between climate change initiatives and firm performance will be stronger. This finding corroborates the arguments that female members strike an effective balance between firms' financial targets and social responsibilities ([Arayssi et al., 2020](#)), females demonstrate more sensitivity to ethical issues and align with societal values ([Dadanlar & Abebe, 2020](#); [Eagly & Wood, 2016](#); [Peterson et al., 2010](#)), and gender diversity in corporate leadership reduces corporate environmental violations ([Liu, 2018](#)), ultimately enhancing firm performance.

In the case of control variables, we find expected signs. For instance, firm size (SIZE), capital expenditures (CE), board tenure (BT), audit committee independence (ACI), and GDP growth have significant and positive impacts on firm performance, and this is in line with the diversification capabilities of large firms. However, leverage (LEV), CEO duality (CEOD), and executives' compensation (EC) are negatively associated with firm performance.

Table 5 reports the regression results of SDG13 and EMT on firm performance.

Table 5. Impacts of climate change initiatives and environment management training on firm performance.

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROE	(8) ROE	(9) ROE	(10) ROE	(11) ROE	(12) ROE
SDG13	0.450*** (0.0973)	0.230** (0.115)	0.502*** (0.111)	0.292** (0.129)	0.401*** (0.111)	0.208 (0.129)	1.076*** (0.228)	0.629** (0.271)	1.344*** (0.253)	0.937*** (0.295)	1.292*** (0.254)	0.857*** (0.295)
EMT	0.0373 (0.131)	0.154 (0.153)	0.0487 (0.131)	0.128 (0.153)	0.0260 (0.130)	0.190 (0.153)	0.225 (0.270)	0.161 (0.312)	0.243 (0.270)	0.0982 (0.312)	0.220 (0.270)	0.590 (0.411)
SIZE	0.383*** (0.0412)	0.382*** (0.0411)	0.375*** (0.0411)	0.375*** (0.0411)	0.290*** (0.0429)	0.289*** (0.0429)	1.028*** (0.0760)	1.028*** (0.0760)	1.009*** (0.0762)	1.009*** (0.0761)	0.642*** (0.0805)	0.639*** (0.0804)
LEV	-0.105*** (0.00495)	-0.105*** (0.00495)	-0.104*** (0.00494)	-0.104*** (0.00494)	-0.109*** (0.00499)	-0.109*** (0.00498)	-0.241*** (0.0108)	-0.241*** (0.0108)	-0.239*** (0.0108)	-0.239*** (0.0108)	-0.242*** (0.0109)	-0.242*** (0.0109)
CE	0.355*** (0.0172)	0.355*** (0.0172)	0.352*** (0.0173)	0.352*** (0.0173)	0.355*** (0.0184)	0.356*** (0.0184)	0.657*** (0.0338)	0.656*** (0.0338)	0.646*** (0.0337)	0.645*** (0.0337)	0.727*** (0.0360)	0.728*** (0.0360)
CEOD	-0.309** (0.157)	-0.295* (0.157)	-0.298* (0.157)	-0.285* (0.157)	-0.228 (0.155)	-0.216 (0.155)	-0.601* (0.331)	-0.571* (0.332)	-0.571* (0.331)	-0.545 (0.332)	-0.291 (0.326)	-0.262 (0.326)
BT	2.057*** (0.141)	2.054*** (0.141)	2.052*** (0.141)	2.050*** (0.141)	1.904*** (0.141)	1.902*** (0.141)	4.331*** (0.284)	4.326*** (0.284)	4.314*** (0.284)	4.310*** (0.284)	3.911*** (0.281)	3.906*** (0.281)
EC	-1.586*** (0.0617)	-1.584*** (0.0617)	-1.589*** (0.0619)	-1.587*** (0.0619)	-1.446*** (0.0621)	-1.446*** (0.0621)	-2.856*** (0.109)	-2.849*** (0.109)	-2.845*** (0.110)	-2.840*** (0.110)	-2.738*** (0.112)	-2.735*** (0.112)
TMTE	0.366 (0.431)	0.379 (0.430)	0.332 (0.429)	0.341 (0.429)	0.373 (0.424)	0.381 (0.424)	-0.486 (0.967)	-0.460 (0.966)	-0.469 (0.966)	-0.452 (0.965)	-0.321 (0.954)	-0.302 (0.953)
ACI	0.00523 (0.00324)	0.00509 (0.00324)	0.00531* (0.00322)	0.00518 (0.00322)	0.00357 (0.00317)	0.00346 (0.00317)	0.00157 (0.00647)	0.00128 (0.00647)	0.00189 (0.00645)	0.00164 (0.00645)	0.00134 (0.00634)	0.00161 (0.00634)
GDP	0.158*** (0.00916)	0.158*** (0.00916)	0.0238 (0.0198)	0.0238 (0.0198)	0.0235 (0.0197)	0.0236 (0.0197)	0.388*** (0.0203)	0.387*** (0.0202)	0.0387 (0.0425)	0.0387 (0.0425)	0.0380 (0.0424)	0.0380 (0.0424)
SDG13XEMT		0.623*** (0.199)		0.577*** (0.199)		0.530*** (0.197)		1.248*** (0.460)		1.103** (0.460)		1.182*** (0.457)
Constant	7.555*** (1.140)	7.645*** (1.139)	8.057*** (1.155)	8.145*** (1.154)	8.359*** (1.223)	8.464*** (1.223)	9.029*** (2.217)	9.174*** (2.214)	10.14*** (2.237)	10.27*** (2.235)	15.05*** (2.419)	15.27*** (2.418)
Year Effects	NO	NO	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES
Industry Effects	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES
R-square	0.273	0.275	0.274	0.275	0.311	0.312	0.241	0.243	0.243	0.244	0.287	0.288
Observations	32,253	32,253	32,253	32,253	32,253	32,253	31,348	31,348	31,348	31,348	31,348	31,348
Number of Firm	9,515	9,515	9,515	9,515	9,515	9,515	9,357	9,357	9,357	9,357	9,357	9,357

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

In the case of the individual effect of EMT, we do not find the impact of environment management training on firm performance. However, the coefficient of the interaction term (SDG13XEMT) is positively related to ROA and ROE ($p < 0.01$ in models 2, 4, 6, 8 & 12 and $p < 0.05$ in model 10), implying that EMT plays an effective role in implementing climate initiatives. This evidence supports H3, which conjectures that the relationship between climate change initiatives and firm performance will be stronger when EMT is high.

