

Innovation, Governance, and ESG: Impacts on the Economic-Financial Performance in Organizations

Adevair de Deus Ribeiro

Federal University of Espírito Santo - UFES, Vitoria, State of Espírito Santo, Brazil

DOI: <https://doi.org/10.47772/IJRISS.2026.100601194>

Received: 24 June 2026; Accepted: 30 June 2026; Published: 14 July 2026

ABSTRACT

In emerging economies, integrating innovation, governance, and ESG criteria poses a strategic challenge, necessitating analyses that align these dimensions. This study, using data from 3483 observations of companies listed on B3 (2015-2022), examined the effects of these factors on economic-financial performance, alongside ESG's role in mitigating CEO duality and promoting female board representation. Employing the Generalized Method of Moments (GMM), results revealed complex relationships: innovation positively impacted performance, solidifying its role as a competitive driver. CEO duality exhibited progressively negative effects, highlighting risks of power concentration. Female representation yielded ambiguous impacts, suggesting reliance on inclusion policies. ESG practices, though linked to operational costs and greenwashing in isolation, enhanced positive outcomes when combined with diversified boards, underscoring governance-sustainability synergies. Theoretically, the study integrated Stakeholder and Agency Theories, indicating ESG amplifies benefits in collaborative contexts but fails to offset governance gaps. Practically, it recommends balanced governance structures, separation of leadership roles, and gender diversity investments as strategic complements to ESG. Thus, the research underscores the relevance of multifaceted approaches for sustainable performance in emerging markets, offering insights into mitigating risks while leveraging innovation and governance synergies.

Keywords: sustainability, accountability, transparency, inclusion, organizational culture.

INTRODUCTION

The increasing pressure resulting from climate change and social demands has encouraged organizations to adopt practices that meet high standards of environmental and social responsibility, thereby driving organizational transformation (Aguilera et al., 2021; Abid et al., 2022). Moreover, growing stakeholder awareness promotes transparency and a commitment to sustainability, establishing a solid foundation for internal changes (Ilyas & Osiyevskyy, 2022; Med Bechir & Jouirou, 2024; Zournatzidou et al., 2025).

In this context, companies are challenged to develop innovative strategies that integrate economic-financial, environmental, and social aspects, fostering a holistic approach that meets the expectations of diverse audiences (Konadu et al., 2022). In this regard, green innovation stands out by enhancing production processes and reducing environmental risks, acting as a catalyst for the creation of long-term value and strengthening competitiveness (Griffin et al., 2021; Korphaibool et al., 2024; Liu et al., 2024).

Furthermore, the incorporation of both tangible and intangible innovations into daily operations is essential, as it increases operational efficiency and enhances corporate reputation by optimizing internal processes and bolstering the company's image among stakeholders (Alkaraan et al., 2025). This synergy between innovation and financial development proves to be a robust solution for promoting a sustainable society, generating both operational and financial gains (Abid et al., 2022; Hsieh et al., 2024; Kwarteng et al., 2022).

The adoption of Environmental, Social, and Governance (ESG) criteria in corporate governance effectively balances economic and environmental objectives (Aguilera et al., 2021; Alkaraan et al., 2025). However, the lack of standardization in ESG scores can lead to inconsistent evaluations and greenwashing practices (Abid et al., 2022). This highlights the need to improve these metrics so that ESG can become a true catalyst for innovation

and governance enhancement (Liu et al., 2024; Agoraki et al., 2024; Shakil et al., 2021; Nguyen et al., 2020; Ma et al., 2022).

At the same time, gender diversity on boards of directors contributes to more effective governance and balanced corporate decisions by mitigating conflicts and enriching the decision-making process, as advocated by Stakeholder Theory (Adams & Ferreira, 2009; García-Meca et al., 2024; Enciso-Alfaro & García-Sánchez, 2024). In contrast, CEO duality – characterized by the accumulation of the roles of board chair and CEO – may restrict the implementation of disruptive innovations and the integration of ESG practices, thereby harming economic-financial performance (Aguilera et al., 2021; Aksoy et al., 2020).

The motivation for this study arises from the need to understand how the strategic integration of ESG practices, combined with sustainable innovations and the implementation of governance structures, can affect the financial sustainability of companies. There is a noticeable scarcity of research addressing these dynamics in an integrated manner. Faced with a scenario full of climatic challenges and demands for social justice, it is essential to analyze the interconnections among these elements to improve economic-financial performance and position sustainability as a competitive advantage. Thus, the guiding question of this investigation is: Which factors in the strategic integration of ESG practices, in combination with sustainable innovations and governance structures, influence the financial sustainability of organizations?

Accordingly, the purpose of this study is to investigate the effects of innovation, governance factors, and ESG criteria on the economic-financial performance of companies. Additionally, it aims to analyze these interactions and highlight the importance of ESG criteria in mitigating the impacts of CEO duality, as well as in promoting female representation on boards, thereby contributing to the generation of sustainable value.

To achieve these objectives, the work is structured into four essential parts:

Part 2 – Explores the theoretical references necessary for formulating the hypotheses; Part 3 – Discusses the methodology used, with a focus on obtaining consistent results; Part 4 – Presents the results accompanied by an in-depth discussion; and Part 5 – Concludes with the final considerations of the research.

THEORETICAL FRAMEWORK

Innovation and Its Impact on Economic-Financial Performance

It is evident that innovation has been identified as a crucial factor for enhancing the economic and financial performance of organizations. Griffin et al. (2021) and Korphaibool et al. (2024) argue that integrating innovative practices into production processes not only minimizes environmental risks but also creates long-term value, thereby strengthening market competitiveness.

Similarly, the study by Liu et al. (2024) analyzed, through regressions on a sample of companies listed in China between 2009 and 2021, that both disruptive green innovations and incremental green innovations contribute significantly to corporate performance and to the incorporation of environmental, social, and governance (ESG) practices. In parallel, Alkaraan et al. (2025) applied the assumptions of the Resource-Based View (RBV) in UK companies participating in the Financial Times Stock Exchange (FTSE) – an index representing the 100 largest companies listed on the London Stock Exchange – between 2012 and 2021, concluding that the synergy between innovation and operational efficiency translates into significant financial gains.

