# CLIMATE GOVERNANCE, GROWTH OPPORTUNITIES, AND INNOVATION IN ADDRESSING CLIMATE CHANGE: EMPIRICAL EVIDENCE FROM EMERGING COUNTRIES

Isabel-María García-Sanchez[a], Beatriz Aibar-Guzman[b], Nicola Raimo[c]*, Filippo Vitolla[c], Giovanni Schiuma[d]

a Instituto Multidisciplinar de Empresa – IME, Universidad de Salamanca. Campus Miguel de Unamuno, Edificio FES. 37007 Salamanca, Spain

b Departamento de Economía Financiera y Contabilidad, Facultad de Ciencias Econ´ omicas y Empresariales. Universidad de Santiago de Compostela. Av. Burgo, s/n 15782. Santiago Compostela, Spain

c Department of Management, Finance and Technology, LUM University, Casamassima, Bari, Italy

d Department of Engineering, LUM University, Casamassima, Bari, Italy

**Abstract**

Emerging economies are often more vulnerable to the impacts of global warming, experiencing devastating floods and a collapse in agricultural production. This study, under the lens of resource dependence theory, aims to determine the role climate governance and growth opportunities in driving the adoption of climate change mitigation initiatives by the leading listed companies in the 28 most important emerging economies from 2013 to 2022. The results indicate that climate governance mechanisms facilitate the development of innovative solutions to fight climate change. However, further efforts are required to mitigate the negative effects of growth opportunities and disruptive events.

**Keywords**: Climate change; Climate governance; Growth opportunities; Innovation; Emerging countries; Resource dependence theory

## 1. Introduction

The impact of climate change on the global economy remains a prominent topic in both academic and policy discussions. Evidence suggests that human activities are driving climate change, which poses a significant threat to global sustainable development and inclusive growth in the medium and long term (Abidoye & Odusola, 2015; Du et al., 2017). The Intergovernmental Panel on Climate Change (2023) has also emphasized the economic costs associated with rising temperatures caused by climate change.

These costs are particularly pronounced in emerging and developing economies due to their heavy reliance on sectors such as forestry, agriculture, and tourism, which are highly vulnerable to changes in climate conditions (Wade & Jennings, 2015). According to Afrifa et al. (2020), for each one-degree Celsius increase in temperature, an emerging country could experience a decline in economic growth of approximately 1.3 percentage points. As a result, the urgent expansion of low-carbon and climate-resilient infrastructure is essential for achieving climate objectives, fostering sustainable development, and promoting inclusive economic growth (Bak et al., 2017).

An encouraging approach to mitigating the adverse impacts of climate change involves embracing advanced, environmentally friendly technologies (Afrifa et al., 2020). These innovations, which span a broad set of investments, include management system technologies, green design technologies, eco-efficiency technologies, pollution control technologies, and low-carbon energy technologies (Wang et al., 2018). Climate change innovation spans all stages of business operations, from green building initiatives and energy-efficient resource use to clean technologies in production processes (García-Sánchez et al., 2023a). It also concerns the adoption of waste technologies for recycling, the development of eco-friendly products, the promotion of sustainable land use and sustainable mobility for work-related travel (García-Sánchez et al., 2023a). Such innovations help reduce emissions, mitigate the consequences of climate change, and generate greater climate knowledge (PwC, 2021).

Consequently, governments and organizations worldwide, spurred by diverse stakeholder demands, have prioritized investments in low-carbon and climate-resilient infrastructure as part of their innovation agendas (Aibar-Guzmán et al., 2024).

Introducing innovations to combat climate change has garnered significant academic interest. Nevertheless, the factors influencing innovation remain underexplored. This study seeks to address this critical gap by examining the impact of two pivotal elements: climate governance and growth opportunities.

In this context, there is a growing imperative to incorporate climate considerations into governance processes, mechanisms, and structures, enhancing companies' capacity to address the risks and opportunities linked to climate change (Aibar-Guzmán et al., 2024). Notably, climate governance has emerged as a pivotal aspect, reflecting companies' commitment to sustainability (Bui et al., 2020), while balancing the long-term implications of climate change with short-term objectives (Luo & Tang, 2021). Moreover, growth opportunities encompass various pathways for a company to expand, evolve, and improve its performance (Audretsch, 1995). Consequently, they could represent key factors in fostering climate-friendly innovations.

The remainder of this article is structured as follows: Section 2 introduces the theoretical framework, Section 3 outlines the research methodology, Section 4 presents the findings, and Section 5 provides the conclusions.

## 2. Theoretical framework

Numerous studies have explored innovation aimed at combating climate change (Matos et al., 2022), focusing primarily on the challenges, opportunities, and trade-offs involved (Pinkse & Kolk, 2010), as well as the role of policy frameworks (Gans, 2012). However, the determinants of climate change innovation remain an under-researched area, with only a limited number of contributions (Su & Moaniba, 2017), and insufficient attention has been given to the influence of corporate governance mechanisms. In this regard, García-Sánchez et al. (2023a) found that companies with higher female board representation are more proactive in investing in climate change innovation. Despite its relevance (Bui et al., 2020), the role of climate governance itself remains largely unexplored.

In line with previous contributions (García-Sánchez et al., 2023a), this study applies Resource Dependence Theory (RDT) to frame the research hypotheses concerning the impact of climate governance and growth opportunities on the implementation of innovation projects aimed at combating climate change. Originally developed by Pfeffer and Salancik (1978), RDT views organizations as open systems whose survival depends on their ability to secure access to external resources (Hillman & Dalziel, 2003; Hillman et al., 2009). According to this theory, organizations do not operate in isolation but are embedded in a broader environment from which they must acquire critical resources, such as capital, information, and legitimacy, to ensure long-term success (Hillman & Dalziel, 2003). RDT emphasizes that organizations adopt various strategies to reduce uncertainty and manage their dependence on external actors. These strategies may include forming alliances, diversifying resource suppliers, and implementing governance structures to better manage the flow of essential resources (Hillman et al., 2000; Wang & Liu, 2021).

In this context, corporate governance mechanisms, including climate governance, play a crucial role in helping organizations manage their dependence on external resources and reduce uncertainty (García-Sánchez et al., 2023a). Climate governance refers to the integration of climate change considerations into corporate governance structures and practices (Bui et al., 2020). This includes assigning climate change responsibilities to the board of directors, often through the establishment of specialized committees focused on environmental issues (Principale & Pizzi, 2023; Aibar-Guzmán et al., 2024). Key elements of climate governance also involve linking executive and director incentives to climate-related targets, establishing comprehensive environmental policies, and enhancing transparency through improved climate-related disclosures to both internal and external stakeholders (Bui et al., 2020; Haque & Ntim, 2020; Aibar-Guzmán et al., 2024).

