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The Impact of ESG Practices on ROA, Financial Leverage, and ROE. A Comparative Analysis of the United States, the European Union, China, and Japan

El impacto de las prácticas ESG en el ROA, el apalancamiento financiero y el ROE. Un análisis comparativo de Estados Unidos, la Unión Europea, China y Japón

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ABSTRACT

The article provides a comprehensive understanding of how Environmental, Social, and Governance performance increase the return on assets and the companies' financial leverage, ultimately enhancing the return on equity, in the United States, the European Union, China and Japan. To achieve this understanding, the study also analyses the core components of the financial leverage: the leverage ratio and the cost of debt. The study analyses 13,321 observations of public companies from 2017 to 2021. To analyse it we use a multilevel model (mix multilevel model in Stata), incorporating into the specified regression models the inherent hierarchical structure of data.

The findings indicate that ESG investments are positively perceived by stakeholders, enhancing financial performance in all regions, though with notable differences. The analysis examines these distinct regions separately but also introduces the geographic zone as a moderating variable to evaluate comparatively how different regional contexts affects environmental performance on corporate financial results. An important conclusion is that the market rewards ESG is inverse proportion to the region's regulatory maturity. Internationally, however, this regulatory framework acts as a country-level or baseline standard. While the US experiences the strongest global impact of ESG on these financial variables, followed by the EU, the effects are more moderate for companies in China and Japan.

Understanding ESG's impact on the returns on assets and equity is crucial for investors, corporate leaders, and policymakers promoting sustainable growth. As global markets integrate sustainability, identifying ESG's financial benefits strengthens the case for its adoption worldwide.

Keywords: ESG; ROE; ROA; Financial Leverage.

R E S U M E N

El artículo proporciona una comprensión integral de cómo el desempeño ambiental, social y de gobernanza (ESG) aumenta la rentabilidad de los activos y el apalancamiento financiero de las empresas, mejorando la rentabilidad del capital en Estados Unidos, la Unión Europea, China y Japón. Para lograr este objetivo, se analizan los componentes clave del apalancamiento financiero: la ratio de apalancamiento y el coste de deuda. El estudio analiza 13.321 observaciones de empresas cotizadas entre 2017 y 2021 utilizando un modelo multinivel mixto en Stata, incorporando la estructura jerárquica de los datos.

Los hallazgos indican que las inversiones ESG son percibidas positivamente por los grupos de interés, lo que mejora el rendimiento financiero en todas las regiones, aunque con diferencias notables. El análisis introduce la zona geográfica como variable moderadora para evaluar de forma comparativa cómo los diferentes contextos regionales afectan al impacto del rendimiento ambiental en los resultados corporativos. Una conclusión importante es que el mercado recompensa los criterios ESG en proporción inversa a la madurez regulatoria de la región. Sin embargo, a nivel internacional, este marco regulatorio actúa como un estándar básico. Si bien EE. UU. experimenta el mayor impacto global de ESG en estas variables, seguido de la UE, los efectos son más moderados en China y Japón.

Comprender este impacto es crucial para inversores, líderes corporativos y responsables políticos que promueven el crecimiento sostenible, reforzando los argumentos a favor de su adopción mundial.

Palabras clave: ESG; ROE; ROA; Apalancamiento financiero.

1. INTRODUCTION

Environmental, Social, and Governance (ESG) practices have emerged as pivotal determinants of corporate strategy and financial performance in recent years. Investors and stakeholders increasingly demand transparency and accountability, expecting that sustainable business practices contribute not only to societal well-being but also to long-term profitability. Consequently, ESG integration has become a strategic imperative for firms seeking to optimize financial outcomes.

Despite extensive research on the financial implications of ESG behavior, a comprehensive comparative analysis across the four major economic regions, namely, the United States (US), the European Union (EU), Japan, and China, remains underexplored. This study addresses this gap by examining how ESG practices influence Return on Equity (ROE). Specifically, the article decomposes this impact by analyzing ESG's effect on: (1) Return on Assets (ROA), (2) the financial leverage effect (comprising the cost of debt and the leverage ratio) and, finally, (3) the resulting total ROE.

The findings demonstrate that while the relationship between ESG behavior and financial performance is globally positive, its impact varies significantly across regions. The US experiences the most pronounced effect, followed by the EU, while the impact is more moderate in China and Japan. Furthermore, the analysis reveals that higher average ESG scores within a geographic area correlate with greater financial impact. Therefore, ESG indices enhance corporate transparency and stakeholder confidence, both of which are vital for sustained financial performance.