In order to delve deeper, we test the moderated moderation of TMTGEN on the SDG13 – EMT – firm performance relationships. Table 6 reports the results. In the case of individual effects, EMT has no impact on firm performance; however, TMTGEN is positively associated with ROA and ROE. In addition, the coefficient of interaction term (SDG13XEMTXTMTGEN) is positively related to performance indicators ($p < 0.01$ in models 2, 4 & 6 and $p < 0.05$ in models 8, 10 & 12), indicating that the presence of females in top management team promotes environment management training and climate change initiatives, which, in turn, improves firm performance. This evidence supports H4, which assumes that when TMT gender diversity is high, the moderation effect of environment management training on SDG13 – firm performance relationship will be stronger.

In the next step, we test the moderated moderation of BGEN on the SDG13 – TMTGEN – firm performance relationships. Table 7 presents the results. We note that BGEN is positively associated with performance indicators ($p < 0.01$ in all models). Interestingly, we also observe that BGEN moderates the SDG13 – TMTGEN – firm performance relationships (SDG13XTMTGENXBGEN), suggesting that female board representation promotes gender diversity in top management. This is consistent with the findings of Gould et al. (2018) and Bilimoria (2006) that female representation at a senior level encourages female representation at the level immediately below, improving gender diversity throughout the organization. Hence, H5 is accepted, and this interesting finding is also consistent with the prior studies on corporate governance – firm performance nexus, which highlighted that women board members play a vital role in implementing stringent oversight to improve monitoring function and governance quality ([Beji et al., 2021](#); [Goergen & Renneboog, 2014](#)), enhance firm performance ([Adams & Ferreira, 2009](#)).

Table 6. Impacts of climate change initiatives, environment management training, and top management team gender diversity on firm performance.

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROE	(8) ROE	(9) ROE	(10) ROE	(11) ROE	(12) ROE
SDG13	0.423*** (0.0976)	0.288*** (0.104)	0.491*** (0.111)	0.357*** (0.118)	0.386*** (0.111)	0.260** (0.118)	0.999*** (0.230)	0.774*** (0.242)	1.304*** (0.254)	1.095*** (0.267)	1.246*** (0.254)	1.017*** (0.267)
EMT	0.0434 (0.131)	0.0824 (0.141)	0.0515 (0.131)	0.0680 (0.141)	0.0181 (0.130)	0.132 (0.140)	0.250 (0.270)	0.0425 (0.287)	0.261 (0.270)	0.0762 (0.287)	0.188 (0.270)	0.395 (0.287)
TMTGEN	0.00933** (0.00426)	0.00705 (0.00438)	0.00894** (0.00427)	0.00675 (0.00439)	0.0109** (0.00424)	0.00884** (0.00436)	0.0290*** (0.00881)	0.0252*** (0.00911)	0.0289*** (0.00882)	0.0255*** (0.00913)	0.0313*** (0.00874)	0.0275*** (0.00903)
SIZE	0.386*** (0.0411)	0.385*** (0.0411)	0.378*** (0.0411)	0.378*** (0.0410)	0.295*** (0.0429)	0.294*** (0.0429)	1.035*** (0.0761)	1.035*** (0.0760)	1.016*** (0.0762)	1.016*** (0.0761)	0.654*** (0.0805)	0.652*** (0.0804)
LEV	-0.105*** (0.00495)	-0.105*** (0.00495)	-0.104*** (0.00495)	-0.104*** (0.00494)	-0.109*** (0.00499)	-0.109*** (0.00498)	-0.241*** (0.0108)	-0.241*** (0.0108)	-0.239*** (0.0108)	-0.239*** (0.0108)	-0.242*** (0.0109)	-0.242*** (0.0109)
CE	0.357*** (0.0173)	0.356*** (0.0173)	0.354*** (0.0174)	0.353*** (0.0173)	0.356*** (0.0185)	0.356*** (0.0185)	0.661*** (0.0339)	0.660*** (0.0339)	0.649*** (0.0338)	0.648*** (0.0338)	0.730*** (0.0361)	0.729*** (0.0361)
CEOD	-0.294* (0.157)	-0.286* (0.157)	-0.286* (0.157)	-0.278* (0.157)	-0.214 (0.155)	-0.207 (0.155)	-0.577* (0.331)	-0.563* (0.331)	-0.550* (0.331)	-0.537 (0.331)	-0.270 (0.326)	-0.255 (0.326)
BT	2.060*** (0.141)	2.060*** (0.141)	2.056*** (0.141)	2.057*** (0.141)	1.909*** (0.141)	1.909*** (0.141)	4.330*** (0.283)	4.330*** (0.283)	4.314*** (0.284)	4.314*** (0.284)	3.913*** (0.281)	3.913*** (0.281)
EC	-1.589*** (0.0618)	-1.587*** (0.0617)	-1.590*** (0.0620)	-1.589*** (0.0619)	-1.446*** (0.0622)	-1.446*** (0.0621)	-2.863*** (0.109)	-2.860*** (0.109)	-2.851*** (0.110)	-2.848*** (0.110)	-2.738*** (0.112)	-2.736*** (0.112)
TMTE	0.361 (0.431)	0.373 (0.431)	0.338 (0.430)	0.348 (0.430)	0.380 (0.425)	0.389 (0.425)	-0.504 (0.968)	-0.484 (0.968)	-0.457 (0.968)	-0.443 (0.967)	-0.308 (0.956)	-0.293 (0.955)
ACI	0.00562* (0.00324)	0.00551* (0.00324)	0.00567* (0.00323)	0.00556* (0.00323)	0.00400 (0.00317)	0.00390 (0.00317)	0.00283 (0.00648)	0.00266 (0.00648)	0.00310 (0.00646)	0.00295 (0.00646)	7.06e-05 (0.00635)	0.000239 (0.00635)
GDP	0.158*** (0.00916)	0.157*** (0.00917)	0.0241 (0.0198)	0.0241 (0.0198)	0.0239 (0.0198)	0.0239 (0.0198)	0.386*** (0.0203)	0.385*** (0.0203)	0.0384 (0.0425)	0.0385 (0.0425)	0.0377 (0.0424)	0.0378 (0.0424)
SDG13XEMTXTMTGEN		0.0208*** (0.00702)		0.0198*** (0.00704)		0.0186*** (0.00700)		0.0340** (0.0153)		0.0303** (0.0153)		0.0334** (0.0152)
Constant	7.402*** (1.141)	7.494*** (1.140)	7.871*** (1.156)	7.963*** (1.155)	8.069*** (1.226)	8.167*** (1.226)	8.608*** (2.222)	8.742*** (2.221)	9.624*** (2.243)	9.749*** (2.243)	14.32*** (2.430)	14.48*** (2.430)
Year Effects	NO	NO	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES
Industry Effects	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES
R-square	0.274	0.275	0.276	0.276	0.312	0.313	0.243	0.244	0.244	0.245	0.288	0.289
Observations	32,241	32,241	32,241	32,241	32,241	32,241	31,336	31,336	31,336	31,336	31,336	31,336
Number of Firm	9,514	9,514	9,514	9,514	9,514	9,514	9,356	9,356	9,356	9,356	9,356	9,356