Thus, these studies reinforce the importance of innovation as a catalyst for positive outcomes. In light of the above, the first hypothesis emerges:

H1: Innovation in assets suggests positive impacts on economic and financial performance.

In line with studies on innovation and governance, Aguilera et al. (2021) emphasize that structured governance is essential for the effective implementation of ESG practices, corroborating the view that the synergy between governance and innovation is vital for the economic and financial performance of organizations. Enciso-Alfaro and García-Sánchez (2024) point out that gender diversity on boards of directors and board independence are factors that enhance the adoption of ESG practices, thereby promoting improved corporate performance.

Corporate Governance, Gender Diversity, and CEO Duality

In the realm of corporate governance, the discussion focuses on the influence of gender diversity on boards of directors and the impact of CEO duality on the economic and financial performance of organizations (Enciso-Alfaro & García-Sánchez, 2024). Adams and Ferreira (2009) emphasize that the presence of women on boards, in line with Stakeholder Theory, promotes more inclusive and balanced decision-making.

Decision-making and its effects on governance are further examined and supported by studies from Nguyen et al. (2020), which highlight the importance of female representation on boards for fostering more ethical and responsible governance. Similarly, Liu et al. (2024) demonstrate that including women on boards not only contributes to innovation and operational efficiency but also drives the adoption of sustainable practices, leading to significant economic benefits. In light of these findings, the second hypothesis was formulated.

H2: The presence of women on boards positively impacts economic and financial performance.

Furthermore, García-Meca et al. (2024) show that gender diversity on boards not only mitigates internal conflicts but also enriches strategic formulation, thereby facilitating the implementation of green innovations and sustainable practices. The presence of women on boards enhances decision-making in an inclusive and balanced manner, as Stakeholder Theory advocates for considering the interests of all parties involved in the company (Adams & Ferreira, 2009).

Conversely, CEO duality – a situation in which the executive also serves as the board chair – has been linked to a concentration of power and the adoption of less collaborative decision-making processes, according to Romano et al. (2020). Studies by Khan et al. (2020) and Krause (2017) reveal that such a concentration of authority may elevate governance risks, resulting in negative effects on the economic and financial performance of organizations. CEO duality can restrict the diversity of opinions and the embrace of innovative approaches, thereby undermining operational efficiency and market competitiveness.

Similarly, Med Bechir and Jouiou (2024) point to the adverse consequences of this practice, underscoring the necessity of diversified boards to counterbalance the negative effects stemming from power concentration. Agency Theory also supports the view that CEO duality may lead to conflicts of interest, wherein the CEO might prioritize personal interests over those of shareholders, thereby compromising corporate governance and financial performance (Fama & Jensen, 1983). Thus, the third hypothesis is presented.

H3: CEO duality negatively impacts the economic and financial performance of the company.

ESG Score and Its Amplification of Economic and Financial Impacts

Environmental, Social, and Governance (ESG) criteria emerge as strategic elements that go beyond a mere classification, decisively influencing corporate responsibility and risk management. Baldi and Pandimiglio (2022) and Zhang (2023) emphasize that although the challenges of greenwashing pose a risk to transparency, the incorporation of ESG metrics reflects companies' commitment to sustainability (Alkaraan et al., 2025).

The adoption of ESG practices has been widely studied and shown to be a positive factor for organizations' economic and financial performance. According to Friede et al. (2015), the analysis of more than 2,000 empirical studies revealed that companies with high ESG scores tend to exhibit better financial performance. This positive relationship is corroborated by studies from Abid et al. (2022), which highlight that the integration of ESG practices promotes a synergy between sustainability and financial development, resulting in both operational and economic benefits. In light of ESG practices and the synergy between sustainability and financial development, the fourth hypothesis was formulated.

H4: The ESG score produces positive impacts on economic and financial performance.

Studies by Post and Byron (2015) indicate that female representation on boards is associated with superior financial performance. When combined with sustainable practices, this effect becomes even more robust, demonstrating the importance of gender diversity in corporate governance. The inclusion of women on boards

promotes more inclusive and balanced decision-making, aligned with Stakeholder Theory, which emphasizes considering the interests of all parties involved in the company (Adams & Ferreira, 2009; García-Meca et al., 2024; Enciso-Alfaro & García-Sánchez, 2024).

This argument is further corroborated by Liu et al. (2024), who demonstrate that the inclusion of women on boards, when coupled with robust ESG practices, increases operational efficiency and strengthens corporate image, making companies more resilient and competitive. Abid et al. (2022) support this view by highlighting that gender diversity on boards fosters more ethical and responsible governance, in line with sustainability principles. Thus, the fifth hypothesis is derived.

H5: The ESG score favorably amplifies the impact of female board presence on organizational performance.

On the other hand, it is observed that the ESG index also positively enhances the influence of CEO duality, generating beneficial effects on economic and financial performance. Aguilera et al. (2021) argue that, when combined with robust governance, ESG can mitigate the risks inherent in the concentration of power, promoting strategic decisions that are more aligned with stakeholders' interests. Furthermore, Chu et al. (2023) reinforce that specific CEO characteristics, such as experience and strategic vision, can be maximized in contexts where the ESG score is high, allowing duality to serve as a catalyst for innovation and operational efficiency.

This perspective is supported by recent empirical studies. For instance, Aksoy et al. (2020) conducted an analysis of Turkish companies and concluded that the adoption of ESG practices reduces agency conflicts associated with CEO duality, thereby enhancing transparency and accountability. Similarly, Konadu et al. (2022) highlight that companies with high ESG indices have a greater capacity to integrate environmental and social innovations, even in scenarios where CEO duality might otherwise be considered an obstacle. These findings indicate that ESG not only acts as a moderator but also as a facilitator that transforms potential disadvantages into growth opportunities. Consequently, the sixth hypothesis is formulated.

H6: The ESG index favorably enhances the influence of CEO duality, generating positive effects on economic and financial performance.

The theoretical framework presented herein demonstrates that innovation, corporate governance, and ESG criteria play complementary and fundamental roles in determining an organization's economic and financial performance. Thus, the strategic integration of these elements is essential for creating more resilient, innovative, and sustainable organizations.

Table 1 summarizes the hypotheses raised in this study.