The remainder of this work is structured as follows: Section 2 develops the theoretical framework and hypotheses; Section 3 details the research methodology; Section 4 presents the empirical results, providing a comprehensive understanding of how ESG increases ROA and financial leverage, ultimately enhancing ROE across varying economic contexts. Finally, Section 5 presents the discussion and Section 6 the conclusions and limitations.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

ESG encompasses the Environmental, Social, and Governance factors utilized to evaluate an organization's sustainability and societal impact. These determinants are increasingly pivotal for investors and stakeholders who seek to look beyond traditional financial metrics to assess long-term value and risk (United Nations Global Compact [UNGC] *et al.*, 2004; United Nations Principles for Responsible Investment [UNPRI], n.d.).

Environmental factors assess how an organization manages its impact on the natural world, specifically regarding climate change impact, resource utilization, waste management, pollution, and conservation. Social factors examine the management of relationships with employees, suppliers, customers, and the communities of operation; these include labor standards, human rights, product safety, data protection, and community engagement. Finally, Governance focuses on leadership structures, executive compensation, audits, internal controls, and shareholder rights, addressing the organization's management, ethical practices, and transparency.

ESG is a multidimensional construct rooted in various theoretical frameworks that explain the motivations for its adoption and its subsequent impact on corporate performance. Stakeholder Theory emphasizes that business strategies based on ESG principles are directly related to stakeholder well-being, suggesting that businesses must integrate the interests of all parties, including employees, customers, suppliers, communities, and the environment (Aguilera *et al.*, 2007; Freeman, 2010). Complementing this, Signaling Theory posits that companies utilize ESG reporting and initiatives as mechanisms to communicate their quality and commitment to sustainability. These signals mitigate information asymmetry, thereby helping firms attract investors and customers while increasing overall firm value (Flammer, 2013; Giannarakis, 2014).

From the perspective of Legitimacy Theory, firms endeavour to operate within societal norms and expectations to be perceived as legitimate, a process that enhances corporate reputation and fosters institutional trust (Suchman, 1995; Zhang *et al.*, 2020). With the increasing institutionalization of ESG, Institutional Theory explains how companies adopt these practices to conform to external pressures and meet the standardized expectations of regulators and global markets (Brammer *et al.*, 2012; DiMaggio *et al.*, 1983). Furthermore, Agency Theory posits that the integration of ESG factors can mitigate risks and better align the interests of managers with those of long-term shareholders, thereby reducing agency conflicts and contributing to sustainable financial performance (Gillan *et al.*, 2010; Harjoto *et al.*, 2015).

Collectively, these theoretical frameworks are interrelated and suggest that ESG integration serves as a strategic driver of financial architecture. Specifically, the reduction of risk and information asymmetry, as conceptualized by Signaling and Agency theories, is expected to lower the cost of debt. Concurrently, improved stakeholder relations and operational legitimacy, rooted in Stakeholder and Legitimacy theories, should enhance operational efficiency as reflected in the Return on Assets (ROA). Ultimately, the interaction between these operational gains and the optimization of the financial leverage effect determines the cumulative impact on Return on Equity (ROE), with the intensity of this relationship varying across distinct economic and institutional regions.

2.1. ESG and Financial Performance: An Integrated Perspective

Funded upon Stakeholder, Signaling, Legitimacy, Institutional, and Agency theories, an extensive body of empirical research has identified a positive correlation between ESG factors and financial performance. For instance, Friede *et al.* (2015) conducted a meta-analysis of over 2,000 studies, concluding that a significant positive relationship exists between ESG integration and corporate financial outcomes. Similarly, Eccles *et al.* (2014) demonstrated that firms with superior ESG performance consistently outperform their peers in long-term stock market returns. Furthermore, a comprehensive review of over 200 academic sources by Clark *et al.* (2015) revealed that approximately 80% of the literature confirms a positive association between corporate sustainability and financial metrics. Conversely, Krüger (2015) highlighted the risks of non-compliance, finding that negative ESG-related controversies exert a substantial adverse impact on both Return on Assets (ROA) and Return on Equity (ROE).

Nevertheless, the empirical evidence is not entirely uniform. Humphrey *et al.* (2012) analyzed a sample of Australian firms and found no conclusive evidence of ESG practices significantly impacting ROA or ROE. Similar non-significant results were reported by Galema *et al.* (2008) in their analysis of European companies. Furthermore, Hoepner *et al.* (2019) observed mixed outcomes in the United States, noting that while certain ESG dimensions bolstered financial performance, others remained statistically insignificant.

A high ESG combined score reflects a firm's robust performance across the environmental, social, and governance pillars. Consistent with prior research, ESG is viewed not merely as an ethical consideration but as a core component of strategic management and long-term value creation. This reinforces the principle that ESG factors are material to a company's financial success across multiple levels, directly impacting its strategic resilience and competitive positioning (Aguilera *et al.*, 2007; Eccles *et al.*, 2014; Friede *et al.*, 2015).