According to RDT, climate governance allows firms to signal to external stakeholders their commitment to addressing climate change, thereby enhancing their access to critical resources such as capital and market opportunities (Bui et al., 2020). This, in turn, fosters environmental consciousness and stakeholder engagement (Konadu et al., 2022), while equipping companies with strategic capabilities to tackle climate change (Haque & Ntim, 2020). Moreover, climate governance inherently provides companies with unique and valuable assets, positioning them favorably to confront challenges related to climate change (Konadu et al., 2022; Luo & Tang, 2021). Additionally, climate governance ensures that companies align their internal policies and strategies with external demands, such as regulatory requirements, stakeholder expectations, and market conditions (Albitar et al., 2023). By integrating climate governance into their corporate structures, firms can effectively manage the risks associated with environmental challenges while also leveraging opportunities for innovation (Bui et al., 2020). In particular, effective climate governance enables firms to integrate climate change-related risks and opportunities into their strategic planning, risk management, and decision-making processes (Bui et al., 2020). From this perspective, the presence of climate governance can increase a firm's ability and propensity to engage in eco-innovation (Haque, 2017), which needs to be driven by both internal and external knowledge and resources (Marzucchi and Montresor, 2017). It also could encourage the development of innovative solutions to combat climate change. Therefore, in light of this, the following hypothesis can be introduced:

**H1: Climate governance mechanisms have a positive impact on the implementation of innovation projects aimed at combating climate change**

Additionally, growth opportunities can foster innovation within a firm (Audretsch, 1995). They refer to a firm's potential to increase overall revenues and expand operations by exploring new markets, developing innovative products, or improving existing services (David et al., 2006). From a Resource Dependence Theory (RDT) perspective, growth opportunities serve as a crucial mechanism through which firms can access critical external resources, such as new technologies, markets, and capital (Hillman & Dalziel, 2003), thereby reducing their dependence on existing, often limited, resources. RDT posits that firms must actively manage and diversify their resource base to ensure survival and competitiveness in dynamic environments (Hillman & Dalziel, 2003). In the presence of significant growth opportunities, companies often allocate resources toward strategic initiatives such as research and development (R&D), capital investments, or market expansion (Goyal, 2023). According to Mueller (1967, p.73), "the faster a firm's sales are increasing, the more confidence it will have about its ability to secure the benefits from uncertain R&D projects, and the more patience it can afford to show in waiting for these benefits". In other words, the faster a company's sales grow, the greater the economic reward and corresponding incentive to engage in innovative activities. In the context of climate change, growth opportunities can influence how firms prioritize sustainable innovation and integrate environmental considerations into their long-term business strategies. Specifically, greater growth opportunities may drive the development of innovative solutions aimed at addressing climate change, as companies seek to capitalize on new technologies that promote sustainability. Therefore, in light of this, the following hypothesis can be introduced:

**H2: Growth opportunities have a positive impact on the implementation of innovation projects aimed at combating climate change.**

According to RDT, climate governance mechanisms have the potential to enhance the impact of growth opportunities on the implementation of innovative projects. When a company faces promising growth prospects, climate governance can provide additional resources and capabilities (Aibar-Guzmán et al., 2024) necessary for the development and implementation of such projects, ensuring access to dedicated financing and the creation of strategic partnerships (Vitolla et al., 2020). Moreover, in line with RDT, in the presence of favorable growth prospects, climate governance mechanisms may help mitigate the risks (Aibar-Guzmán et al., 2024) associated with innovation, thereby increasing companies' willingness to address climate change through innovative initiatives. Therefore, in light of this, the following hypothesis can be introduced:

**H3: Climate governance mechanisms strengthen the impact of growth opportunities on the implementation of innovation projects aimed at combating climate change.**

Figure 1 represents the research hypotheses in accordance with the previous theoretical framework.

Figure 1

## 3. Methodology

According to previous literature in the field (Aibar-Guzmán et al., 2023; 2024; García-Sánchez et al., 2023a), the research hypotheses are tested by estimating a dependency model, as presented in Equation 1 below. The effect of $\beta_1 > 0$ tests H1, while the impact of $\beta_2 < 0$ tests H2. Finally, $\beta_3$ tests the moderating effect of climate governance mechanisms.

$$\mathbf{CCHInno_{i,t}} = \beta_0 + \beta_1 \mathrm{ClimateGov}_{i,t} + \beta_2 \mathrm{GrowthOpp}_{i,t} + \beta_3 \mathrm{ClimateGov} * \mathrm{GrowthOpp}_{i,t} + \sum_{j=4}^{25} \beta_j \mathrm{Control}_{it} + \varepsilon_{it} + \eta_i \quad \text{[Equation 1]}$$

The solutions and actions to combat climate change are diverse and closely linked to innovation and technology. According to García-Sánchez et al. (2023a), the CCHInno variable represents a score ranging from 0 and 7, calculated by summing dummy variables that indicate whether a company has implemented (value 1) or not (value 0) the following solutions: (1) pollution-control equipment and other green innovations in buildings; (2) projects for sustainable land use; (3) technologies and systems for reducing material and energy consumption and improving efficiency; (4) clean technologies in planning and production processes; (5) waste technologies for resource recycling; (6) production of environmentally responsible products; and (7) promotion of sustainable mobility. These initiatives involve various technologies and innovations that help reduce emissions and mitigate climate change (Wang et al., 2018; PwC, 2021).

Following Bui et al. (2020), García-Sánchez et al. (2023b), and Aibar-Guzmán et al. (2024), the ClimateGov variable is constructed as a score ranging from 0 to 6, based on the presence (value 1) or absence (value 0) of the following climate governance mechanisms: (i) an emissions policy for combating climate change (POL); (2) an environment management team (EMT); (3) a sustainability committee on the board (BCOM); (4) an ESG compensation policy (CMP); (5) executive compensation associated with ESG performance (EXE); and (6) public information on climate change that adheres to international standards and has been verified by an assurer (ASSU).

The GrowthOpp variable is measured using the market-to-book ratio (Chen & Zhao, 2006). Emerging markets offer significant growth potential due to their size and the business opportunities they present.

Three sets of control variables are included to avoid biases in the estimates: (i) firm-specific factors, including investment in capital, R&D, and advertising, measured by the annual investment effort in each category. Additionally, the presence of strategic investors is controlled for by considering the percentage of shares they hold; (ii) board-specific factors, including activity (number of annual board meetings), independence (proportion of independent directors), gender diversity (proportion of female directors), skills (proportions of directors with specific expertise) and duality (dummy variable with value of 1 if the CEO is also the chair of the board, and 0 otherwise); and (iii) macro-level factors, including disruptive events (dummy variable with value of 1 for the 2019-2022 period, and 0 for other years) and geographic regions, represented by dummies for ASIA, EUROPE, LATINAMERICA and AFRICA dummies. MIDDLEEAST is omitted to avoid collinearity issues. These categorical variables take a value of 1 when the country belongs to the specified geographic region, and 0 otherwise. The effects of country, industry, and year are also controlled for.

Following the recommendations of Hair et al. (2018), the ordinal nature of the dependent variable necessitates the use of ordinal regressions for panel data. However, to ensure the robustness of the results, Equation 1 is also estimated using linear regressions with fixed and random effects. A time lag is applied to the explanatory variables to control for endogeneity, and centered variables are used in the interaction terms to reduce multicollinearity.

The sample comprises 15,441 observations from 2,320 of the largest listed companies located in 28 emerging economies between 2013 and 2022. These large companies are under significant scrutiny regarding their environmental practices and possess the resources necessary to address new climate challenges (Aibar-Guzmán et al., 2023). The sample distribution is represented in Figure 2, allowing for the identification of the most relevant emerging markets according to the International Monetary Fund (IMF) and stock market indices such as S&P, among others. The data for the analysis are obtained from the Refinitiv database, requiring companies to be present in the panel for at least three consecutive years and to have the necessary information to estimate Equation 1. Refinitiv provides one of the most comprehensive global financial and ESG data series, facilitating the exploration and analysis of the relationships between various business decisions through econometric approaches based on historical and current panel data.