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Lastly, to assess whether the trickle-down effect of board-level gender diversity on gender diversity in top management teams translates into environmental training, ultimately improving firm performance, we test the moderated moderation of BGEN on the SDG13 – EMT – TMTGEN – firm performance relationships. Results are reported in table 8. The coefficient of the interaction term (SDG13XEMTGMTGENXBGEN) is positively associated with performance indicators. This evidence supports H6, and this intriguing finding underscores the importance of gender diversity across the organization. This result is consistent with existing literature in two ways. First, this finding supports prior literature documented a positive association between female representation at a senior level and female representation at the level immediately below ([Bilimoria, 2006](#); [Cohen et al., 1998](#); [Kurtulus & Tomaskovic-Devey, 2012](#); [Matsa & Miller, 2011](#)), the trickle-down effect. Second, this finding is aligned with the stream of literature suggests that gender diversity promotes the adoption of sustainability initiatives due to effective monitoring and stakeholder management ([Ben-Amar et al., 2017](#); [Fabrício et al., 2022](#)), improves eco-innovation ([Al-Najjar & Salama, 2022](#); [Zaman et al., 2024](#)), increases environmental and social performance ([Ginglinger & Raskopf, 2023](#)), and helps mitigate firm-level climate change exposure ([Trinh et al., 2023](#)).

Table 7. Impacts of climate change initiatives, top management team gender diversity, and board gender diversity on firm performance.

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROE	(8) ROE	(9) ROE	(10) ROE	(11) ROE	(12) ROE
SDG13	0.310*** (0.0975)	0.165 (0.118)	0.442*** (0.111)	0.294** (0.129)	0.339*** (0.111)	0.222* (0.129)	0.631*** (0.230)	0.280 (0.286)	1.108*** (0.253)	0.764** (0.304)	1.089*** (0.254)	0.843*** (0.304)
TMTGEN	0.00408 (0.00434)	0.00137 (0.00475)	0.00419 (0.00434)	0.00146 (0.00475)	0.00613 (0.00431)	0.00396 (0.00471)	0.0124 (0.00897)	0.00569 (0.00963)	0.0132 (0.00897)	0.00672 (0.00963)	0.0160 (0.00988)	0.0114 (0.00951)
BGEN	0.0278*** (0.00494)	0.0263*** (0.00507)	0.0287*** (0.00502)	0.0271*** (0.00515)	0.0294*** (0.00495)	0.0281*** (0.00507)	0.0842*** (0.0101)	0.0802*** (0.0104)	0.0880*** (0.0102)	0.0841*** (0.0105)	0.0882*** (0.0100)	0.0854*** (0.0103)
SIZE	0.398*** (0.0410)	0.400*** (0.0410)	0.392*** (0.0411)	0.394*** (0.0410)	0.313*** (0.0426)	0.315*** (0.0426)	1.076*** (0.0758)	1.081*** (0.0757)	1.062*** (0.0759)	1.067*** (0.0759)	0.722*** (0.0797)	0.726*** (0.0797)
LEV	-0.106*** (0.00496)	-0.106*** (0.00496)	-0.105*** (0.00495)	-0.105*** (0.00495)	-0.110*** (0.00499)	-0.110*** (0.00499)	-0.243*** (0.0108)	-0.243*** (0.0108)	-0.242*** (0.0108)	-0.242*** (0.0108)	-0.245*** (0.0109)	-0.245*** (0.0109)
CE	0.360*** (0.0173)	0.360*** (0.0172)	0.355*** (0.0173)	0.355*** (0.0173)	0.357*** (0.0184)	0.357*** (0.0184)	0.670*** (0.0338)	0.670*** (0.0338)	0.654*** (0.0337)	0.654*** (0.0337)	0.733*** (0.0360)	0.732*** (0.0360)
CEOD	-0.293* (0.157)	-0.296* (0.157)	-0.288* (0.157)	-0.291* (0.157)	-0.217 (0.155)	-0.220 (0.155)	-0.571* (0.330)	-0.580* (0.331)	-0.553* (0.331)	-0.561* (0.331)	-0.276 (0.325)	-0.282 (0.325)
BT	2.096*** (0.141)	2.098*** (0.141)	2.098*** (0.141)	2.100*** (0.141)	1.954*** (0.141)	1.955*** (0.141)	4.436*** (0.283)	4.440*** (0.283)	4.434*** (0.283)	4.437*** (0.283)	4.047*** (0.281)	4.050*** (0.281)
EC	-1.588*** (0.0614)	-1.588*** (0.0614)	-1.586*** (0.0616)	-1.587*** (0.0616)	-1.442*** (0.0619)	-1.443*** (0.0619)	-2.855*** (0.108)	-2.855*** (0.108)	-2.833*** (0.109)	-2.834*** (0.109)	-2.729*** (0.111)	-2.729*** (0.111)
TMTE	0.300 (0.430)	0.307 (0.431)	0.335 (0.429)	0.341 (0.430)	0.373 (0.425)	0.378 (0.425)	-0.655 (0.967)	-0.638 (0.968)	-0.440 (0.968)	-0.427 (0.969)	-0.311 (0.957)	-0.302 (0.958)
ACI	0.00665** (0.00323)	0.00655** (0.00323)	0.00664** (0.00322)	0.00653** (0.00322)	0.00497 (0.00317)	0.00489 (0.00317)	0.00586 (0.00646)	0.00563 (0.00646)	0.00611 (0.00644)	0.00587 (0.00644)	0.00287 (0.00634)	0.00271 (0.00634)
GDP	0.155*** (0.00916)	0.155*** (0.00916)	0.0241 (0.0199)	0.0243 (0.0199)	0.0238 (0.0198)	0.0240 (0.0198)	0.376*** (0.0203)	0.376*** (0.0203)	0.0381 (0.0427)	0.0386 (0.0427)	0.0373 (0.0426)	0.0376 (0.0426)
SDG13XTMTGENXBGEN		0.000274** (0.000136)		0.000276** (0.000136)		0.000219 (0.000135)		0.000668** (0.000322)		0.000647** (0.000321)		0.000464 (0.000320)
Constant	6.839*** (1.143)	6.871*** (1.144)	7.072*** (1.166)	7.106*** (1.167)	7.149*** (1.231)	7.165*** (1.232)	6.820*** (2.227)	6.898*** (2.229)	7.156*** (2.255)	7.234*** (2.257)	11.32*** (2.438)	11.36*** (2.439)
Year Effects	NO	NO	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES
Industry Effects	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES
R-square	0.277	0.278	0.278	0.279	0.315	0.315	0.249	0.250	0.250	0.251	0.294	0.294
Observations	32,243	32,243	32,243	32,243	32,243	32,243	31,338	31,338	31,338	31,338	31,338	31,338
Number of Firm	9,515	9,515	9,515	9,515	9,515	9,515	9,357	9,357	9,357	9,357	9,357	9,357