Although the prevailing literature suggests a positive ESG-performance nexus, the specific transmission mechanisms, particularly those operating through financial leverage, merit a more detailed investigation. The financial leverage effect captures the incremental return or loss generated for shareholders through debt financing. This is mathematically defined as the spread between ROA and the cost of debt, amplified by the leverage ratio. Under the premise that sustainability optimizes strategic management and value creation, we propose:

H1.1. ESG performance increases the return of assets (ROA)

Beyond operational efficiency (ROA), ESG performance influences how a firm finances its operations. Lassala *et al.* (2017) demonstrated that a positive ROA level is a necessary condition for leveraged companies to benefit financially from their sustainability profile. These criteria have become essential for investors and stakeholders who look beyond traditional financial metrics to assess long-term value and risk mitigation (United Nations Global Compact [UNGC], 2004). If ESG integration reduces a firm's risk profile, it should optimize its cost of capital. In fact, other lines of research have investigated how ESG affects the cost of debt, highlighting that firms with stronger ESG tend to experience reduced borrowing costs (Caragnano *et al.*, 2020; Ali *et al.*, 2023; Fandella *et al.*, 2023). To examine this mechanism, we propose the following sub-hypotheses:

H1.2. ESG performance increases financial leverage effect

H1.2.1. ESG performance decreases the cost of debt

H1.2.2. ESG performance increases companies' external debt capacity

In summary, the proposed hypotheses constitute a structured model that seeks to explain how ESG integration transcends being a mere reputational asset to become a fundamental driver of corporate profitability. By synthesizing Stakeholder and Signaling theories with the financial mechanics of the leverage effect, this study posits that ESG behavior acts on two fronts: first, by enhancing operational efficiency and asset productivity (ROA); and second, by optimizing the firm's financing conditions through reduced risk perception and lower cost of debt. The confluence of these factors, operational gains and a favorable financial spread, is expected to result in a superior Return on Equity (ROE) (Florez-Parra *et al.*, 2020). Thus, the last hypothesis is:

H1.3. ESG performance increases the return of equity (ROE)

2.2. The Moderating Role of Geographical Areas

The intensity of the relationships between ESG performance and financial profitability may be moderated by the specific institutional and economic contexts of the US, EU, Japan, and China. Consequently, market rewards and disclosure levels may vary significantly due to differing institutional settings (Eliwa *et al.*, 2021; Singhania *et al.*, 2024).

The European Union (EU) has implemented landmark initiatives such as the European Green Deal (European Commission, 2019) and the Sustainable Finance Disclosure Regulation (SFDR; European Union, 2019). These establish stringent requirements for companies to disclose ESG-related information, further bolstered by the Corporate Sustainability Reporting Directive (CSRD), effective as of January 2024 (European Commission, 2022). This comprehensive regulatory framework, which also includes the EU Taxonomy and the European Green Bond Standard (European Commission, 2023), has led to greater consistency and comparability in ESG scores across the region.

The United States (US) possesses a well-developed ESG ecosystem, featuring a wide range of data providers, rating agencies, and investors focused on sustainability factors. However, it lacks a unified federal ESG framework, resulting in a patchwork of state and industry-specific regulations. Nevertheless, many US companies voluntarily disclose ESG-related information and make public commitments, not due to legal mandates, but because investors and other stakeholders expect greater transparency and accountability (Malone *et al.*, 2023).

Research from both the US and the EU highlights a generally positive impact of ESG performance on financial outcomes. For instance, Pérez and Sevillano (2025) and Krüger (2015) found that companies with higher ESG scores tend to achieve improved ROE and ROA, driven by enhanced risk management and stronger stakeholder engagement. However, findings are not strictly uniform. Candio (2024), analysing the European healthcare sector, found no significant impact, while Hoepner *et al.* (2019) reported mixed results for US companies, suggesting that while some ESG factors positively influence ROA and ROE, others show no significant relationship.

In China, many studies focus on environmental issues driven by ambitious decarbonization goals and the implementation of a green credit policy since 2007 (Liu *et al.*, 2017). Notably, China emerged as a major issuer of green bonds in 2023 (Bloomberg, 2023). However, ESG progress in social and human rights dimensions remains comparatively weak and disparate across regions (United Nations Human Rights Office [UNHRO], 2022). The integration process is also hindered by inconsistent data and a lack of standardized metrics, with only 35% of firms consistently appearing in top-tier rankings (Zhu *et al.*, 2023). Nonetheless, Zhao *et al.* (2018) demonstrated that ESG scores positively influence ROA and ROE in listed power generation groups, and Chen *et al.* (2023) noted that this impact is particularly significant for large companies and high-risk industries.