Figure 2

## 4. Results

### *4.1 Basic analysis*

Table 1 presents the descriptive statistics for the variables included in Equation 1, as well as the bivariate correlations between them. On average, companies have implemented 3 out of the 7 solutions against climate change considered in the construction of the CCHInno variable. In this sense, the average number of innovations aimed at mitigating climate change in companies located in emerging economies is slightly higher than the global average up until 2020. According to García-Sánchez et al. (2023a), large multinationals promoted 2 of the 7 initiatives analyzed during the period 2010-2020. In contrast, for the ClimateGov score, with an average of 2.58 out of a maximum of 6 points, it is observed that the development of climate governance mechanisms is slightly lower than the global average of 3.28 (Aibar-Gúzman et al., 2023).

Table 1

Table 2 presents the results of Equation 1 using the selected methodological specifications to obtain both the basic (ordinal regression) and robust (linear regression with fixed and random effects) results. Additionally, to ensure the absence of multicollinearity problems due to the interaction between ClimateGov and GrowthOpp, a model 0 is presented in which this interaction variable is omitted.

The second column of Table 2 shows the results from the estimation of Equation 1, indicating that the effect of the ClimateGov variable ($\beta_1 = 0.562 > 0$) is positive and significant at the 99% confidence level. This effect is consistent across all estimated models, ensuring the robustness of its impact under different methodological specifications. These findings support H1, confirming that the implementation of climate governance mechanisms promotes investment in business projects aimed at reducing emissions and mitigating climate change.

In contrast, the negative impact of the GrowthOpp variable ($\beta_2 = -0.0119 < 0$) on CCHInno, at the 95% confidence level, suggests that companies with greater growth opportunities are less committed to responsible environmental practices. The robust models further confirm this relationship, showing an opposite effect to that proposed in H2. In this regard, organizations such as the IMF have emphasized the need to promote policies to mobilize private capital in emerging markets and developing economies to generate a positive impact on the climate, as these regions currently account for approximately two-thirds of global greenhouse gas emissions[1].

The ClimateGov*GrowthOpp interaction ($\beta_3 = 0.00543 > 0$) has a positive and significant impact at the 95% confidence level. This result suggests that the negative effect of growth opportunities on business commitment to climate change mitigation is partially mitigated in companies that have already implemented climate governance mechanisms ($\beta_2 - \beta_3 = -0.0119 + 0.00543 =$ -0.00647 < 0). These results support the moderating effect proposed in H3. However, no reinforcing effect is observed, as the relationship for growth opportunities remains negative; the interaction merely lessens the magnitude of this negative impact.

Regarding the control variables, the empirical results show that the characteristics of companies in emerging economies that drive innovations against climate change differ slightly from those identified globally (Aibar-Guzmán et al., 2023). While these companies are linked to greater resource availability due to their size and investment capacity, in contrast to the findings of García-Sánchez et al. (2023a), the results indicate a strong association with the specific skills of the directors, but not with the presence of women on the board. Additionally, a negative trend is observed in the period 2020-2022.

Table 2

### 4.2 *Complementary analysis: disruptive events and regions' effect*

The effect observed for the Disruptive variable contrasts with empirical findings from studies of the COVID-19 period and the need for ecological transitions driven by war conflicts in other countries, particularly in Europe. In this regard, two complementary analyses are proposed to assess whether the empirical evidence from the basic analysis differs between the pre-disruptive and disruptive periods, and whether there is a regional effect based on the geographical location of the emerging economies analyzed.

For the first complementary analysis, Equation 2 is designed and presented below. This model introduces interactions between the disruptive period and the variables ClimateGov and GrowthOpp, allowing the observation of relationships across different time periods.

[1] https://www.imf.org/es/Blogs/Articles/2023/10/02/emerging-economies-need-much-more-private-financing-for-climate-transition

$$\mathbf{CChInno_{i,t}} = \beta_0 + \beta_1 \text{ClimateGov}_{i,t} + \beta_2 \text{GrowthOpp}_{i,t} + \beta_3 \text{Disruptive}_{i,t} + \beta_4 \text{ClimateGov} * \text{GrowthOpp}_{i,t} + \beta_5 \text{ClimateGov} * \text{Disruptive}_{i,t} + \beta_6 \text{GrowthOpp} * \text{Disruptive}_{i,t} + \beta_7 \text{ClimateGov} * \text{GrowthOpp} * \text{Disruptive}_{i,t} + \sum_{j=8}^{28} \beta_j \text{Control}_{it} + \varepsilon_{it} + \eta_i \text{ [Equation 2]}$$

The estimates in Table 3 confirm the positive and statistically significant effect of the variables ClimateGov ($\beta_1 = 0.875 > 0$) and ClimateGov*GrowthOpp ($\beta_4 = 0.0169 > 0$), as well as the negative effects of GrowthOpp ($\beta_2 = -0.0492 < 0$) and Disruptive ($\beta_3 = -0.988 < 0$). Regarding the interactions specified in Equation 2, the interactions GrowthOpp*Disruptive ($\beta_6 = -0.456 < 0$) and ClimateGov*GrowthOpp*Disruptive ($\beta_7 = -0.0143 < 0$) have a negative impact on the dependent variable CCHInno, significant at the 99% and 95% confidence levels, respectively. In contrast, the ClimateGov*Disruptive interaction ($\beta_5 = 0.0432 > 0$) has a positive and significant effect at 99% confidence level.

The results indicate that the implementation of climate governance mechanisms promotes an active business commitment to climate change mitigation in emerging economies, partially offsetting the negative impact of growth opportunities and the disruptive events of the 2020-2022 period on emission reduction practices. However, this moderating effect is observed only when these factors are considered individually—that is, for companies with either greater growth opportunities or during disruptive periods. The effect does not hold when both factors are combined, suggesting that climate governance mechanisms are ineffective for companies with growth opportunities during the disruptive period associated with COVID-19 and recent war conflicts.

Table 3

For the second complementary analysis, the sample is segmented into the five regions analyzed: Asia, Europe, Latin America, Africa, and the Middle East. Table 4 presents the estimation results of Equations 1 and 2 for each subsample.

In this regard, the effect of climate governance mechanisms is observed in three of the regions analyzed, while lacking significant influence in companies located in African and Middle Eastern countries. The negative impact of growth opportunities is evident in companies in Asia, Latin America, and Africa. Similarly, the adverse effects of disruptive events are found in Asia and the Middle East. Overall, the moderating effects are not significant, suggesting that they occur independently of the regional context.

Table 4

To complement the evidence on the regional context, Figure 3 presents the average business commitment to climate change and associated growth opportunities. It can be observed that Latin American firms lead in climate governance, with higher growth opportunities. In contrast, European companies demonstrate the highest levels of climate innovation, while African firms show the lowest levels of growth opportunities. Regarding overall climate commitment (in terms of governance and innovation), firms in the Middle East exhibit the greatest delay.

Figure 3

In addition, Table 5 presents the relative frequencies of companies that have implemented each climate governance component. These frequencies help identify the extent of internal climate practices, which are essential drivers of climate innovation in emerging countries.

Table 5

## 5. Conclusions

This study examined the influence of climate governance mechanisms and growth opportunities on the adoption of innovative practices to address climate change in emerging economies. The findings indicated that while climate governance mechanisms have supported the development of innovative solutions for addressing climate change, they are not sufficient on their own to fully offset the negative impacts associated with growth opportunities.