Table 1 – Hypotheses Raised in the Study

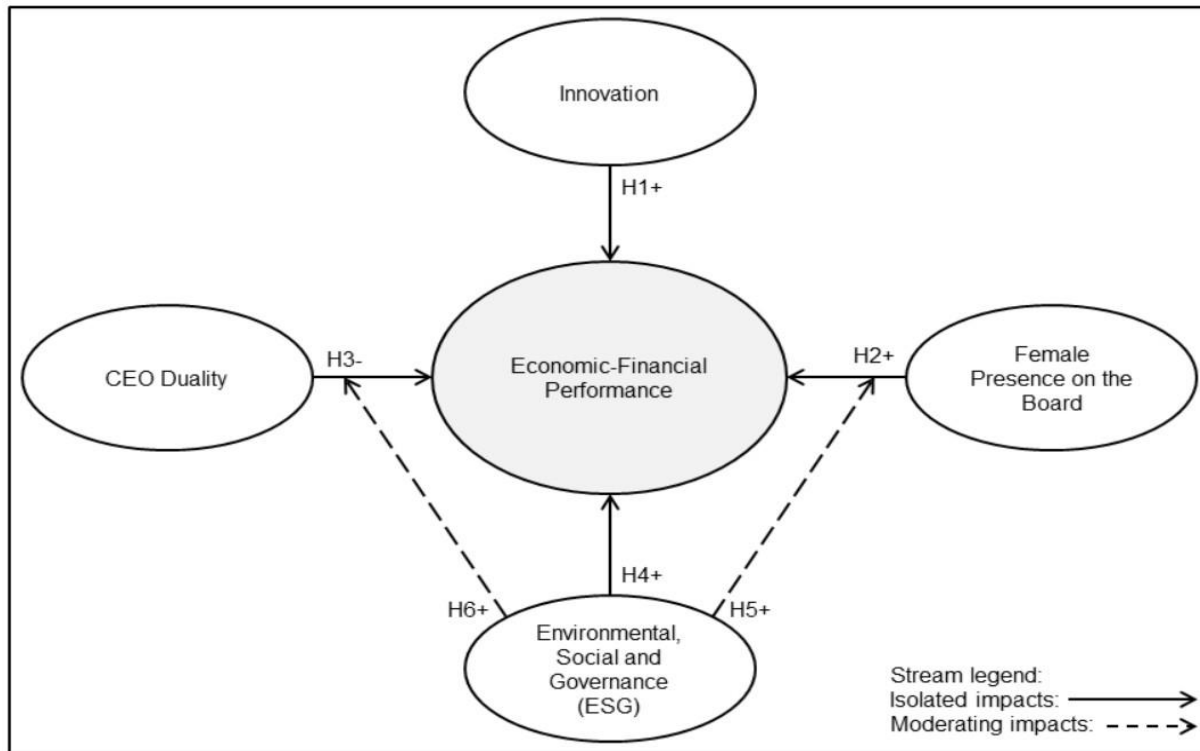
Hypotheses		Expected Sign
H1	Innovation in assets suggests positive impacts on economic-financial performance.	+
H2	Female presence on boards produces a positive impact on economic-financial performance.	+
H3	CEO duality negatively impacts the company's economic-financial performance.	-
H4	The ESG score rating produces positive impacts on economic-financial performance.	+
H5	The ESG score favorably amplifies the effect of female presence on boards on organizational performance.	+
H6	The ESG index favorably enhances the influence of CEO duality, generating positive effects on economic-financial performance.	+

Source: Generated by the author based on the theoretical framework

Structural Model and Impact Flow

Figure 1 presents the schematic structural model of the flows and impacts of the assertions on economic-financial performance.

Figure 1 - Schematic Structural Model and Distribution of Hypotheses



Source: Generated by the author

METHODOLOGY

This study investigates how innovation, sustainability, and corporate governance influence the economic-financial performance of organizations, drawing on recent empirical evidence (Liu et al., 2024; Palea et al., 2023). Initially, the research adopts a longitudinal quantitative approach with a descriptive character and cross-sectional analysis, which allows for monitoring the evolution of variables over time and comparing companies from different sectors and sizes (Palea et al., 2023; Abid et al., 2022).

To obtain the results, a multivariate linear regression was employed in an unbalanced panel model, a technique that precisely captures temporal and sectorial variations (Wooldridge, 2010; An et al., 2021). Additionally, to overcome challenges inherent to endogeneity, the Generalized Method of Moments (GMM) was utilized, whose effectiveness is well established in dynamic panel models (Alvarez & Arellano, 2022; Arellano & Bond, 1991; Boakye et al., 2021). This methodological approach reinforces the reliability of the results (García-Meca et al., 2024).

Sample

The sample comprised 3483 observations extracted from the accounting and financial data of companies listed on the official Brazilian stock exchange (B3). Using the Economática and Bloomberg platforms, emphasis was placed on companies that are part of the B3 Corporate Governance Index (IGC), a subset that includes the Novo Mercado and Levels 1 and 2, between 2015 and 2022. The selection of this period is justified by the availability of robust data and by the intensification of global discussions regarding governance and socio-environmental responsibility, elements that are crucial for performance analysis in emerging economies (Liu et al., 2024; Palea et al., 2023). To minimize the impact of outliers, the data were winsorized at the 2nd and 98th percentiles (García-Meca et al., 2024).

Dependent Variable

This study used return on assets (ROA) as the metric for the dependent endogenous variable, reflecting both operational efficiency and the profitability of asset usage, in accordance with the parameters adopted by Geissdoerfer et al. (2017) and Alkaraan et al. (2025). In this way, the work contributes to understanding the relationships among innovation, sustainability, governance, and economic-financial performance, providing support for corporate policies and strategies aimed at competitiveness and socio-environmental responsibility (Ribeiro & Funchal, 2018).

Independent Variables

The variable (CAP) represents capital expenditures (CAPEX) and is used to evaluate the influence of technological innovation on organizational performance, as highlighted by Hall et al. (2014). CAPEX involves investments both in the acquisition of tangible assets and in fostering new technologies, which not only increase productivity but also help reduce operating costs, as observed by Med et al. (2024). Investments in CAPEX thus reflect both the acquisition of tangible assets and the development of innovative strategies, such as technologies that enhance productivity and lower operational costs (Med et al., 2024).