Japan builds upon traditional cultural values of responsibility and community to drive ESG integration (Miyamoto & Nohara, 2023). In October 2020, Japan joined the EU in pledging to reach net-zero carbon emissions by 2050. However, in terms of social and governance metrics, Japanese companies have historically lagged behind their Western counterparts, particularly regarding diversity, board composition, and transparency (McKinsey Sustainability, 2021). Studies focused on Japanese firms reveal trends similar to other regions; Fujii *et al.* (2020) observed that firms adopting ESG practices report higher ROA and ROE due to operational efficiency and consumer trust, while Harada and Yamamoto (2021) found a significant positive relationship between ESG disclosure and profitability. Recently, the Financial Services Agency (FSA) implemented new rules in 2023, mandating sustainability disclosures in annual reports, aligned with the International Sustainability Standards Board (ISSB) standards (EY, 2023).

In summary, while there is a global trend toward ESG compliance, the transmission mechanisms to financial performance are dictated by regional institutional frameworks and business cultures (Friede, 2015). Hypothesis 2 addresses these geographical variances:

H2. The relationship between ESG performance and financial variables (ROA, Financial Leverage, Cost of Debt, Leverage Ratio, and ROE) is moderated by geographical area, reflecting the distinct institutional frameworks and market expectations.

3. RESEARCH METHODOLOGY

The dataset was extracted from the Refinitiv Eikon database, comprising publicly listed firms from the US, the EU, China, and Japan for the period 2017-2021. These regions were selected as the four most industrialized areas globally. To exclude small-sized enterprises, a minimum turnover of €40 million and a workforce of 250 employees were required. These criteria follow the thresholds defined by the EU Accounting Directive (Directive 2013/34/EU) for large undertakings. Applying these criteria serves a dual purpose: 1. It ensures that the firms have the institutional maturity required to provide financial and non-financial disclosures, thereby reducing the prevalence of missing data in the Refinitiv EIKON database. 2. It harmonizes the sample across jurisdictions, ensuring that the 'medium-to-large' firm category is economically equivalent across the four regions, which enhances the internal validity of the financial performance comparisons. The final sample comprises 4,275 firms, restricted to those with leverage ratios ranging from 0.5 to 3[1]. To minimize the impact of extreme outliers and potential data entry errors in the financial variables, all continuous dependent variables were winsorized at the 2nd and 98th percentiles. This procedure is standard in empirical corporate finance to prevent spurious results driven by extreme observations while preserving the underlying distribution of the data. By capping these outliers, we ensure that the estimated relationship between ESG performance and financial outcomes is robust and representative of the broader sample, leading to more conservative and reliable standard.

The model alternatively employs Return on Assets (*ROA*), financial leverage (*FinancialLeverage*), cost of debt (*CostofDebt*), leverage (*Lev*), and Return on Equity (*ROE*) as dependent variables. The primary independent variable is the ESG Combined Score (*ESGCombScore*), which is operationalized as a categorical variable with three levels: Level 0 serves as the control group, comprising firms not included in the ESG index; Level 1 includes companies within the index scoring between 0 and 50 (the minimum score of enterprises in ESG combined index is 0.66); and Level 2 consists of firms with scores exceeding 50 (the continuous score ranges from 0 to 100). Consistent with previous literature (Flórez-Parra *et al.*, 2020; Lassala *et al.*, 2017), we incorporate several control variables: the natural logarithm of full-time employees (*Employees*) as a proxy for firm size; the liquidity ratio (*LiquidityRatio*), representing a firm's ability to meet short-term obligations; the solvency ratio (*SolvencyRatio*) for long-term obligations; the cost of debt (*CostofDebt*) expressed as a percentage; and the leverage ratio (*LeverageRatio*).

The inclusion of Employees (Log) as a control variable addresses the potential size bias, accounting for the fact that larger corporations often possess greater resources for ESG implementation and disclosure. Furthermore, we include a set of financial control variables (*LiquidityRatio*, *SolvencyRatio*, *CostofDebt*, and *LeverageRatio*) to isolate the impact of the firm's financial risk and capital structure from its financial performance. This ensures that the observed relationship between ESG and financial outcomes is not confounded by the companies' underlying financial health or risk profile.