This study provides valuable contributions to the academic literature on climate change innovation. It addresses the under-explored determinants driving innovation in this field. While previous research has primarily focused on the challenges, opportunities, and policy frameworks, this study highlights the crucial role of corporate governance mechanisms and growth opportunities, which have been insufficiently examined. By analyzing the influence of these factors and their interaction on corporate investment in climate change innovation, this study fills a significant gap in the literature, especially in relation to emerging economies. In addition, this study extends the application of RDT by using it to frame the factors that influence firms' implementation of climate change innovation projects. We show that climate governance plays a key role in helping firms manage their dependence on external resources, reduce uncertainty, and signal to external stakeholders their commitment to addressing climate change, thereby improving their access to critical resources such as capital and market opportunities.

The main implication of this study is that companies should integrate climate considerations more deeply into their governance structures to enhance innovation efforts aimed at combating climate change.

While the results are robust across different methodological specifications, the disaggregated analyses at the regional level revealed significant differences in the development of climate initiatives and their relationships, reflecting varying growth opportunities across regions. In this context, future research should address the specific characteristics of geographic regions and/or individual emerging countries to provide deeper insights into the climate efforts undertaken by companies.

Furthermore, as the current analysis focused on the largest companies in these countries, future research should also explore whether these practices are prevalent among small and medium-sized enterprises (SMEs). Additionally, it would be valuable to investigate the role of growth opportunities in these relationships, taking into account the size of the companies.

## References

Abidoye, B. O., & Odusola, A. F. (2015). Climate change and economic growth in Africa: an econometric analysis. *Journal of African Economies*, 24(2), 277-301.

Afrifa, G. A., Tingbani, I., Yamoah, F., & Appiah, G. (2020). Innovation input, governance and climate change: Evidence from emerging countries. *Technological Forecasting and Social Change*, 161, 120256.

Aibar-Guzmán, B., Aibar-Guzmán, C., Piñeiro-Chousa, J. R., Hussain, N., & García-Sánchez, I. M. (2023). The benefits of climate tech: Do institutional investors affect these impacts?. *Technological Forecasting and Social Change*, 192, 122536.

Aibar-Guzmán, B., Raimo, N., Vitolla, F., & García-Sánchez, I. M. (2024). Corporate governance and financial performance: Reframing their relationship in the context of climate change. *Corporate Social Responsibility and Environmental Management*, 31(3), 1493-1509.

Albitar, K., Al-Shaer, H., & Liu, Y. S. (2023). Corporate commitment to climate change: The effect of eco-innovation and climate governance. *Research Policy*, 52(2), 104697.

Audretsch, D. B. (1995). Innovation, growth and survival. *International Journal of Industrial Organization*, 13(4), 441-457.

Bak, C., Bhattacharya, A., Edenhofer, O., & Knopf, B. (2017). Towards a comprehensive approach to climate policy, sustainable infrastructure, and finance. *Economics*, 11(1), 20170033.

Bui, B., Houqe, M. N., & Zaman, M. (2020). Climate governance effects on carbon disclosure and performance. *The British Accounting Review*, 52(2), 100880.

Chen, L., & Zhao, X. (2006). On the relation between the market-to-book ratio, growth opportunity, and leverage ratio. *Finance Research Letters*, 3(4), 253-266.

David, P., Yoshikawa, T., Chari, M. D., & Rasheed, A. A. (2006). Strategic investments in Japanese corporations: Do foreign portfolio owners foster underinvestment or appropriate investment?. *Strategic Management Journal*, 27(6), 591-600.

Du, D., Zhao, X., & Huang, R. (2017). The impact of climate change on developed economies. *Economics Letters*, 153, 43-46.

Gans, J. S. (2012). Innovation and climate change policy. American Economic Journal: *Economic Policy*, 4(4), 125-145.

García-Sánchez, I. M., Monteiro, S., Piñeiro-Chousa, J. R., & Aibar-Guzmán, B. (2023a). Climate change innovation: Does board gender diversity matter?. *Journal of Innovation & Knowledge*, 8(3), 100372.

García-Sánchez, I. M., Ali, R., & Rehman, R. U. (2023b). Is there a complementary or a substitutive relationship between climate governance and analyst coverage? Its effect on climate disclosure. *Business Strategy and the Environment*, 32(6), 3445-3464.

Goyal, L. (2023). Investments during institutional transitions: Driven by problems or opportunities?. *Asia Pacific Journal of Management*, 40(4), 1733-1768.

Hair Jr, J. F., Anderson, R. E., & Tatham, R. L. (2018). *Multivariate data analysis with readings*. Pearson Education Limited, 8$^{th}$ edition.

Haque, F. (2017). The effects of board characteristics and sustainable compensation policy on carbon performance of UK firms. *The British Accounting Review*, 49(3), 347-364.

Haque, F., & Ntim, C. G. (2020). Executive compensation, sustainable compensation policy, carbon performance and market value. *British Journal of Management*, 31(3), 525-546.

Hillman, A. J., & Dalziel, T. (2003). Boards of directors and firm performance: Integrating agency and resource dependence perspectives. *Academy of Management Review*, 28(3), 383-396.

Hillman, A. J., Cannella, A. A., & Paetzold, R. L. (2000). The resource dependence role of corporate directors: Strategic adaptation of board composition in response to environmental change. *Journal of Management Studies*, 37(2), 235-256.

Hillman, A. J., Withers, M. C., & Collins, B. J. (2009). Resource dependence theory: A review. *Journal of Management*, 35(6), 1404-1427.

Konadu, R., Ahinful, G. S., Boakye, D. J., & Elbardan, H. (2022). Board gender diversity, environmental innovation and corporate carbon emissions. *Technological Forecasting and Social Change*, 174, 121279.

Luo, L., & Tang, Q. (2021). Corporate governance and carbon performance: Role of carbon strategy and awareness of climate risk. *Accounting & Finance*, 61(2), 2891-2934.

Marzucchi, A., & Montresor, S. (2017). Forms of knowledge and eco-innovation modes: Evidence from Spanish manufacturing firms. *Ecological Economics*, 131, 208-221.

Matos, S., Viardot, E., Sovacool, B. K., Geels, F. W., & Xiong, Y. (2022). Innovation and climate change: A review and introduction to the special issue. *Technovation*, 117, 102612.

Mueller, D. C. (1967). The firm decision process: An econometric investigation. *The Quarterly Journal of Economics*, 81(1), 58-87.

Pfeffer, J., & Salancik, G. (1978). *The external control of organizations: A resource-dependence perspective*. Harper & Row: New York.

Pinkse, J., & Kolk, A. (2010). Challenges and trade-offs in corporate innovation for climate change. *Business Strategy and the Environment*, 19(4), 261-272.

Principale, S., & Pizzi, S. (2023). The determinants of TCFD reporting: A focus on the Italian context. *Administrative Sciences*, 13(2), 61.

PwC (2021). State of climate tech 2021: Scaling breakthroughs for net zero. Retrieved from Https://www.pwc.com/gx/en/services/sustainability/publications/state-of-climate-tech.html

Su, H. N., & Moaniba, I. M. (2017). Does innovation respond to climate change? Empirical evidence from patents and greenhouse gas emissions. *Technological Forecasting and Social Change*, 122, 49-62.

Vitolla, F., Raimo, N., & Rubino, M. (2020). Board characteristics and integrated reporting quality: an agency theory perspective. *Corporate Social Responsibility and Environmental Management*, 27(2), 1152-1163.