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 8. Impacts of climate change initiatives, environment management training, top management team gender diversity, and board gender diversity on firm performance.

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROE	(8) ROE	(9) ROE	(10) ROE	(11) ROE	(12) ROE
SDG13	0.327*** (0.0990)	0.227** (0.104)	0.453*** (0.112)	0.353*** (0.117)	0.343*** (0.112)	0.249** (0.117)	0.699*** (0.233)	0.510** (0.242)	1.159*** (0.254)	0.980*** (0.264)	1.086*** (0.255)	0.897*** (0.264)
EMT	0.0767 (0.131)	0.0195 (0.138)	0.0713 (0.131)	0.0203 (0.137)	0.00865 (0.131)	0.0790 (0.137)	0.359 (0.270)	0.178 (0.282)	0.339 (0.270)	0.175 (0.282)	0.0913 (0.270)	0.268 (0.281)
TMTGEN	0.00421 (0.00437)	0.00259 (0.00444)	0.00428 (0.00437)	0.00273 (0.00444)	0.00622 (0.00434)	0.00475 (0.00441)	0.0128 (0.00900)	0.00974 (0.00915)	0.0136 (0.00899)	0.0108 (0.00915)	0.0163 (0.00991)	0.0132 (0.00906)
BGEN	0.0283*** (0.00496)	0.0272*** (0.00499)	0.0290*** (0.00503)	0.0279*** (0.00507)	0.0296*** (0.00497)	0.0285*** (0.00500)	0.0854*** (0.0101)	0.0833*** (0.0102)	0.0887*** (0.0102)	0.0868*** (0.0103)	0.0882*** (0.0101)	0.0861*** (0.0101)
SIZE	0.406*** (0.0414)	0.406*** (0.0414)	0.400*** (0.0415)	0.399*** (0.0414)	0.319*** (0.0433)	0.318*** (0.0432)	1.100*** (0.0764)	1.100*** (0.0763)	1.085*** (0.0765)	1.084*** (0.0764)	0.726*** (0.0809)	0.724*** (0.0808)
LEV	-0.105*** (0.00496)	-0.105*** (0.00495)	-0.105*** (0.00495)	-0.105*** (0.00494)	-0.109*** (0.00499)	-0.109*** (0.00499)	-0.242*** (0.0108)	-0.243*** (0.0108)	-0.241*** (0.0108)	-0.241*** (0.0108)	-0.244*** (0.0109)	-0.244*** (0.0109)
CE	0.359*** (0.0173)	0.358*** (0.0173)	0.354*** (0.0173)	0.354*** (0.0173)	0.356*** (0.0184)	0.355*** (0.0184)	0.669*** (0.0338)	0.668*** (0.0337)	0.653*** (0.0337)	0.652*** (0.0337)	0.730*** (0.0360)	0.730*** (0.0359)
CEOD	-0.309** (0.157)	-0.303* (0.157)	-0.304* (0.157)	-0.299* (0.157)	-0.229 (0.155)	-0.224 (0.155)	-0.612* (0.330)	-0.600* (0.330)	-0.593* (0.331)	-0.583* (0.330)	-0.305 (0.325)	-0.293 (0.325)
BT	2.281*** (0.146)	2.283*** (0.146)	2.286*** (0.146)	2.288*** (0.146)	2.110*** (0.146)	2.112*** (0.146)	4.830*** (0.290)	4.834*** (0.290)	4.833*** (0.290)	4.837*** (0.290)	4.368*** (0.287)	4.372*** (0.287)
EC	-1.591*** (0.0616)	-1.590*** (0.0616)	-1.589*** (0.0618)	-1.589*** (0.0618)	-1.444*** (0.0620)	-1.444*** (0.0620)	-2.866*** (0.109)	-2.863*** (0.109)	-2.844*** (0.109)	-2.842*** (0.109)	-2.730*** (0.111)	-2.729*** (0.111)
TMTE	0.351 (0.429)	0.364 (0.429)	0.381 (0.428)	0.390 (0.427)	0.419 (0.423)	0.428 (0.423)	-0.546 (0.968)	-0.523 (0.967)	-0.345 (0.968)	-0.329 (0.968)	-0.208 (0.957)	-0.190 (0.956)
ACI	0.00697** (0.00324)	0.00685** (0.00324)	0.00698** (0.00323)	0.00686** (0.00323)	0.00528* (0.00317)	0.00517 (0.00317)	0.00657 (0.00647)	0.00635 (0.00647)	0.00686 (0.00645)	0.00665 (0.00645)	0.00355 (0.00634)	0.00333 (0.00634)
GDP	0.155*** (0.00917)	0.155*** (0.00917)	0.0233 (0.0198)	0.0232 (0.0198)	0.0230 (0.0198)	0.0230 (0.0198)	0.377*** (0.0203)	0.377*** (0.0203)	0.0367 (0.0426)	0.0366 (0.0426)	0.0360 (0.0425)	0.0359 (0.0425)
SDG13XEMTGMTGENXBGEN		0.000511*** (0.000197)		0.000488** (0.000197)		0.000461** (0.000197)		0.000959** (0.000414)		0.000868** (0.000413)		0.000919** (0.000413)
Constant	6.301*** (1.159)	6.384*** (1.159)	6.567*** (1.180)	6.652*** (1.180)	6.764*** (1.250)	6.854*** (1.251)	5.483** (2.251)	5.622** (2.252)	5.909*** (2.275)	6.045*** (2.276)	10.66*** (2.466)	10.83*** (2.467)
Year Effects	NO	NO	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES
Industry Effects	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES
R-square	0.277	0.278	0.278	0.279	0.315	0.315	0.249	0.250	0.250	0.251	0.294	0.295
Observations	32,241	32,241	32,241	32,241	32,241	32,241	31,336	31,336	31,336	31,336	31,336	31,336
Number of Firm	9,514	9,514	9,514	9,514	9,514	9,514	9,356	9,356	9,356	9,356	9,356	9,356