We employ a Linear Mixed-Effects (LME) model, also known as a multilevel model, to analyze the impact of ESG performance on corporate financial structures. This approach is superior to standard OLS regression because it accounts for the nested nature of the data where observations are grouped within firms, which are in turn grouped within sectors and geographic regions. By accounting for the variance caused by sectors, countries, and individual firm identities, we are forcing the Fixed Effects (the ESG scores) to prove their significance against a much tougher benchmark. To be able to verify a causal relationship (and not only a correlation) the independent variables have been lagged by one period. Table 1 shows the definition and characteristics of the variables included in the model:

$$ROA_{i,t}/FinancialLeverage_{i,t}/CostofDebt_{i,t}/Leverage_{i,t}/ROE_{i,t} = \alpha+\beta_2 ESGCombScore_{i,t-1}+\beta_n Controls_{i,t-1}+\varepsilon_t+\varepsilon_z+\varepsilon_{zs}+\varepsilon_{zsi}+\varepsilon_r \quad (1)$$

We first developed a global model encompassing all geographical regions, followed by four area-specific models that isolate each world region to compare the effects of ESG on financial performance. To address the inherent hierarchical structure of the data, where firms are nested within sectors and geographical areas (and within countries for the European subsample), we employ a multilevel mixed-effects model via the mixed command in Stata. This approach controls for unobserved heterogeneity caused by differences across groups, which might otherwise bias the estimates, and accounts for intra-group correlation. The model structure is illustrated in Figure 1.

[1] According to Altman's model, the leverage at which a company would be at risk is 1.6. If we take into account that according to our database the market value of equity is on average 1.9 times the value of book equity, we can assume leverage close to 3 as a risk threshold.

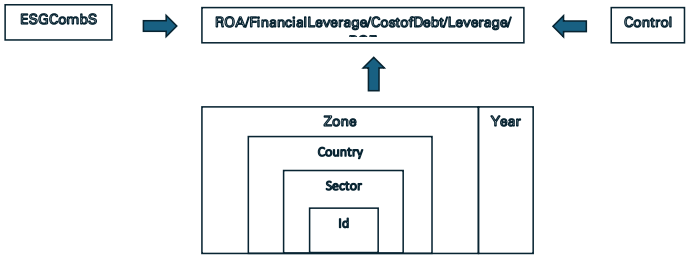

Figure 1
Diagram of the multilevel model
Source: Own elaboration.

In this framework, the model is decomposed into two parts. The random effects component separates the variation into within-group (individual) and between-group (cluster) levels. Consequently, the total error term is partitioned into five sources of volatility: ε_t, ε_z, ε_{zs}, ε_{zsi}, ε_r. For the global model: *Year (t)*, *Zone* or *Geographical area (Z)*, *Country* (only for UE) *(C)*, economic sector *(S)*, firm (*i*), and residual *(r)*. While firms are nested within Sectors and Geographical Zones, the Year (ε_t) is treated as a transversal factor. This specification is crucial as it allows the model to absorb time-specific shocks that affect the entire global market simultaneously. Consequently, latent macroeconomic variables such as global inflation, currency fluctuations, and international sectoral cycles are effectively controlled, ensuring that the coefficients for ESG performance represent the net impact on financial results, independent of the temporal economic climate.

The fixed-effects component of the model estimates the coefficients for the independent variables and controls for the specific observed characteristics that influence the outcome, as detailed in Table 1.

Table 1
Definitions and characteristics of the variables

DEPENDENT VARIABLES	
ROA	EBIT / Total Assets
FinancialLeverage	(*ROA – CostofDebt)* * (Total Liabilities/ Total Equity)
ROE	*ROA + FinancialLeverage*
INDEPENDENT VARIABLE	
ESGCombScore	Level variable: *Level 0 collects scores = 0 ;Level 1 collects scores > 0 and < = 50; Level 2 collects scores > 50.*
CONTINUOS CONTROL VARIABLES	
Employees	Natural logarithm of the total employees
LiquidityRatio	Total current assets / Total current liabilities
SolvencyRatio	Total assets / Total liabilities
CostofDebt	(Interest expense / Total liabilities) * 100
LeverageRatio	Total liabilities / Total equity

Source: Own elaboration.

4. EMPIRICAL RESULTS

Table 2 presents the descriptive statistics for the continuous variables. The results indicate that the mean *ROA* is 6%, while the average cost of debt stands at 3.53%. Furthermore, the mean *FinancialLeverage* is approximately 6%, and the *ESGCombScore* averages 34 points.

Table 2
Descriptives of continuous variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA (%)	13,321	6.03	10.14	–603.27	217.77
FinancialLeverage (%)	13,321	6.05	13.75	–672.08	298.54
ROE (%)	13,321	12.08	23.23	–1275.36	516.31
$ESGCombScore_{t-1}$	13,321	33.59	27.96	0.00	94.77
$Employees_{t-1}$ *(ln)*	13,221	8.39	1.54	5.52	14.65
$LiquidityRatio_{t-1}$	13,321	1.75	1.15	0.02	30.39
$SolvencyRatio_{t-1}$	13,321	1.87	0.41	1.33	3.00
$CostofDebt_{t-1}$ *(%)*	13,321	3.53	3.38	0.00	26.62
$LeverageRatio_{t-1}$	13,321	1.43	0.65	0.50	3.00

Source: Own elaboration.