However, the relationship between CAPEX and innovation can be bidirectional, since innovative companies may attract more resources for investment, while those with higher CAPEX have a greater capacity to finance innovations (Hall et al., 2014). Nonetheless, some unobserved variables, such as management practices and access to capital, may affect the magnitude of this relationship, introducing distortions into the analysis.

To address these distortions and prevent endogeneity in causal models, the instrumental variable (IV) technique was adopted, which integrates CAPEX, Net Income, and the Corporate Governance Index (IGC) as instruments. This approach, as discussed by Adams and Ferreira (2009) and Agoraki et al. (2024), reveals that companies with solid governance direct resources toward strategic and sustainable innovations. The interaction between CAPEX, Net Income, and corporate governance highlights the strategic role of CAPEX in aligning financial returns with a positive environmental impact (Abid et al., 2022; Friede et al., 2015).

Thus, this triple interaction (CAPEX, Net Income, and IGC) allows for the identification of specific effects, demonstrating how CAPEX can serve as a lever for the emergence of innovations that yield financial returns alongside positive environmental impacts. This connection, therefore, underscores the importance of intelligent CAPEX investment aimed not only at immediate profit but also at alignment with long-term sustainability practices.

Sustainability and corporate governance practices are measured by the variable (ESG), derived from the ESG Score collected on the Bloomberg platform, a variable well established in the literature (Ranta et al., 2018; Austin & Rahman, 2022). This index reflects organizations' commitment to investments in sustainable innovation.

Board gender diversity (PFC) is operationalized as the proportion of women in decision-making positions, a factor associated with greater transparency and socio-environmental responsibility (Aksoy et al., 2020; Konadu et al., 2022). Meanwhile, CEO duality (DCE), defined as a dummy variable (1 if the CEO chairs the board, 0 otherwise), is linked to risks of power concentration, as theorized by Fama and Jensen (1983).

The interactions $ESG \times DCE$ (ESDC) and $ESG \times PFC$ (ESPF) explore how sustainability performance moderates the effects of governance – namely, CEO duality and female board presence – on the financial outcomes of organizations. Romano et al. (2020) demonstrate that companies with high ESG mitigate the risks associated with CEO duality, while Post and Byron (2015) show that gender diversity enhances sustainable investments. Friede et al. (2015) further reinforce that ESG broadens long-term returns, especially in contexts of robust governance.

Control Variables

This study employs control variables to analyze investments in innovation and sustainable economic-financial performance. The first variable used in this study was Financial Leverage (ALF), which measures indebtedness and its impact on the cost of capital. Companies with high financial leverage tend to have less flexibility to

innovate due to liquidity constraints (Boakye et al., 2021; Liu et al., 2024; Alkaraan et al., 2025). The independent variable, Market Value (VLM), reflects the ability to raise funds. Larger companies with a high market value have an advantage in investing in sustainable technologies (Agoraki et al., 2024; Kwarteng et al., 2022). Intangible Assets (ATI), which are associated with patents, R&D, and intellectual capital, drive innovation and increase market value (García-Meca et al., 2024; Alkaraan et al., 2025).

Methodological controls for temporal and sector fixed effects were also applied to isolate external influences, following robust econometric practices (Alvarez & Arellano, 2022; Enciso-Alfaro & García-Sánchez, 2024). This framework allows for the evaluation of how ALF, VLM, and ATI interact with sustainable strategies, mitigating bias from omitted variables.

Treatment of Endogeneity and Robustness

The relationship between CAPEX (capital expenditures) and innovation exhibits a causal dynamic, where investments in fixed assets are often influenced by expectations of technological advancements and improvements in organizations' financial performance. However, this relationship can be undermined by endogeneity issues, which arise when explanatory variables correlate with the model's error term. To mitigate these challenges, the use of an instrumental variable (IV) is recommended, as proposed by Arellano and Bond (1991) and Boakye et al. (2021).

In this study, the instrumental variable is represented by the interaction between CAPEX, Net Profit, and participation in B3's Corporate Governance Index (IGC), forming the CLS variable. This approach is relevant because the IGC reflects companies' commitment to governance practices, directly influencing their investment decisions in innovation. Thus, the use of the CLS variable enables capturing the combined effects of these dimensions within the context of innovation and financial performance.

To robustly estimate the effects, the Generalized Method of Moments (GMM) was employed, a methodology widely used in economic and financial research to address endogeneity concerns. As highlighted by Alvarez and Arellano (2022), Arellano and Bond (1991), and Boakye et al. (2021), GMM is effective because it utilizes internal instruments, such as the CLS variable, to correct biases in estimates. This methodology is particularly advantageous when addressing correlations between explanatory variables and the model's error term, ensuring greater precision in the inferences drawn.

By combining GMM with the creation of the CLS variable, a more robust analytical model is achieved. This approach enables a deeper understanding of how CAPEX, alongside corporate governance and financial performance, influences innovation investments in a well-founded and consistent manner.

Econometric Model

The econometric model for this study is specified as follows:

$$ROA_{it} = \beta_0 + \beta_1 CLS_{it} + \beta_2 ESG_{it} + \beta_3 PFC_{it} + \beta_4 DCE_{it} + \beta_5 (ESG * PFC)_{it} + \beta_6 (ESG * DCE)_{it} + \beta_7 ALF_{it} + \beta_8 VLM_{it} + \beta_9 ATI_{it} + \beta_{10} i.SECTOR_i + \beta_{11} i.ANO_t + E_{it}$$

Where:

ROA: Return on Assets (ROA); CLS: Interaction between CAPEX and Net Profit in organizations participating in the Corporate Governance Index (IGC); ESG: ESG score; PFC: Proportion of female members on the board of directors; DCE: CEO duality dummy; ESG*PFC or (ESPF): Interaction between the ESG score and the proportion of female representation on the board; ESG*DCE or (ESDC): Interaction between the ESG score and the CEO duality dummy; ALF: Natural logarithm of financial leverage values; VLM: Natural logarithm of market value; ATI: Natural logarithm of intangible asset values; *i.SECTOR*: Fixed effect by sector; *i.YEAR*: Fixed effect by year; *it*: individual and time, respectively; and *E*: Error.