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

4.3. Robustness checks

In this section, we perform sensitivity tests to assess the robustness of our main findings. First, we employ a two-step system generalized method of moments (GMM) developed by Arellano & Bond (1991) and Blundell & Bond (1998) to address the potential endogeneity issue. Table 9 reports the results regarding endogeneity.

Table 9. Addressing endogeneity issue: System GMM

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROE	(7) ROE	(8) ROE	(9) ROE	(10) ROE
L.ROA	0.256*** (0.0266)	0.260*** (0.0329)	0.197*** (0.0469)	0.144*** (0.0400)	0.171*** (0.0427)					
L.ROE						0.226*** (0.0244)	0.242*** (0.0243)	0.189*** (0.0353)	0.158*** (0.0315)	0.186*** (0.0377)
SDG13	11.71** (5.783)	13.62** (6.081)	25.20*** (6.048)	8.918** (3.872)	17.14*** (4.485)	18.64** (9.454)	1.354 (9.000)	26.28*** (9.671)	4.287 (6.484)	25.52*** (8.159)
TMTGEN	0.237** (0.113)	0.370** (0.149)		0.0977 (0.0606)	0.0814 (0.0704)	0.393** (0.190)	0.0229 (0.235)		0.0160 (0.110)	0.0149 (0.112)
SDG13XTMTGEN	0.658** (0.318)					1.059** (0.517)				
BGEN		1.161*** (0.339)			0.379** (0.179)		0.282 (0.493)			0.157 (0.336)
SDG13XTMTGENXBGEN		-0.0250** (0.0112)					0.00374 (0.0168)			
EMT			77.74*** (16.51)	66.06*** (14.35)	73.49*** (15.01)			125.2*** (27.28)	104.4*** (24.17)	122.6*** (28.22)
SDG13XEMT			68.89*** (17.74)					67.15** (28.20)		
SDG13XEMTXTMTGEN				1.116* (0.612)					0.0906 (1.011)	
SDG13XEMTXTMTGENXBGEN					1.640*** (0.481)					2.374*** (0.873)
SIZE	0.924* (0.497)	1.899*** (0.682)	4.055*** (0.863)	3.238*** (0.796)	4.380*** (0.817)	2.670*** (0.896)	2.211*** (0.855)	8.172*** (1.630)	7.662*** (1.580)	8.391*** (1.556)
LEV	-0.173*** (0.0127)	-0.153*** (0.0158)	-0.186*** (0.0237)	-0.194*** (0.0194)	-0.196*** (0.0214)	-0.426*** (0.0262)	-0.411*** (0.0250)	-0.469*** (0.0392)	-0.482*** (0.0401)	-0.480*** (0.0426)
CE	0.188*** (0.0329)	0.248*** (0.0506)	0.273*** (0.0631)	0.317*** (0.0598)	0.292*** (0.0610)	0.515*** (0.0671)	0.511*** (0.0644)	0.541*** (0.102)	0.550*** (0.101)	0.582*** (0.113)
CEOD	-0.709** (0.346)	0.299 (0.531)	-1.549* (0.817)	-0.604 (0.617)	-1.070 (0.742)	-1.530** (0.690)	-1.094 (0.733)	-2.498* (1.283)	-1.381 (1.120)	-2.379* (1.390)
BT	-0.249 (0.345)	-4.597*** (1.448)	2.765*** (1.066)	2.554*** (0.873)	0.668 (1.064)	-0.678 (0.685)	-1.523 (2.202)	4.266*** (1.649)	3.684** (1.538)	2.315 (2.003)
EC	-0.688*** (0.127)	-0.896*** (0.165)	-0.906*** (0.196)	-0.873*** (0.164)	-0.989*** (0.178)	-1.339*** (0.227)	-1.211*** (0.225)	-1.681*** (0.304)	-1.691*** (0.284)	-1.806*** (0.325)
TMTE	0.720 (0.650)	-1.089 (1.091)	-3.012* (1.640)	-2.634** (1.266)	-3.401** (1.501)	-0.543 (1.315)	-1.345 (1.226)	-6.068** (2.600)	-4.678** (2.259)	-6.757** (2.907)
ACI	0.00453 (0.00921)	0.0128 (0.0135)	0.0111 (0.0182)	0.00123 (0.0153)	0.00856 (0.0180)	0.00185 (0.0164)	0.00843 (0.0148)	0.0203 (0.0273)	0.0169 (0.0264)	0.0103 (0.0325)
GDP	0.0396 (0.0262)	0.00224 (0.0368)	0.0497 (0.0493)	0.0568 (0.0417)	0.0766 (0.0475)	0.0528 (0.0564)	0.0283 (0.0524)	0.0782 (0.0790)	0.0795 (0.0784)	0.112 (0.0902)
AR (1) (<i>p</i> -value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2) (<i>p</i> -value)	0.501	0.504	0.503	0.507	0.611	0.645	0.628	0.504	0.522	0.566
Hansen test (<i>p</i> -value)	0.392	0.396	0.400	0.403	0.402	0.522	0.501	0.501	0.504	0.503
Number of instruments	56	56	56	56	56	56	56	56	56	56
Observations	22,422	22,422	22,421	22,421	22,421	21,456	21,456	21,455	21,455	21,455
Number of Firm	8,142	8,142	8,141	8,141	8,141	7,860	7,860	7,859	7,859	7,859