Regarding the ESG variable, we opted for a level-based approach instead of a continuous one. This choice is driven by the need to include a control group consisting of firms without an ESG score. Table 3 summarizes the distribution of firms across ESG levels by geographical region. In the US, only 7.98% of the sampled listed companies do not participate in any sustainability ranking (Level 0). In contrast, non-participation rates are significantly higher in other regions: 47.73% in the EU, followed by 55.41% in China and 55.97% in Japan. Among participating firms, 62.32% of American companies are classified as Level 1 (a score equal to or less than 50 points), while 29.7% reach Level 2 (more than 50 points). Notable differences emerge when comparing these figures to the EU, where 21.57% and 30.7% of firms achieve Level 1 and 2, respectively. In the Asian markets, sustainability performance appears more polarized; only 19.54% of Chinese firms reach Level 2, whereas this figure increases to 25.87% for Japanese companies. The figure for China clearly indicates a small number of companies participating in international indices but, in addition, most companies are in level 1, meaning, on average, certain non-compliance with international standards, as indicated in the previous framework.

Table 3
Descriptive firms in each ESG Combined Score level by Country

ESGCombScore Level	US	%	EU	%	CHINA	%	JAPAN	%	Total
ESGCombScore 0	328,000	7.98	2,728	47.73	655,000	55.41	1,294	55.97	5,005
ESGCombScore 1	2,562	62.32	1,233	21.57	296,000	25.04	420,000	18.17	4,511
ESGCombScore 2	1,221	29.70	1,755	30.70	231,000	19.54	598,000	25.87	3,805
Total	4,111	100	5,716	100	1,182	100	2,312	100	13,321

Source: Own elaboration.

Table 4 shows the average ESG combined Score by geographical area and sector. The US has the best ranking with an average score of 41.89 points, followed by the EU, Japan and China with 33.34, 24.24 and 24.21 respectively.

Table 4
Descriptive statistics for the ESG Combined Score mean by Country

Sector/Zone	US	EU	CHINA	JAPAN	Mean Sector
Healthcare	43.10	45.20	34.89	35.04	42.62
Technology	41.24	32.12	32.93	33.79	35.80
Consumer Non-Cyclicals	41.81	28.61	33.78	26.45	31.34
Industrials	41.52	31.37	23.29	20.79	31.49
Utilities	50.55	40.73	30.78	26.57	41.59
Consumer Cyclicals	39.70	28.83	22.40	21.60	29.91
Basic Materials	45.45	37.85	13.37	23.55	34.20
Energy	38.84	42.37	21.21	23.05	37.38
Real Estate	49.76	42.80	18.79	22.79	31.11
Academic & Education	32.19	32.97	17.03	69.01	27.13
Mean by Country	41.89	33.34	24.21	24.24	

Source: Own elaboration.

The correlation matrix reveals a strong correlation among the performance metrics, namely *ROA*, *FinancialLeverage*, and *ROE*; consequently, these variables will be analyzed in separate models. As hypothesized, the *ESGCombScore* exhibits a positive correlation with all three profitability ratios. Furthermore, firm size is positively associated with these financial indicators, whereas the cost of debt demonstrates a significant negative correlation with them.

We also observe the strong correlation between the solvency and leverage ratio; thus, we will avoid introducing them in the same equation to avoid multicollinearity. Nevertheless, the correlations between the rest of independent variables are mostly weak and all VIF values are below 4, indicating that our sample does not suffer from multicollinearity problems.

Table 5
Correlation matrix

	1	2	3	4	5	6	7	8	9
1- ROA	1								
2- FinancialLeverage	0.9028	1							
3- ROE	0.9684	0.9815	1						
4- ESGCombScore $_{t-1}$	0.1003	0.1200	0.1142	1					
5- Employees $_{t-1}$	0.0813	0.1449	0.1202	0.5299	1				
6- LiquidityRatio $_{t-1}$	−0.0180	−0.0930	−0.0620	−0.0020	−0.159	1			
7- SolvencyRatio $_{t-1}$	0.0253	−0.1360	−0.0680	−0.0790	−0.142	0.2996	1		
8- CostofDebt $_{t-1}$	−0.0690	−0.1550	−0.121	0.0429	−0.116	0.0764	−0.110	1	
9- LeverageRatio $_{t-1}$	−0.0240	0.0590	0.0236	0.0137	0.056	−0.1130	−0.414	0.1088	1

Source: Own elaboration.