RESULTS AND DISCUSSION

Correlations Between Variables

The analysis of Pearson's correlation matrix (Table 2) reveals varied relationships among the variables. Notable are moderate correlations, such as between capital expenditures (CAPEX) and VLM (0.52) and between PFC and ESPF (0.59), as well as a strong negative correlation between ESG and ATI, which was -0.59 . However, values above 0.70 would indicate high correlation and potential redundancy, thereby increasing the risk of multicollinearity, which was not observed. Relationships below 0.30 predominate, suggesting a limited impact on the estimation of a regression. According to Adams and Ferreira (2009) and Abid et al. (2022), this configuration favors running regressions without significant multicollinearity issues, thereby yielding more robust and reliable results.

Table 2 – Correlations Between Variables

		1	2	3	4	5	6	7	8	9
1	CAP	1.00								
2	DCE	0.21	1.00							
3	PFC	0.09	0.24	1.00						
4	ESG	-0.29	-0.07	0.09	1.00					
5	ESDC	0.18	0.50	0.15	0.41	1.00				
6	ESPF	-0.06	0.04	0.59	0.51	0.36	1.00			
7	ALF	0.06	0.17	0.02	0.06	0.04	0.08	1.00		
8	VLM	0.52	0.05	-0.04	-0.26	0.17	-0.08	0.03	1.00	
9	ATI	0.50	0.09	0.03	-0.59	-0.18	-0.22	0.03	0.35	1.00

Source: Generated by the author from the database

Descriptive Statistics

The Table 3 presents descriptive statistics among variables, with unbalanced samples ranging from 178 to 3,153 observations. The analysis of the descriptive statistics reveals that the capital expenditure variable (CAP) has a mean of 11.58, with values ranging from -2.43 to 15.03 and a standard deviation of 2.37, indicating moderate dispersion. CEO duality (DCE) occurs in 21% of the observations, with binary values (0 or 1). The proportion of women on the board (PFC) is low, with an average of 7%, highlighting the underrepresentation of women on boards.

The ESG variable showed high variability, with a standard deviation of 14.60, reflecting significant disparities in environmental, social, and governance practices. Meanwhile, the interactions ESDC and ESPF display wide ranges of values, suggesting heterogeneous impacts. The ROA variable presents a negative minimum value of -30.39 , indicating potential financial challenges in some companies. Overall, the data highlight a diversity of corporate practices and operational performance.

Table 3 – Description of Variables

Variables	Obs	Mean	Standard Deviation	Minimum	Máximo
CAP	2378	11.58	2.37	-2.43	15.03
DCE	406	0.21	0.41	0.00	1.00
PFC	406	0.07	0.10	0.00	0.43
ESG	178	10.05	14.60	0.92	57.34
ESDC	178	2.56	8.57	0.00	57.34
ESPF	178	0.98	2.59	0.00	18.77

ALF	2960	1.57	3.20	-5.81	9.91
VLM	2440	14.42	2.14	10.42	17.98
ATI	2085	11.02	3.56	-1.28	16.12
ROA	3153	1.09	10.95	-30.39	17.53

Source: Generated by the author from the database

Main Results

Table 4 presents the regression results. To understand the impact of each variable under different conditions, the regression results were divided into four stages. In the final rows, model quality indicators, verification tests, and tests of instrument validity are provided to ensure robustness and mitigate endogeneity issues.

Table 4 – Results of Isolated Variables

Variables	Stage 1	Stage 2	Stage 3	Stage 4
CLS	0.867*** (0.264)	0.868*** (0.268)	1.232** (0.425)	1.188** (0.424)
DCE	-0.879* (0.472)			-1.925*** (0.569)
PFC		-1.740 (2.334)		5724* (3.037)
ESG			-0.040 (0.028)	-0.054** (0.024)
ALF	0.457** (0.147)	0.461** (0.146)	0.735** (0.254)	0.799*** (0.212)
VLM	1.160*** (0.313)	1.120*** (0.317)	0.563 (0.377)	0.656** (0.324)
ATI	-1.440*** (0.155)	-1.420*** (0.159)	-1.549*** (0.278)	-1.674*** (0.247)
Constant	-12.221*** (3.537)	-11.828*** (3.666)	1.436 (6.040)	2.641 (5.122)
R ² (Centered)	0.406	0.398	0.369	0.457
Underidentification Test (LM statistic)	26.49***	26.36***	25.60***	25.06**
Identification Test (Wald F statistic)	144.580	144.180	76.220	78.370
Hansen Test (p-value)	0.470	0.540	0.990	0.960

Source: Generated by the author from the research results

Note 1 – Distribution of p-values: * p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01.

Note 2 – Values in parentheses are standard errors, while the values without parentheses represent the coefficients of the respective variables.

The analysis of the four stages presented in Table 4 reveals significant relationships between corporate variables and economic-financial performance. In Stage 1, the instrumental innovation variable (CLS) shows a positive and significant coefficient (0.867; p-value=0.001), while CEO duality (DCE) exhibits a marginally negative effect (-0.879; p-value=0.063). In Stage 2, female board presence (PFC) registers a non-significant negative coefficient (-1.740; p-value=0.456). With the inclusion of ESG in Stage 3, innovation strengthens its positive impact (1.232; p-value=0.004), leverage retains a positive sign (0.735; p-value=0.004), while ESG shows a non-significant negative effect (-0.040; p-value=0.150).

In Stage 4, innovation maintains robustness (1.188; p-value=0.005), CEO duality (DCE) becomes strongly negative (-1.925; p-value=0.001), and ESG gains statistically significant negative relevance (-0.054; p-value=0.025). Female presence (PFC) shifts to a marginally positive coefficient (5.723; p-value=0.059). The R² values (0.369 to 0.457) and identification tests (LM, Wald F, and Hansen) validate the models.

Comparing the stages, CLS retains positive consistency, supporting H1 and reinforcing innovation's role in performance, as corroborated by Abid et al. (2022) and Alvarez and Arellano (2022). DCE confirms H3, with an increasing negative impact aligned with Adams and Ferreira (2009), suggesting risks of power concentration. PFC shows inconsistencies (negative in Stage 2 and positive in Stage 4), indicating partial confirmation of H2 and reflecting complexity in gender diversity, per Aguilera et al. (2021). ESG, contrary to H4, demonstrates a significant negative effect in Stage 4, potentially linked to operational costs or greenwashing, as discussed by Baldi and Pandimiglio (2022) and Zhang (2023), diverging from Friede et al. (2015).