Wade, K., & Jennings, M. (2015). Climate change and the global economy: regional effects. Schroders. https://www.schroders.com/en/ch/asset-management/insights/economics/climate-change-and-the-global-economy-regional-effects.

Wang, D. D., Li, S., & Sueyoshi, T. (2018). Determinants of climate change mitigation technology portfolio: An empirical study of major US firms. *Journal of Cleaner Production*, 196, 202-215.

Wang, Y., & Liu, B. (2021). The effect of supplier globalization on firm innovation: a resource dependence theory perspective. *Industrial Management & Data Systems*, 121(12), 2450-2466.

**Table 1.** Descriptive statistics and correlation analysis (*** p<0.01, ** p<0.05, * p<0.1)

| | | mean | std. dev. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CCHInno | 2.85 | 1.66 | 1 | | | | | | | | | | | | | | | | | |
| 2 | ClimateGov | 2.58 | 1.98 | 0.68*** | 1 | | | | | | | | | | | | | | | | |
| 3 | GrowthOpp | 2.32 | 1.50 | -0.01 | 0.02** | 1 | | | | | | | | | | | | | | | |
| 4 | Fsize | 22.55 | 1.66 | 0.29*** | 0.18*** | 0.00 | 1 | | | | | | | | | | | | | | |
| 5 | Fleverage | 0.14 | 0.15 | 0.08*** | 0.08*** | 0.04*** | 0.12*** | 1 | | | | | | | | | | | | | |
| 6 | Froa | 0.07 | 0.23 | 0.01 | 0.03*** | 0.00 | -0.03*** | -0.03*** | 1 | | | | | | | | | | | | |
| 7 | Fwc | 9.61 | 5.67 | 0.07*** | 0.05*** | 0.00 | 0.21*** | -0.03*** | 0.04*** | 1 | | | | | | | | | | | |
| 8 | Fdiv | 0.50 | 4.73 | -0.01 | 0.00 | -0.01 | 0.03*** | -0.01 | 0.02** | 0.03*** | 1 | | | | | | | | | | |
| 9 | Fcapex | 0.17 | 2.28 | -0.02** | -0.03*** | 0.00 | -0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 1 | | | | | | | | | |
| 10 | Fr&d | 0.20 | 0.81 | 0.00 | -0.01 | 0.00 | -0.05*** | -0.02** | -0.03*** | 0.00 | -0.02** | 0.00 | 1 | | | | | | | | |
| 11 | Fadv | 0.19 | 0.02 | 0.27*** | 0.20*** | 0.01 | 0.72*** | 0.03*** | 0.04*** | 0.17*** | 0.07*** | -0.02** | -0.05*** | 1 | | | | | | | |
| 12 | StraInv | 4.29 | 1.78 | 0.00 | -0.01 | 0.18*** | 0.07*** | 0.04*** | 0.02* | 0.01 | -0.02** | -0.01 | -0.01 | 0.01 | 1 | | | | | | |
| 13 | Bactivity | 9.73 | 6.99 | 0.05*** | 0.02* | 0.01 | 0.23*** | 0.06*** | -0.10*** | 0.05*** | 0.03*** | -0.01 | -0.01 | 0.13*** | 0.09*** | 1 | | | | | |
| 14 | Bindep | 42.01 | 17.34 | 0.11*** | 0.20*** | -0.01 | -0.03*** | 0.02*** | 0.03*** | 0.01 | 0.03*** | 0.00 | 0.00 | 0.07*** | -0.08*** | -0.11*** | 1 | | | | |
| 15 | Bwomen | 12.40 | 12.21 | 0.07*** | 0.15*** | -0.01 | -0.15*** | -0.05*** | 0.03*** | -0.04*** | -0.04*** | 0.01 | -0.0*** | -0.14*** | 0.00 | -0.06*** | 0.14*** | 1 | | | |
| 16 | Bskills | 42.58 | 20.84 | 0.04*** | 0.05*** | -0.01 | -0.04*** | -0.09*** | 0.00 | 0.04*** | -0.03*** | 0.00 | -0.02** | 0.04*** | -0.04*** | -0.11*** | 0.03*** | 0.13*** | 1 | | |
| 17 | Duality | 24.58 | | 0.01* | -0.03*** | -0.01 | -0.02** | -0.01 | 0.00 | 0.06*** | 0.00 | 0.01 | 0.04*** | 0.06*** | -0.08*** | -0.04*** | 0.05*** | -0.05*** | 0.12*** | 1 | |
| 18 | Disruptive | 44.17 | | 0.16*** | 0.30*** | -0.01 | -0.07*** | -0.08*** | -0.02** | 0.01 | -0.03*** | -0.01 | 0.00 | -0.09*** | -0.01 | 0.03*** | 0.05*** | 0.14*** | 0.07*** | -0.01* | 1 |

**Table 2.** Basic and robust results (*** p<0.01, ** p<0.05, * p<0.1)

| | | | Linear regression | | | |
|---|---|---|---|---|---|---|
| | Ordered regression | | Fixed effects | | Random effects | |
| | coeff. | coeff. | coeff. | coeff. | coeff. | coeff. |
| | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) |
| ClimateGov (CG) | 0.595*** | 0.562*** | 0.105*** | 0.0903*** | 0.218*** | 0.207*** |
| | (0.0369) | (0.0399) | (0.0136) | (0.0148) | (0.0115) | (0.0127) |
| GrowthOpp (GO) | -0.000404** | -0.0119** | -9.9e-05** | -0.00482** | -0.000120** | -0.00362* |
| | (0.000141) | (0.00546) | (0.000229) | (0.00194) | (0.000053) | (0.00188) |
| CG*GO | | 0.00543** | | 0.00221** | | 0.00164* |
| | | (0.00248) | | (0.000876) | | (0.000843) |
| Fsize | 1.045*** | 1.049*** | 0.314*** | 0.315*** | 0.326*** | 0.327*** |
| | (0.0986) | (0.0987) | (0.0684) | (0.0684) | (0.0301) | (0.0301) |
| Fleverage | -0.345 | -0.386 | -0.210 | -0.232 | -0.139 | -0.148 |
| | (0.557) | (0.558) | (0.231) | (0.231) | (0.183) | (0.183) |
| Froa | 0.0853 | 0.0386 | -0.109 | -0.129 | -0.0355 | -0.0487 |
| | (0.552) | (0.552) | (0.208) | (0.208) | (0.189) | (0.189) |
| Fwc | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Fdiv | -0.0295 | -0.0291 | 0.542 | 0.540 | -0.00932 | -0.00917 |
| | (0.0196) | (0.0196) | (0.583) | (0.583) | (0.00595) | (0.00595) |
| Fcapex | -0.0372 | -0.0366 | -0.00898 | -0.00876 | -0.00935 | -0.00919 |
| | (0.0230) | (0.0230) | (0.00850) | (0.00849) | (0.00849) | (0.00848) |
| Fr&d | -0.00358 | -0.00378 | 0.000 | 0.000 | -0.00131 | -0.00138 |
| | (0.0147) | (0.0147) | (0.000) | (0.000) | (0.00449) | (0.00450) |
| Fadv | 0.232*** | 0.232*** | 0.150*** | 0.152*** | 0.0662*** | 0.0657*** |
| | (0.0804) | (0.0805) | (0.0475) | (0.0474) | (0.0251) | (0.0251) |
| StraInv | -0.0239 | -0.0327 | 2.639 | 2.601 | -0.00592 | -0.00851 |
| | (0.0372) | (0.0375) | (11.81) | (11.80) | (0.0113) | (0.0114) |
| Bactivity | 0.00366 | 0.00399 | 0.000668 | 0.000699 | 0.00111 | 0.00120 |
| | (0.00888) | (0.00889) | (0.00348) | (0.00347) | (0.00294) | (0.00294) |
| Bindep | 0.00209 | 0.00236 | -0.000277 | -0.000112 | 0.00103 | 0.00111 |
| | (0.00454) | (0.00454) | (0.00187) | (0.00187) | (0.00149) | (0.00149) |
| Bwomen | -0.00435 | -0.00444 | -0.00231 | -0.00243 | -0.00126 | -0.00129 |
| | (0.00548) | (0.00548) | (0.00230) | (0.00230) | (0.00179) | (0.00179) |
| Bskills | 0.00727*** | 0.00733*** | 0.00252** | 0.00256** | 0.00256*** | 0.00257*** |
| | (0.00275) | (0.00275) | (0.00101) | (0.00101) | (0.000906) | (0.000905) |
| Duality | 0.0106 | 0.00973 | -0.00431 | -0.00640 | 0.0347 | 0.0341 |
| | (0.139) | (0.139) | (0.0555) | (0.0555) | (0.0451) | (0.0451) |
| Disruptive | -0.301** | -0.309** | -0.0838* | -0.0861** | -0.136*** | -0.138*** |
| | (0.128) | (0.128) | (0.0437) | (0.0437) | (0.0442) | (0.0442) |
| | Year, industry, country and region controlled | | | | | |
| Constant | | | -323.9*** | -323.9*** | -243.0*** | -242.6*** |
| | | | (29.92) | (29.90) | (20.91) | (20.90) |
| Log likelihood | -5831.9506 | -5829.5684 | | | | |
| LR test | 2627.86*** | 2628.61*** | | | | |
| R-square | | | 0.3202*** | 0.3215*** | 0.3057*** | 0.3068*** |
| Hausman test | | | 247.37*** | 242.17*** | | |