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

The results from the system GMM (in Table 9) are similar to those reported in Tables 4 to 8, indicating the robustness of our main findings to endogeneity.

Table 10. Impacts of climate change initiatives, environment management training and top management team gender diversity on firm performance.

VARIABLES	(1) ROA	(2) ROA	(3) ROE	(4) ROE	(5) ROA	(6) ROA	(7) ROE	(8) ROE	(9) ROA	(10) ROA	(11) ROE	(12) ROE
EPScore	0.00922*** (0.00230)	0.00558** (0.00279)	0.0251*** (0.00500)	0.0148** (0.00633)	0.0111*** (0.00245)	0.00161 (0.00327)	0.0281*** (0.00539)	0.00956 (0.00704)	0.0108*** (0.00245)	0.00873*** (0.00265)	0.0271*** (0.00540)	0.0243*** (0.00588)
TMTGEN	0.0105*** (0.00377)	0.00239 (0.00620)	0.0301*** (0.00797)	0.00718 (0.0124)					0.0105*** (0.00378)	0.00782* (0.00414)	0.0300*** (0.00798)	0.0263*** (0.00867)
EMT					0.182 (0.111)	0.526*** (0.203)	0.202 (0.242)	1.183*** (0.416)	0.180 (0.111)	0.0272 (0.136)	0.202 (0.242)	0.00804 (0.292)
EPScoreXTMTGEN		0.000231** (0.000114)		0.000654*** (0.000248)								
EPScoreXEMT						0.0174*** (0.00386)		0.0343*** (0.00844)				
EPScoreXEMTXTMTGEN										0.000222* (0.000115)		0.000308 (0.000258)
SIZE	0.455*** (0.0420)	0.457*** (0.0419)	0.926*** (0.0766)	0.930*** (0.0765)	0.448*** (0.0422)	0.442*** (0.0419)	0.905*** (0.0769)	0.897*** (0.0766)	0.454*** (0.0422)	0.452*** (0.0421)	0.918*** (0.0770)	0.916*** (0.0769)
LEV	-0.109*** (0.00460)	-0.109*** (0.00460)	-0.240*** (0.0102)	-0.240*** (0.0102)	-0.109*** (0.00461)	-0.109*** (0.00460)	-0.240*** (0.0102)	-0.240*** (0.0102)	-0.109*** (0.00461)	-0.109*** (0.00460)	-0.240*** (0.0102)	-0.240*** (0.0102)
CE	0.351*** (0.0150)	0.351*** (0.0150)	0.746*** (0.0302)	0.745*** (0.0302)	0.350*** (0.0151)	0.351*** (0.0151)	0.745*** (0.0303)	0.746*** (0.0302)	0.351*** (0.0151)	0.351*** (0.0151)	0.746*** (0.0303)	0.746*** (0.0302)
CEOD	-0.295** (0.126)	-0.296** (0.126)	-0.458* (0.271)	-0.463* (0.271)	-0.306** (0.127)	-0.292** (0.127)	-0.497* (0.270)	-0.461* (0.270)	-0.300** (0.127)	-0.296** (0.127)	-0.487* (0.270)	-0.481* (0.270)
BT	1.509*** (0.123)	1.510*** (0.123)	3.076*** (0.250)	3.075*** (0.250)	1.500*** (0.124)	1.506*** (0.124)	3.074*** (0.251)	3.078*** (0.251)	1.508*** (0.124)	1.513*** (0.124)	3.086*** (0.251)	3.092*** (0.251)
EC	-1.028*** (0.0496)	-1.029*** (0.0496)	-1.980*** (0.0919)	-1.982*** (0.0919)	-1.034*** (0.0498)	-1.036*** (0.0497)	-1.991*** (0.0924)	-1.988*** (0.0923)	-1.034*** (0.0498)	-1.035*** (0.0498)	-1.990*** (0.0924)	-1.991*** (0.0924)
TMTE	0.467* (0.248)	0.471* (0.248)	0.347 (0.562)	0.358 (0.561)	0.498** (0.249)	0.515** (0.249)	0.407 (0.564)	0.438 (0.562)	0.504** (0.249)	0.510** (0.249)	0.419 (0.564)	0.428 (0.564)
ACI	0.00650** (0.00265)	0.00648** (0.00265)	0.00261 (0.00546)	0.00261 (0.00546)	0.00616** (0.00265)	0.00592** (0.00264)	0.00182 (0.00544)	0.00130 (0.00543)	0.00650** (0.00265)	0.00643** (0.00265)	0.00281 (0.00544)	0.00272 (0.00544)
GDP	0.0177 (0.0169)	0.0179 (0.0169)	0.0378 (0.0364)	0.0384 (0.0364)	0.0179 (0.0169)	0.0183 (0.0169)	0.0368 (0.0365)	0.0374 (0.0365)	0.0182 (0.0170)	0.0186 (0.0170)	0.0375 (0.0365)	0.0379 (0.0365)
Constant	2.746*** (1.061)	2.842*** (1.064)	3.936* (2.060)	4.213** (2.064)	2.929*** (1.064)	3.464*** (1.062)	4.666** (2.068)	5.615*** (2.075)	2.656** (1.070)	2.811*** (1.069)	3.941* (2.079)	4.149** (2.083)
Year Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-square	0.295	0.296	0.278	0.279	0.294	0.299	0.277	0.280	0.295	0.296	0.278	0.279
Observations	50,376	50,376	49,007	49,007	50,143	50,143	48,786	48,786	50,125	50,125	48,768	48,768
Number of Firm	9,668	9,668	9,552	9,552	9,667	9,667	9,549	9,549	9,667	9,667	9,549	9,549