Furthermore, IV validation tests were conducted using metrics such as the Stock-Yogo test, LM statistic, Wald F statistic, and Hansen test. The Stock-Yogo critical value ranges from 7.25 to 19.93, and the Wald F statistic results (76.22 to 144.58) consistently exceed these critical values, indicating the instrument's strength and relevance. Additionally, the Hansen test (p-values between 0.47 and 0.99) suggests valid instruments with no exclusion restriction violations.

The results demonstrate that innovation and board role separation are critical factors for economic-financial performance. Gender diversity shows ambiguous impacts, while ESG may have negative effects in certain contexts. These findings emphasize the need to balance governance and sustainability practices to maximize organizational benefits.

The Table 5 presents the regression results illustrating how ESG moderators influence the effects of DCE and PFC variables on organizational performance. To this end, the results are organized into three stages (5, 6, and 7), which include independent variables such as the instrumental innovation variable (CLS), the interaction between ESG and CEO Duality (ESDC), and the interaction between ESG and Female Board Presence (ESPF). Additionally, analyses of control variables – Financial Leverage (ALF), Market Value (VLM), and Intangible Assets (ATI) – are provided. Furthermore, metrics such as centered R^2 , underidentification tests (LM statistic), identification tests (Wald F statistic), and the Hansen test were employed to assess model robustness and validate the instrument.

Table 5 - Moderating Variable Results

Variables	Stage 5	Stage 6	Stage 7
CLS	1.612*** (0.484)	1.301** (0.433)	1.605*** (0.489)
ESDC	-0.114*** (0.028)		-0.127*** (0.032)
ESPF		0.168** (0.078)	0.239*** (0.049)
ALF	0.735*** (0.218)	0.647** (0.228)	0.687*** (0.195)
VLM	0.919*** (0.278)	0.672** (0.317)	0.975*** (0.278)
ATI	-1.773*** (0.240)	-1.389*** (0.250)	-1.750*** (0.235)
Constant	-6.462 (4.509)	-3.941 (4.724)	-7.628* (4.592)
R^2 (Centered)	0.383	0.355	0.438
Underidentification Test (LM statistic)	6.22**	6.05**	6.01**
Identification Test (Wald F statistic)	80.240	85.130	80.950
Hansen Test (p-value)	0.750	0.320	0.870

Source: Generated by the author from the research results

Note 1 – Distribution of p-values: * p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01.

Note 2 – Values in parentheses are standard errors, while the values without parentheses represent the coefficients of the respective variables.

The study analyzes the effects of variables such as innovation (CLS), ESG practices (environmental, social, and governance), female board representation, and CEO duality on organizational economic and financial performance. The innovation instrumental variable (CLS) showed positive and significant coefficients in all stages, the coefficients being 1.612 in Stage 5, 1.301 in Stage 6, and 1.605 in Stage 7. This indicates that, regardless of the model, innovations contribute significantly to organizational performance, confirming the central role of innovation in generating results (Abid et al., 2022; Alvarez and Arellano, 2022).

The effects of the control variables are also consistent: Financial Leverage (ALF) and Market Value (VLM) present positive and significant coefficients in all stages, whereas Intangible Assets (ATI) exhibit a negative and highly significant coefficient, suggesting that high investments in intangibles may possibly reflect costs or inefficiencies (Chu et al., 2023). Regarding the validation of the IV instrument, the statistical tests provide robust evidence of its adequacy. The underidentification test (LM statistic) yielded values of 6.22, 6.05, and 6.01 for the respective stages, indicating that the instruments are not underidentified and that there is sufficient correlation between the instrument and the endogenous variable.

The identification test, measured by the Wald F statistic, is particularly relevant for verifying the strength of the instruments. With values of 80.24, 85.13, and 80.95, these results far exceed the Stock-Yogo critical values, which range between 7.25 and 19.93. According to Woodridge (2010), an F statistic above these critical thresholds ensures that the instruments are strong enough to avoid the problem of weak instruments, which can lead to biased and inconsistent estimates. Thus, the results indicate that the instruments used possess high relevance and robustness.

Regarding the interactions, the variable ESDC (ESG combined with CEO duality) revealed negative and significant coefficients in Stages 5 and 7, refuting hypothesis H6. These results indicate that the concentration of power in the CEO, even in high ESG contexts, impairs performance, corroborating warnings about conflicts of interest and lack of accountability (Aguilera et al., 2021; Shakil et al., 2021). In contrast, the variable ESPF (ESG with female board presence) presented positive and significant coefficients in Stages 6 and 7, supporting hypothesis H5. This synergy suggests that ESG practices amplify the benefits of gender diversity, aligning with studies that associate higher female participation with environmental innovations and transparency (Nguyen et al., 2020; Konadu et al., 2022).

The dichotomy between the results of the ESPF and ESDC interactions can be explained by distinct theories. Stakeholder Theory posits that female board presence fosters collaboration and pluralistic decision-making (Post & Byron, 2015), a benefit that is enhanced by ESG. Conversely, Agency Theory (Fama & Jensen, 1983) emphasizes that CEO duality concentrates power, thereby reducing board independence and creating governance risks, even in high ESG environments (Romano et al., 2020).

In summary, the results show that ESG practices are catalysts for positive impacts only when combined with balanced governance structures, such as diversified boards. However, they fail to mitigate the negative effects of power concentration, as seen in CEO duality. These conclusions reinforce the need for policies that integrate sustainability, diversity, and the separation of strategic roles, aiming to optimize performance and reduce decision-making asymmetries.

The Table 6 presents a summary of the hypothesis results.