Table 6 presents the results of Equation (1) concerning ROA. The findings indicate that the Global model shows increase in ROA of 0.73% when ESGCombScore moves from level 0 to level 1, and 1.49% for level 2. US outperforms other regions in terms of ESG engagement. Specifically, Level 1 and Level 2 of the combined ESG ranking correspond to ROA improvements of 2.45% and 3.39%, respectively. In contrast, the EU shows more modest increases of approximately 1% (Level 1) and 1.78% (Level 2). For China and Japan, Level 1 improvements reach around 2% and 1%, while Level 2 gains are lower at 1.13% and 0.83%. These results confirm Hypothesis 1.1 for US and EU, while only partially for China and Japan, revealing significant regional divergences as suggested in Hypothesis 2.

Regarding Random Effects, the σ values show how much of the unexplained variance is located at each specific level of the data structure: σ1 (Year) is relatively low, suggesting that the "year" itself doesn't cause massive swings in the results compared to other factors. σ2 (Zone or Country) does not exist for the US, China, and Japan, because they are treated as single-country entities in those columns. However, for the EU (1.545), it shows significant differences between member states. σ3 (Zone or Country/Sector) is highly significant in the Global and the US models. This means that the industry which a company belongs to (e.g., Tech vs. Energy) heavily influences the outcome. σ4 (Zone or Country/Sector/id) is the most significant component in almost every column (e.g., 10.34 in the US). This indicates "firm-level heterogeneity", meaning there are unique characteristics of individual companies not captured by other control variables that strongly impact the results.

Table 6
The impact of ESG Combined score on ROA. Multilevel model

	GLOBAL	US	EU	CHINA	JAPAN
Fixed effects					
ESGCombScore 1 $_{t-1}$	0.73000***	2.45600***	1.00200**	1.986000***	0.93800***
	(0.265)	(0.584)	(0.455)	(0.663)	(0.269)
ESGCombScore 2 $_{t-1}$	1.48700***	3.39100***	1.78500***	1.131000*	0.83700***
	(0.316)	(0.669)	(0.518)	(0.645)	(0.308)
Control variables					
Employees $_{t-1}$	0.58800***	1.78000***	0.10100	0.263000	–0.23000*
	(0.097)	(0.181)	(0.153)	(0.268)	(0.12)
LiquidityRatio $_{t-1}$	–0.28400***	–0.43200***	0.40700**	–0.506000**	0.54400***
	(0.0908)	(0.111)	(0.188)	(0.209)	(0.131)
CostofDebt $_{t-1}$	–0.25400***	0.11600	–0.60500***	–0.360000*	–0.52500**
	(0.0705)	(0.0866)	(0.141)	(0.198)	(0.247)
LeverageRatio $_{t-1}$	0.00212	0.00789	0.00164	0.000531	–0.00623
	(0.00908)	(0.0483)	(0.0117)	(0.0536)	(0.047)
Constant	0.86600	–11.96000***	5.21600***	4.210000*	6.41800***
	(0.953)	(1.825)	(1.363)	(2.449)	(1.138)
Random effects					
σ1 (Year)	0.65100	0.85300	0.70800	0.442000	0.64400
σ2 (Zone or Country)	0.24600	—	1.54500	—	0.00000
σ3 (Zone or Country/Sector)	1.79100***	2.56500***	1.51400	1.340000	0.50300
σ4 (Zone or Country/Sector/Id)	7.51600***	10.34000***	6.67900***	6.278000***	2.78700***
σ5 (Residual)	7.19900***	5.25400***	9.67000***	4.297000***	2.07300***
N	13321	4111	5716	1182	2312
R^2_{GLMM} Conditional	0.55	0.82	0.35	0.7	0.67
ICC	0.53	0.8	0.34	0.69	0.66
LR test vs. linear model Prob> X2	0	0	0	0	0
Tier (Zone-Country/Sector/Id)	4/40/4275	–/10/1417	27/182/1842	–/10/379	–/10/637

Note: Standard errors are shown in parenthesis below the parameters. ***, **, and * are below the 1%, 5% and 10% statistical significance thresholds, respectively.

Source: Own elaboration.

Table 7 shows the spread over the return on assets, *FinancialLeverage* (Equation (1)), which firms achieve through borrowing. To mitigate endogeneity concerns, controls for *CostofDebt* and *Leverage* were excluded, given their accounting identity with the financial leverage variable. This specification allows for the inclusion of the *SolvencyRatio* in this second model, an addition that was previously omitted due to its strong correlation with the leverage ratio.

When the average cost of debt is lower than the return on assets (*ROA* > *CostofDebt*), shareholders earn an additional return through the leverage effect. The result in the Global model shows a positively effect in the leverage effect when ESGCombScore increases (0.745 for level 1 and 1.73 for level 2). As in the previous model, US exhibits the most substantial impact of ESG engagement on this spread among the developed regions, with an average increase of 5.63% for Level 2 of the ESGCombScore. This is followed by the EU at 2.1% and Japan with an increase of approximately 0.76% for the same level. In contrast, for China, the combined ESG score is only significant at Level 1, showing a 1.9% increase.