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Second, we use an alternative measure of climate change initiatives, the environment pillar score (EPScore). Tables 10 and 11 report the results regarding EPScore models.

Table 11. Impacts of climate change initiatives, environment management training, top management team gender diversity, and board gender diversity on firm performance

VARIABLES	(1) ROA	(2) ROA	(3) ROE	(4) ROE	(5) ROA	(6) ROA	(7) ROE	(8) ROE
EPScore	0.00734*** (0.00233)	0.00579** (0.00244)	0.0190*** (0.00507)	0.0138** (0.00545)	0.00885*** (0.00248)	0.00734*** (0.00257)	0.0207*** (0.00548)	0.0187*** (0.00572)
TMTGEN	0.00716* (0.00384)	0.00297 (0.00491)	0.0197** (0.00813)	0.00606 (0.0100)	0.00721 (0.00685)	0.00517 (0.00404)	0.0196 (0.0814)	0.0168 (0.0847)
BGEN	0.0242*** (0.00422)	0.0218*** (0.00453)	0.0695*** (0.00881)	0.0614*** (0.00947)	0.0240*** (0.00425)	0.0227*** (0.00428)	0.0694*** (0.00883)	0.0677*** (0.00894)
EMT					0.172 (0.110)	0.0554 (0.125)	0.176 (0.242)	0.0208 (0.270)
EPScoreXTMTGENXBGEN		0.773*** (0.166)		0.285** (0.141)				
EPScoreXEMTXTMTGENXBGEN						0.804** (0.343)		0.805** (0.343)
SIZE	0.472*** (0.0423)	0.472*** (0.0423)	0.982*** (0.0770)	0.984*** (0.0770)	0.470*** (0.0425)	0.468*** (0.0425)	0.974*** (0.0774)	0.972*** (0.0773)
LEV	-0.110*** (0.00460)	-0.110*** (0.00460)	-0.242*** (0.0101)	-0.242*** (0.0101)	-0.110*** (0.00460)	-0.110*** (0.00460)	-0.242*** (0.0102)	-0.241*** (0.0102)
CE	0.351*** (0.0150)	0.351*** (0.0150)	0.748*** (0.0302)	0.747*** (0.0302)	0.351*** (0.0151)	0.351*** (0.0151)	0.748*** (0.0303)	0.748*** (0.0302)
CEOD	-0.299** (0.126)	-0.301** (0.126)	-0.466* (0.270)	-0.475* (0.270)	-0.304** (0.127)	-0.300** (0.127)	-0.496* (0.270)	-0.491* (0.270)
BT	1.559*** (0.124)	1.564*** (0.124)	3.214*** (0.251)	3.225*** (0.251)	1.557*** (0.124)	1.562*** (0.124)	3.223*** (0.251)	3.230*** (0.251)
EC	-1.025*** (0.0495)	-1.026*** (0.0495)	-1.972*** (0.0917)	-1.973*** (0.0916)	-1.031*** (0.0498)	-1.032*** (0.0498)	-1.982*** (0.0922)	-1.984*** (0.0922)
TMTE	0.483* (0.248)	0.489** (0.248)	0.398 (0.560)	0.414 (0.560)	0.520** (0.249)	0.525** (0.249)	0.470 (0.561)	0.478 (0.561)
ACI	0.00714*** (0.00265)	0.00709*** (0.00265)	0.00445 (0.00545)	0.00429 (0.00545)	0.00713*** (0.00265)	0.00706*** (0.00265)	0.00465 (0.00543)	0.00456 (0.00543)
GDP	0.0177 (0.0169)	0.0177 (0.0169)	0.0376 (0.0365)	0.0378 (0.0365)	0.0182 (0.0170)	0.0184 (0.0170)	0.0373 (0.0366)	0.0375 (0.0366)
Constant	1.940* (1.080)	2.018* (1.082)	1.541 (2.088)	1.798 (2.092)	1.864* (1.088)	2.007* (1.089)	1.570 (2.105)	1.759 (2.109)
Year Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry Effects	YES	YES	YES	YES	YES	YES	YES	YES
R-square	0.298	0.298	0.282	0.283	0.297	0.298	0.283	0.283
Observations	50,374	50,374	49,005	49,005	50,123	50,123	48,766	48,766
Number of Firm	9,668	9,668	9,552	9,552	9,667	9,667	9,549	9,549

Note: Robust standard errors are reported in parentheses. All standard errors are clustered at the firm-level. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Overall, the results corroborate the main findings and indicate that our findings are robust to the inclusion of alternative measures of climate change initiatives.

5. Conclusion

The global climate is undergoing significant changes, leading to major economic and social impacts, which have drawn increasing attention from academics, practitioners, policymakers, and regulators in recent decades. However, there is scarce evidence on the role of corporate governance mechanisms, such as gender diversity at the TMT and board levels, in addressing the impact of diversity both at the TMT and board level, along with the role of environmental management training on the climate change initiatives taken by the organization and its overall performance. Our study aimed to address this lacuna by empirically investigating the interrelationships among gender diversity at the TMT and board levels, climate change initiatives, EMT, and firm performance based on a dataset of 117,410 firm-year observations spanning five regions, 11 industries, and 71 countries from 2013 to 2022. Drawing on the Resource-Based View Theory and Upper Echelon Theory, our study offers several new contributions to the existing literature.