Table 6 – Summary of the Hypothesis Results

Hypotheses		Expected Sign	Achieved Sign	Outcome
H1	Innovation in assets suggests positive impacts on economic-financial performance.	+	+	Supported
H2	Female presence on boards produces a positive impact on economic-financial performance.	+	+/-	Partially supported
H3	CEO duality negatively impacts the company's economic-financial performance.	-	-	Supported

H4	The ESG score rating produces positive impacts on economic-financial performance.	+	-	Not supported
H5	The ESG score favorably amplifies the effect of female presence on boards on organizational performance.	+	+	Supported
H6	The ESG index favorably enhances the influence of CEO duality, generating positive effects on economic-financial performance.	+	-	Not supported

Source: Generated by the author based on the theoretical framework and research findings

CONCLUSION

This study investigated the effects of innovation, governance factors, and ESG criteria on the economic and financial performance of companies. It also examined the implications of ESG criteria in mitigating the effects of CEO duality, as well as in promoting female representation on boards. By employing the Generalized Method of Moments (GMM) to address endogeneity issues, the results revealed complex and multifaceted relationships.

The findings demonstrated that innovation exerts a positive and consistent influence on performance, corroborating its role as a driver of competitiveness. In contrast, CEO duality exhibited increasingly negative effects, reinforcing the risks associated with concentrated decision-making power. Female representation on boards yielded ambiguous results with fluctuating impacts, suggesting that its effectiveness depends on contextual mediators such as inclusion policies and organizational culture. Meanwhile, ESG practices, although linked to operational costs and greenwashing risks in isolated analyses, proved to be catalysts for positive outcomes when combined with diversified boards, corroborating the importance of synergies between sustainability and governance.

The theoretical implications reside in integrating perspectives from Stakeholder Theory and Agency Theory, highlighting that ESG practices amplify benefits in collaborative contexts but fail to compensate for governance shortcomings. For managerial practice, the results suggest that companies should prioritize balanced governance structures by separating the roles of CEO and president, and invest in gender diversity as a strategic complement to ESG. Furthermore, managing intangible assets requires caution, given their potential for underutilization and high costs.

Among the limitations, the potential omission of moderating variables (e.g., organizational culture) and the concentration of the sample in specific sectors or regions stand out, which may limit generalizability. Moreover, standardized ESG metrics still require refinement to capture substantive versus performative practices. As suggestions for future research, it is proposed to investigate temporal interactions between variables, analyze sectors with stringent environmental regulations, and explore the role of mediators such as transparency policies and accountability mechanisms. The combination of qualitative and quantitative methods could also elucidate nuances not captured by econometric models, deepening the understanding of the dynamics observed here.

REFERENCES

1. Abid, N., Ceci, F., Ahmad, F., & Aftab, J. (2022). Financial development and green innovation, the ultimate solutions to an environmentally sustainable society: Evidence from leading economies. *Journal of Cleaner Production*, 369, 133223. <https://doi.org/10.1016/j.jclepro.2022.133223>
2. Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of financial economics*, 94(2), 291-309. <https://doi.org/10.1016/j.jfineco.2008.10.007>
3. Agoraki, K. K., Giaka, M., Konstantios, D., & Negkakis, I. (2024). The relationship between firm-level climate change exposure, financial integration, cost of capital and investment efficiency. *Journal of International Money and Finance*, 141, 102994. <https://doi.org/10.1016/j.jimonfin.2023.102994>.
4. Aguilera, R. V., Aragón-Correa, J. A., Marano, V., & Tashman, P. A. (2021). The corporate governance of environmental sustainability: A review and proposal for more integrated research. *Journal of Management*, 47(6), 1468-1497. <https://doi.org/10.1177/0149206321991212>

5. Aksoy, M., Yilmaz, M. K., Tatoglu, E., & Basar, M. (2020). Antecedents of corporate sustainability performance in Turkey: The effects of ownership structure and board attributes on non-financial companies. *Journal of Cleaner Production*, 276, 124284. <https://doi.org/10.1016/j.jclepro.2020.124284>.
6. Alkaraan, F., Elmarzouky, M., de Sousa Jabbour, A. B. L., Jabbour, C. J. C., & Gulko, N. (2025). Maximising sustainable performance: Integrating servitisation innovation into green sustainable supply chain management under the influence of governance and Industry 4.0. *Journal of Business Research*, 186, 115029. <https://doi.org/10.1016/j.jbusres.2024.115029>
7. Alvarez, J., & Arellano, M. (2022). Robust likelihood estimation of dynamic panel data models. *Journal of econometrics*, 226(1), 21-61. <https://doi.org/10.1016/j.jeconom.2021.03.005>
8. An, H., Chen, C. R., Wu, Q., & Zhang, T. (2021). Corporate innovation: Do diverse boards help?. *Journal of Financial and Quantitative Analysis*, 56(1), 155-182. <https://doi.org/10.1017/S0022109019001005>
9. Austin, A., & Rahman, I. U. (2022). A triple helix of market failures: Financing the 3Rs of the circular economy in European SMEs. *Journal of Cleaner Production*, 361, 132284. <https://doi.org/10.1016/j.jclepro.2022.132284>
10. Baldi, F., & Pandimiglio, A. (2022). The role of ESG scoring and greenwashing risk in explaining the yields of green bonds: A conceptual framework and an econometric analysis. *Global Finance Journal*, 52, 100711. <https://doi.org/10.1016/j.gfj.2022.100711>
11. Boakye, D. J., Tingbani, I., Ahinful, G. S., & Nsor-Ambala, R. (2021). The relationship between environmental management performance and financial performance of firms listed in the Alternative Investment Market (AIM) in the UK. *Journal of Cleaner Production*, 278, 124034. <https://doi.org/10.1016/j.jclepro.2020.124034>
12. Chu, H. L., Liu, N. Y., & Chiu, S. C. (2023). CEO power and CSR: the moderating role of CEO characteristics. *China Accounting and Finance Review*, 25(1), 101-121. <https://doi.org/10.1108/CAFR-03-2022-0027>
13. Enciso-Alfaro, S. Y., & García-Sánchez, I. M. (2024). Do boards care about planetary boundaries? A gender perspective on circular economy disclosures. *Business Strategy and the Environment*, 33(5), 4562-4597. <https://doi.org/10.1002/bse.3700>
14. Fama, E.F., & Jensen, M.C., (1983). Separation of ownership and control. *SSRN Electronic Journal*. 26 (2), 301-325. <https://doi.org/10.2139/ssrn.94034>
15. Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of sustainable finance & investment*, 5(4), 210-233. <https://doi.org/10.1080/20430795.2015.1118917>
16. García-Meca, E., Ramón-Llorens, M. C., & Martínez-Ferrero, J. (2024). Feminine expertise on board and environmental innovation: the role of critical mass. *Review of Managerial Science*, 18(8), 2255-2286. <https://doi.org/10.1007/s11846-023-00685-2>
17. Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A New Sustainability Paradigm? *Journal of Cleaner Production*, 143, 757–768. <https://doi.org/10.1016/j.jclepro.2016.12.048>
18. Griffin, D., Li, K., & Xu, T. (2021). Board gender diversity and corporate innovation: International evidence. *Journal of Financial and Quantitative Analysis*, 56(1), 123-154. <https://doi.org/10.1017/S002210901900098X>
19. Hall, B. H., Lotti, F., & Mairesse, J. (2014). Evidence on the Impact of R&D and ICT Investment on Innovation and Productivity in Italian Firms. *Economics of Innovation and New Technology*, 23(3), 300–328. <https://doi.org/10.1080/10438599.2012.708134>
20. Hsieh, T. Y., Lin, T. Y., Li, F., & Kuo, J. N. (2024). CEO duality and corporation innovation. *Sage Open*, 14(1), 21582440231226019. <https://doi.org/10.1177/21582440231226019>
21. Ilyas, I. M., & Osiyevskyy, O. (2022). Exploring the impact of sustainable value proposition on firm performance. *European Management Journal*, 40(5), 729-740. <https://doi.org/10.1016/j.emj.2021.09.009>
22. Khan, T. M., Gang, B., Fareed, Z., & Yasmeen, R. (2020). The impact of CEO tenure on corporate social and environmental performance: an emerging country's analysis. *Environmental Science and Pollution Research*, 27, 19314-19326. <https://doi.org/10.1007/s11356-020-08468-y>
23. 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. <https://doi.org/10.1016/j.techfore.2021.121279>