**Table 3.** Complementary analysis for the effect of disruptive events (*** p<0.01, ** p<0.05, * p<0.1)

| | Ordered regression | Linear regression | |
|---|---|---|---|
| | | fixed effects | random effects |
| | coeff. | coeff. | coeff. |
| | (std. error) | (std. error) | (std. error) |
| ClimateGov (CG) | 0.875*** | 0.213*** | 0.316*** |
| | (0.0600) | (0.0197) | (0.0182) |
| GrowthOpp (GO) | -0.0492*** | -0.0138*** | -0.0134*** |
| | (0.0157) | (0.00471) | (0.00463) |
| Disruptive (D) | -0.988*** | -0.494*** | -0.335*** |
| | (0.203) | (0.0676) | (0.0651) |
| CG*GO | 0.0169*** | 0.00490*** | 0.00458*** |
| | (0.00592) | (0.00180) | (0.00177) |
| CG*D | 0.0432*** | 0.0112** | 0.0120** |
| | (0.0167) | (0.00501) | (0.00495) |
| GO*D | -0.456*** | -0.189*** | -0.166*** |
| | (0.0571) | (0.0183) | (0.0179) |
| CG*GO*D | -0.0143** | -0.00379** | -0.00397** |
| | (0.00638) | (0.00192) | (0.00190) |
| Fsize | 1.107*** | 0.283*** | 0.338*** |
| | (0.101) | (0.0666) | (0.0299) |
| Fleverage | -0.155 | -0.0923 | -0.0571 |
| | (0.567) | (0.223) | (0.179) |
| Froa | 0.348 | 0.0624 | 0.0855 |
| | (0.561) | (0.202) | (0.184) |
| Fwc | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) |
| Fdiv | -0.0287 | 0.0358 | -0.00884 |
| | (0.0203) | (0.564) | (0.00596) |
| Fcapex | -0.0404* | -0.00984 | -0.0109 |
| | (0.0234) | (0.00821) | (0.00823) |
| Fr&d | -0.00593 | 0.000 | -0.00207 |
| | (0.0152) | (0.000) | (0.00449) |
| Fadv | 0.214*** | 0.118** | 0.0564** |
| | (0.0827) | (0.0460) | (0.0249) |
| StraInv | -0.0156 | 2.443 | -0.00345 |
| | (0.0390) | (11.40) | (0.0115) |
| Bactivity | 0.00193 | -6.33e-05 | 0.000692 |
| | (0.00902) | (0.00336) | (0.00288) |
| Bindep | 0.00121 | -0.00119 | 0.000324 |
| | (0.00461) | (0.00181) | (0.00146) |
| Bwomen | -0.00285 | -0.00104 | -0.000799 |
| | (0.00557) | (0.00223) | (0.00176) |
| Bskills | 0.00678** | 0.00181* | 0.00221** |
| | (0.00279) | (0.000983) | (0.000886) |
| Duality | 0.0169 | -0.0179 | 0.0293 |

| | | | |
|---|---|---|---|
| | (0.141) | (0.0536) | (0.0442) |
| | Year, industry, country and region controlled | | |
| Constant | | -306.8*** | -230.0*** |
| | | (26.68) | (17.65) |
| Log likelihood | -57.453.507 | | |
| LR test | 2729.14*** | | |
| R-square | | 0.3674*** | 0.3524*** |
| Hausman test | | 258.01*** | |

**Table 4.** Complementary analysis for regional effect using ordered logistic regression (*** p<0.01, ** p<0.05, * p<0.1)