First, it extends the existing literature ([Danso et al., 2019](#); [Orazalin et al., 2024](#); [Ozkan et al., 2023](#)) by suggesting that the actual climate change initiatives taken by the organization enhance its overall performance. Second, our findings provide new evidence that gender diversity at both the board and TMT levels moderates the relationship between climate change initiatives and firm performance (the trickle-down effect), suggesting that organizations can appoint female directors with the expectation that this will lead to increased female executive representation. Third, this study examines the role of EMT as a moderating variable to address the scarcity of research on climate change initiatives. It provides a unique contribution by exploring EMT as a key factor in firm performance, specifically within the context of both developed and underdeveloped countries. Additionally, the study deepens understanding of how gender-diverse boards and top management teams influence EMT, ultimately enhancing organizational performance in the context of climate change. Finally, our study offers important practical and social implications for climate change initiatives, offering insights that

policymakers and organizations can craft programs and policies to promote gender diversity and strengthen sustainability practices, ultimately improving organizational performance.

Our study has two limitations that future research should explicitly address. First, it focuses on global firms with publicly traded shares in various stock markets, which may limit the generalizability of the findings to small and medium-sized enterprises (SMEs). Future research could offer valuable insights by exploring whether these relationships also apply to SMEs and non-publicly traded firms. Second, our analysis focuses on data related to climate change initiatives, environmental management training, and the financial performance of the sampled firms without considering non-financial information that might reflect actual practices and performance. To address this gap, future studies could conduct in-depth case studies and interviews with executives, board members, investors, and other stakeholders to gain new insights into climate change initiatives.

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Appendix A.

Table A1. Sample distribution by country.

Sr. #	Country	Firm-year observations	Percent	Cum.
1	Argentina	580	0.49	0.49
2	Australia	4,020	3.42	3.92
3	Austria	310	0.26	4.18
4	Bahrain	210	0.18	4.36
5	Belgium	490	0.42	4.78
6	Brazil	1,310	1.12	5.89
7	Bulgaria	20	0.02	5.91
8	Canada	4,270	3.64	9.55
9	Chile	460	0.39	9.94
10	China	10,400	8.86	18.8
11	Colombia	230	0.2	18.99
12	Cyprus	10	0.01	19
13	Czech Republic	30	0.03	19.03
14	Denmark	640	0.55	19.57
15	Egypt	350	0.3	19.87
16	Finland	740	0.63	20.5
17	France	1,970	1.68	22.18
18	Germany	2,860	2.44	24.61
19	Greece	260	0.22	24.84
20	Hong Kong	3,500	2.98	27.82
21	Hungary	70	0.06	27.88
22	Iceland	80	0.07	27.94
23	India	7,140	6.08	34.03
24	Indonesia	860	0.73	34.76
25	Ireland; Republic of	140	0.12	34.88
26	Israel	150	0.13	35.01
27	Italy	1,310	1.12	36.12
28	Japan	5,010	4.27	40.39
29	Jordan	80	0.07	40.46
30	Kazakhstan	40	0.03	40.49
31	Kenya	20	0.02	40.51
32	Korea; Republic (S. Korea)	1,720	1.46	41.97
33	Kuwait	230	0.2	42.17
34	Lebanon	10	0.01	42.18
35	Luxembourg	20	0.02	42.19
36	Malaysia	3,570	3.04	45.23
37	Mauritius	10	0.01	45.24
38	Mexico	990	0.84	46.09
39	Morocco	460	0.39	46.48

40	Netherlands	580	0.49	46.97
41	New Zealand	580	0.49	47.47
42	Nigeria	60	0.05	47.52
43	Norway	940	0.8	48.32
44	Oman	110	0.09	48.41
45	Pakistan	110	0.09	48.51
46	Peru	330	0.28	48.79
47	Philippines	380	0.32	49.11
48	Poland	420	0.36	49.47
49	Portugal	160	0.14	49.6
50	Qatar	480	0.41	50.01
51	Romania	100	0.09	50.1
52	Russia	530	0.45	50.55
53	Saudi Arabia	690	0.59	51.14
54	Singapore	920	0.78	51.92
55	Slovak Republic	20	0.02	51.94
56	Slovenia	30	0.03	51.96
57	South Africa	1,180	1.01	52.97
58	Spain	710	0.6	53.57
59	Sri Lanka	10	0.01	53.58
60	Sweden	3,250	2.77	56.35
61	Switzerland	1,830	1.56	57.91
62	Taiwan	1,850	1.58	59.48
63	Thailand	1,780	1.52	61
64	Tunisia	10	0.01	61.01
65	Turkey	1,160	0.99	62
66	Uganda	30	0.03	62.02
67	United Arab Emirates	840	0.72	62.74
68	United Kingdom	6,550	5.58	68.32
69	United States of America	36,930	31.45	99.77
70	Vietnam	260	0.22	99.99
71	Zimbabwe	10	0.01	100
Total		117,410	100	

Table A2. Sample distribution by region and industry.

Panel A: Sample distribution by region.

Sr. #	Region	Firm-year observations	Percent	Cum.
1	Africa	2,130	1.81	1.81
2	America	45,100	38.41	40.23
3	Asia	41,510	35.35	75.58
4	Europe	24,070	20.5	96.08
5	Oceania	4,600	3.92	100
	Total	117,410	100	

Panel B: Sample distribution by industry.

Sr. #	Industry	Firm-year observations	Percent	Cum.
1	Basic Materials	9,900	8.43	8.43
2	Consumer Discretionary	17,320	14.75	23.2
3	Consumer Staples	7,150	6.09	29.3
4	Energy	5,620	4.79	34.1
5	Financials	17,710	15.08	49.1
6	Health Care	13,100	11.16	60.3
7	Industrials	21,010	17.89	78.2
8	Real Estate	7,640	6.51	84.7
9	Technology	10,730	9.14	93.8
10	Telecommunications	3,070	2.61	96.5
11	Utilities	4,160	3.54	100
	Total	117,410	100	