24. 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. <https://doi.org/10.1016/j.techfore.2021.121279>
25. Korphaibool, V., Chindasombatcharoen, P., Chatjuthamard, P., Jiraporn, P., & Treepongkaruna, S. (2024). Business sustainability under the influence of female directors toward the risk-taking in innovation: Evidence from textual analysis. *Business Strategy and the Environment*, 33(3), 1578-1591. <https://doi.org/10.1002/bse.3560>
26. Krause, R. (2017). Being the CEO's boss: An examination of board chair orientations. *Strategic Management Journal*, 38(3), 697-713. <https://doi.org/10.1002/smj.2500>
27. Kwarteng, A., Simpson, S. N. Y., & Agyenim-Boateng, C. (2022). The effects of circular economy initiative implementation on business performance: the moderating role of organizational culture. *Social Responsibility Journal*, 18(7), 1311-1341. <https://doi.org/10.1108/SRJ-01-2021-0045>
28. Liu, X., Huang, N., Su, W., & Zhou, H. (2024). Green innovation and corporate ESG performance: Evidence from Chinese listed companies. *International Review of Economics & Finance*, 95, 103461. <https://doi.org/10.1016/j.iref.2024.103461>
29. Ma, Z., Shu, G., Wang, Q., & Wang, L. (2022). Sustainable governance and green innovation: A perspective from gender diversity in China's listed companies. *Sustainability*, 14(11), 6403. <https://doi.org/10.3390/su14116403>
30. Med Bechir, C., & Jouirou, M. (2024). Investment efficiency and corporate governance: evidence from Asian listed firms. *Journal of Sustainable Finance & Investment*, 14(3), 596-618. <https://doi.org/10.1080/20430795.2021.1974241>
31. Nguyen, T. H. H., Ntim, C. G., & Malagila, J. K., (2020). Women on corporate boards and corporate financial and non-financial performance: A systematic literature review and future research agenda. *International Review of Financial Analysis*, 71, 101554. <https://doi.org/10.1016/j.irfa.2020.101554>
32. Palea, V., Santhià, C., & Miazza, A. (2023). Are circular economy strategies economically successful? Evidence from a longitudinal panel. *Journal of Environmental Management*, 337, 117726. <https://doi.org/10.1016/j.jenvman.2023.117726>
33. Post, C., & Byron, K. (2015). Women on boards and firm financial performance: A meta-analysis. *Academy of management Journal*, 58(5), 1546-1571. <https://doi.org/10.5465/amj.2013.0319>
34. Ranta, V., Aarikka-Stenroos, L., & Mäkinen, S. J. (2018). Creating value in the circular economy: A structured multiple-case analysis of business models. *Journal of cleaner production*, 201, 988-1000. <https://doi.org/10.1016/j.jclepro.2018.08.072>
35. Ribeiro, A. D.; & Funchal, B. (2018). Fatores determinantes na incorporação das organizações ao ISE. *Base Revista de Administração e Contabilidade da UNISINOS*, v. 15, n. 1, p. 31-41. <https://doi.org/10.4013/base.2018.151.03>
36. Romano, M., Cirillo, A., Favino, C., & Netti, A. (2020). ESG (environmental, social and governance) performance and board gender diversity: the moderating role of CEO duality. *Sustainability*, 12(21), 9298. <https://doi.org/10.3390/su12219298>
37. Shakil, M.H., Tasnia, M. and Mostafiz, M.I. (2021), "Board gender diversity and environmental, social and governance performance of US banks: moderating role of environmental, social and corporate governance controversies", *International Journal of Bank Marketing*, 39(4), 661-677. <https://doi.org/10.1108/IJBM-04-2020-0210>
38. Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT Press. Acesso em: 27 fev. 2025. Disponível em: http://mmf.lnu.edu.ua/images/stories/depart/mee/wooldridge_cross_section_and_panel_data.pdf
39. Zhang, D. (2023). Does green finance really inhibit extreme hypocritical ESG risk? A greenwashing perspective exploration. *Energy Economics*, 121, 106688. <https://doi.org/10.1016/j.eneco.2023.106688>
40. Zournatzidou, G., Ragazou, K., Sklavos, G., & Sariannidis, N. (2025). Examining the Impact of Environmental, Social, and Corporate Governance Factors on Long-Term Financial Stability of the European Financial Institutions: Dynamic Panel Data Models with Fixed Effects. *International Journal of Financial Studies*, 13(1), 3. <https://doi.org/10.3390/ijfs13010003>