| | ASIA | | EUROPE | | LATIN AMERICA | | AFRICA | | MIDDLE EAST | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Equation 1 | Equation 2 | Equation 1 | Equation 2 | Equation 1 | Equation 2 | Equation 1 | Equation 2 | Equation 1 | Equation 2 |
| | coeff. | coeff. | coeff. | coeff. | coeff. | coeff. | coeff. | coeff. | coeff. | coeff. |
| | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) | (std. error) |
| ClimateGov (CG) | 0.625*** | 1.004*** | 0.995*** | 1.168* | 1.272*** | 2.167** | 0.196 | 0.197 | -0.0615 | -0.0862 |
| | (0.0419) | (0.0657) | (0.329) | (0.680) | (0.415) | (0.866) | (0.236) | (0.275) | (0.442) | (1.020) |
| GrowthOpp (GO) | -0.0106* | -0.0347** | -0.0516 | -0.291 | -0.464** | -0.327* | -0.251* | -0.340* | -0.207 | -0.161 |
| | (0.00571) | (0.0163) | (0.125) | (0.302) | (0.228) | (0.234) | (0.087) | (0.205) | (0.193) | (0.388) |
| Disruptive (D) | -0.396*** | -0.947*** | -0.309 | -0.679 | -1.221 | -1.780 | -0.442 | -1.006 | -0.714** | -3.921* |
| | (0.138) | (0.214) | (0.982) | (2.550) | (1.476) | (5.026) | (0.609) | (1.829) | (0.026) | (2.096) |
| CG*GO | 0.00483* | 0.0112* | -0.0192 | 0.0245 | 0.00908 | -0.114 | 0.0587 | 0.0736 | 0.0579 | 0.123 |
| | (0.00261) | (0.00611) | (0.0244) | (0.118) | (0.0241) | (0.133) | (0.0408) | (0.0564) | (0.0637) | (0.185) |
| CG*D | | 0.0291* | | 0.434 | | 1.422** | | 0.190 | | 0.604 |
| | | (0.0172) | | (0.291) | | (0.693) | | (0.272) | | (0.370) |
| GO*D | | -0.519*** | | -0.300 | | -2.993** | | -0.108 | | 0.560 |
| | | (0.0626) | | (0.836) | | (1.164) | | (0.351) | | (0.896) |
| CG*GO*D | | -0.00865 | | -0.0588 | | -0.408* | | -0.0395 | | -0.132 |
| | | (0.00659) | | (0.112) | | (0.210) | | (0.0577) | | (0.171) |
| Fsize | 0.955*** | 1.010*** | -0.254 | -0.125 | 2.226 | 2.910 | 0.607 | 0.734 | 1.679* | 1.551* |
| | (0.107) | (0.110) | (0.751) | (0.766) | (1.423) | (2.279) | (0.603) | (0.595) | (0.966) | (0.902) |
| Fleverage | 0.0363 | 0.393 | -1.336 | -0.871 | 12.05* | 11.68 | 1.064 | 1.068 | 7.531 | 7.568 |
| | (0.603) | (0.615) | (3.430) | (3.514) | (6.727) | (8.458) | (2.675) | (2.724) | (6.828) | (6.789) |
| Froa | 0.0940 | 0.320 | 4.171 | 4.633 | -5.779 | -7.394 | 0.139 | 0.371 | 33.87** | 33.19** |
| | (0.570) | (0.579) | (7.090) | (7.201) | (6.224) | (7.342) | (3.895) | (4.207) | (15.43) | (14.68) |
| Fwc | 0.000 | 0.000 | 2.99e-10 | 2.90e-10 | 5.08e-10 | 7.46e-10 | -2.28e-10 | -2.64e-10 | 1.38e-10 | 0.000 |
| | (0.000) | (0.000) | (2.21e-10) | (2.34e-10) | (6.12e-10) | (6.86e-10) | (2.79e-10) | (2.76e-10) | (1.29e-10) | (1.60e-10) |
| Fdiv | 0.0344 | 0.0155 | -0.0505** | -0.0507** | -10.56** | -15.10 | 3.680*** | 3.583*** | -1.820 | -0.793 |
| | (0.127) | (0.131) | (0.0246) | (0.0253) | (5.219) | (9.662) | (1.327) | (1.340) | (4.560) | (4.240) |
| Fcapex | -0.0337 | -0.0371 | -3.182** | -3.326** | -0.0681 | -0.0268 | -0.0864 | -0.0597 | 0.153 | 0.141 |
| | (0.0238) | (0.0242) | (1.350) | (1.387) | (0.182) | (0.203) | (0.160) | (0.162) | (0.229) | (0.239) |
| Fr&d | -0.0170 | -0.0188 | -0.715* | -0.749* | -0.986 | -1.162 | 0.538 | 0.510 | -3.668 | -1.834 |
| | (0.0146) | (0.0151) | (0.427) | (0.435) | (1.224) | (1.565) | (1.079) | (1.068) | (8.020) | (7.467) |
| Fadv | 0.229** | 0.211** | 1.874** | 2.174*** | 0.273 | 0.234 | -0.104 | -0.135 | 1.519* | 1.234 |
| | (0.0937) | (0.0962) | (0.750) | (0.804) | (1.010) | (1.408) | (0.257) | (0.263) | (0.885) | (0.877) |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| StraInv | -0.0563 | -0.0390 | -0.364 | -0.170 | 0.995** | 1.274** | 0.172 | 0.266 | -1.085* | -0.900 |
| | (0.0690) | (0.0715) | (0.527) | (0.546) | (0.469) | (0.613) | (0.440) | (0.459) | (0.604) | (0.590) |
| Bactivity | -0.00167 | -0.00339 | 0.0396 | 0.0333 | 0.0943 | 0.0712 | -0.00175 | -0.0250 | 0.143 | -0.00210 |
| | (0.0100) | (0.0102) | (0.0241) | (0.0244) | (0.117) | (0.131) | (0.0756) | (0.0763) | (0.220) | (0.223) |
| Bindep | 0.00490 | 0.00467 | -0.0523* | -0.0437 | -0.0538 | -0.0791* | 0.00222 | 0.00314 | 0.0421 | 0.0411 |
| | (0.00513) | (0.00522) | (0.0312) | (0.0326) | (0.0346) | (0.0456) | (0.0267) | (0.0267) | (0.0298) | (0.0288) |
| Bwomen | -0.00250 | -0.00172 | -0.0706** | -0.0675* | -0.152** | -0.138* | 0.0549** | 0.0572** | -0.0418 | -0.0312 |
| | (0.00595) | (0.00605) | (0.0352) | (0.0359) | (0.0654) | (0.0802) | (0.0275) | (0.0279) | (0.0707) | (0.0700) |
| Bskills | 0.00698** | 0.00656** | 0.00833 | 0.0173 | 0.0137 | -0.00168 | -0.0240 | -0.0227 | -0.0161 | -0.0178 |
| | (0.00292) | (0.00298) | (0.0177) | (0.0184) | (0.0363) | (0.0423) | (0.0148) | (0.0147) | (0.0274) | (0.0268) |
| Duality | 0.0300 | 0.0327 | -1.311 | -1.383 | -0.697 | -0.793 | -0.970 | -0.862 | 8.623** | 8.054** |
| | (0.146) | (0.148) | (1.001) | (1.028) | (1.413) | (1.523) | (0.906) | (0.900) | (3.924) | (3.661) |
| | Year and industry controlled | | | | | | | | | |
| Log likelihood | -5065.9956 | -4985.6032 | -145.51673 | -140.86298 | -144.61555 | -138.99125 | -250.55374 | -249.5567 | -106.59011 | -104.22095 |
| LR test | 2182.67*** | 2283.22*** | 55.52*** | 53.66*** | 101.58*** | 17.85*** | 153.23*** | 151.16*** | 41.63*** | 23.81*** |

**Table 5.** Climate governance components by country (relative frequencies for firms)

| Country | POL | EMT | BCOM | CMP | EXE | ASSU |
|---|---|---|---|---|---|---|
| Brazil | 71,71% | 43,89% | 62,75% | 5,24% | 5,12% | 43,07% |
| Chile | 70,18% | 26,90% | 56,73% | 3,51% | 2,92% | 37,13% |
| China | 67,54% | 36,97% | 36,08% | 1,14% | 1,40% | 8,69% |
| Colombia | 76,65% | 49,70% | 68,26% | 2,99% | 4,79% | 61,08% |
| Czech Republic | 76,92% | 15,38% | 34,62% | 26,92% | 23,08% | 19,23% |
| Egypt | 32,65% | 30,61% | 34,69% | 0,00% | 6,12% | 7,14% |
| Hungary | 93,75% | 54,17% | 50,00% | 10,42% | 0,00% | 62,50% |
| India | 76,98% | 49,92% | 91,92% | 7,27% | 6,79% | 35,95% |
| Indonesia | 70,32% | 37,71% | 48,18% | 3,65% | 1,46% | 26,28% |
| Korea (South Korea) | 72,56% | 54,24% | 57,52% | 3,60% | 1,92% | 55,04% |
| Kuwait | 25,81% | 11,83% | 41,94% | 12,90% | 2,15% | 11,83% |
| Malaysia | 77,78% | 57,41% | 81,30% | 14,63% | 16,48% | 24,07% |
| Mexico | 71,75% | 46,50% | 62,50% | 4,50% | 3,75% | 35,50% |
| Morocco | 60,00% | 13,33% | 10,00% | 0,00% | 0,00% | 0,00% |
| Nigeria | 61,54% | 61,54% | 23,08% | 15,38% | 23,08% | 15,38% |
| Peru | 51,96% | 27,94% | 47,55% | 0,00% | 2,94% | 10,78% |
| Philippines | 65,63% | 47,32% | 40,63% | 11,61% | 9,38% | 24,11% |
| Poland | 67,29% | 19,31% | 30,84% | 11,84% | 7,17% | 17,76% |
| Qatar | 17,86% | 10,71% | 20,71% | 4,29% | 2,14% | 5,71% |
| Romania | 53,85% | 38,46% | 69,23% | 46,15% | 23,08% | 30,77% |
| Russia | 69,03% | 50,44% | 52,21% | 18,58% | 19,76% | 43,66% |
| Saudi Arabia | 42,13% | 31,94% | 36,11% | 12,50% | 3,24% | 10,19% |
| South Africa | 74,26% | 51,49% | 97,12% | 38,71% | 53,79% | 47,74% |
| Taiwan | 78,52% | 63,71% | 70,67% | 1,83% | 1,10% | 56,23% |
| Thailand | 76,13% | 59,66% | 77,65% | 14,29% | 9,08% | 31,93% |
| Turkey | 82,03% | 78,23% | 70,89% | 9,62% | 1,52% | 31,90% |
| United Arab Emirates | 56,00% | 23,20% | 56,80% | 4,80% | 13,60% | 11,20% |
| Vietnam | 96,15% | 26,92% | 26,92% | 3,85% | 0,00% | 26,92% |

ClimateGov score is constructed as a score based on the presence (value 1) or absence (value 0) of the six climate governance mechanisms. The table presents the percentage of companies that takes value 1 in each of these components: POL: an emission policy for combating climate change; EMT: an environmental management team; BCOM a sustainability committee on the board; CMP: an ESG compensation policy; EXE: executive compensation associated with ESG performance; and ASSU: public information on climate change that adheres to international standards and has been verified by an assurer.

**Figure 1.** Theoretical framework and research hypotheses

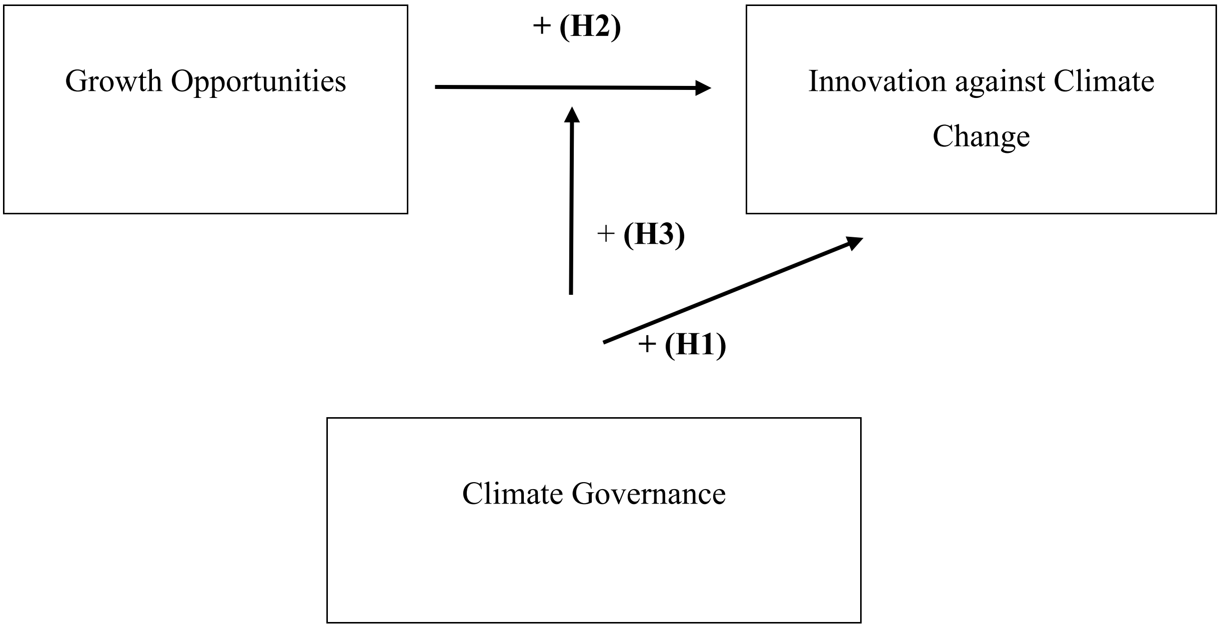
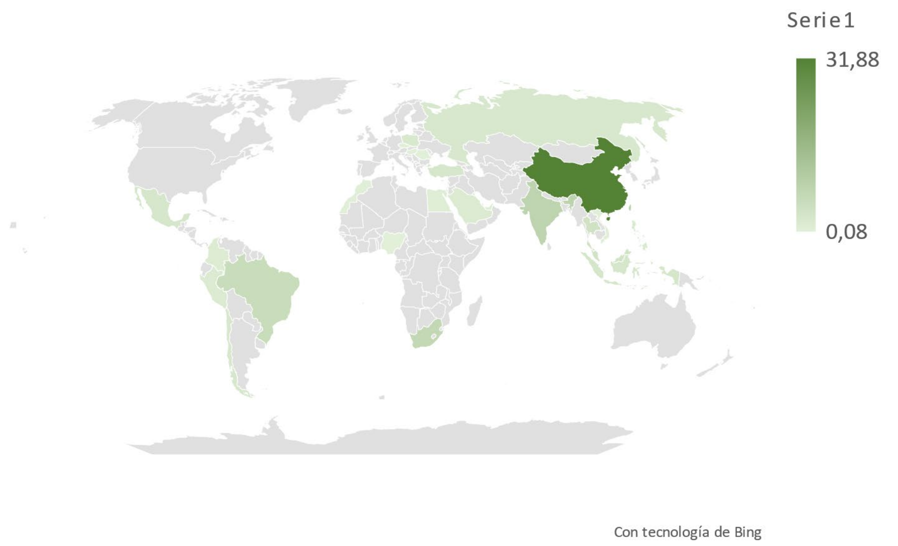


**Figure 2.** Sample by emerging economies




| Country | Percentage | Country | Percentage |
|---|---|---|---|
| Brazil | 5.56% | Nigeria | 0.08% |
| Chile | 2.21% | Peru | 1.32% |
| China | 31.88% | Philippines | 1.45% |
| Colombia | 1.08% | Poland | 2.08% |
| Czech Republic | 0.17% | Qatar | 0.91% |
| Egypt | 0.63% | Romania | 0.08% |
| Hungary | 0.31% | Russia | 2.2% |
| India | 8.02% | Saudi Arabia | 1.4% |
| Indonesia | 2.66% | South Africa | 6.74% |
| Korea (South Korea) | 8.1% | Taiwan | 8.83% |
| Kuwait | 0.6% | Thailand | 3.85% |
| Malaysia | 3.5% | Turkey | 2.56% |
| Mexico | 2.59% | United Arab Emirates | 0.81% |
| Morocco | 0.19% | Vietnam | 0.17% |

**Figure 3.** Climate commitment and growth opoortunities by geographic regions