These findings provide support for Hypothesis 1.2 for the Global model, US and EU, but at the same time, the results in Table 7 continue to demonstrate significant heterogeneity in ESG coefficients across regions (where the impact of ESG on the *FinancialLeverage* is not significant for levels 2 in China and does not exceed the previous level for Japan), as proposed in Hypothesis 2.

Similarly to the ROA results, the global model for *FinancialLeverage* is highly influenced by clustering at the Zone or Country/Sector/Id, σ4 level. However, the Country/Sector cluster, σ3 level, is only significant within the US subsample, whereas the Zone or Country cluster, σ2, loses significance in both the European and global models. This may be attributed to common trends and shared regulatory frameworks, such as those within the Eurozone.

Table 7
The impact of ESG Combined score on *FinancialLeverage*. Multilevel model

	GLOBAL	US	EU	CHINA	JAPAN
Fixed effects					
ESGCombScore 1 $_{t-1}$	0.745**	4.579***	1.073*	1.9100**	0.906**
	(0.353)	(0.891)	(0.568)	(0.824)	(0.41)
ESGCombScore 2 $_{t-1}$	1.735***	5.635***	2.107***	1.359	0.760*
	(0.421)	(1.023)	(0.65)	(0.923)	(0.469)
Control variables					
Employees $_{t-1}$	1.195***	2.759***	0.448**	0.498	–0.291
	(0.132)	(0.265)	(0.195)	(0.321)	(0.182)
LiquidityRatio $_{t-1}$	–0.506***	–0.627***	0.262	–1.0420***	0.612***
	(0.126)	(0.172)	(0.254)	(0.36)	(0.222)
SolvencyRatio $_{t-1}$	–0.988***	–0.505***	–2.537***	0.599	–2.983***
	(0.167)	(0.192)	(0.455)	(0.426)	(0.333)
Constant	–2.548*	–20.910***	6.990***	–0.0991	13.130***
	(1.389)	(2.658)	(1.911)	(2.877)	(1.823)
Random effects					
σ1 (Year)	0.924	1.107	1.073	0.587	1.029
σ2 (Zon or Country)	0.795	—	1.551	—	—
σ3 (Zon or Country /Sector)	2.482***	3.490***	1.66	1.023	1.115
σ4 (Zon or Country /Sector/Id)	10.402***	14.354***	8.855***	7.471***	4.011***
σ5 (Residual)	9.365***	8.373***	11.894***	5.523***	3.327***
N	13321	4111	5716	1182	2312
R^2_{GLMM} Conditional	0.58	0.78	0.39	0.66	0.64
ICC	0.56	0.75	0.37	0.65	0.62
LR test vs. linear model Prob> X2	0	0	0	0	0
Tier (Zone-Country/Sector/Id)	4/40/4275	–/10/1417	27/182/1842	–/10/379	–/10/637

Note: Standard errors are shown in parenthesis below the parameters. ***, **, and * are below the 1%, 5% and 10% statistical significance thresholds, respectively.

Source: Own elaboration.

Table 8 delves into the factors driving the financial leverage effect, calculated as (ROA - Ki) *Leverage Ratio. Specifically, it examines the impact of the sustainability score on both the cost of debt and the leverage ratio. The empirical results indicate a robust and statistically significant negative relationship between ESG performance and the Cost of Debt. Lenders are incentivized to offer reduced interest rates to companies with superior ESG performance. The fixed effects for the ESG Combined Score (levels 1 and 2) demonstrate that higher sustainability ratings consistently lead to a reduction in financing costs across almost all jurisdictions. Lenders are incentivized to offer reduced interest rates to companies with superior ESG performance. This effect is particularly pronounced in the US and EU markets, where the coefficients for *ESGCombScore* Level 2 (–0.64 and –0.45, respectively) suggest that credit markets actively price in ESG-related risk mitigation, rewarding firms with superior non-financial performance through lower risk premiums.

Regarding capital structure, the impact of ESG indicators on *Leverage* exhibits notable regional heterogeneity, as captured by the multilevel framework. While the fixed effects for the EU show a marginal positive correlation (0.02), the results for China indicate a significant negative influence (–0.07), highlighting how institutional contexts shape corporate financing decisions differently.

In summary, the empirical evidence suggests a regional asymmetry in the efficiency of capital markets. In the US and the EU, a clear transmission mechanism exists where sustainability (ESG) is priced into the cost of debt, indicating an advanced stage of financial resource allocation that rewards non-financial risk mitigation. While the US shows the strongest sensitivity in pricing (Hypothesis 1.2.1), the EU demonstrates a unique balance where sustainable firms enjoy both lower costs and stable access to leverage (Hypothesis 1.2.2). In contrast, markets in China and Japan show a lack of statistical significance for ESG in debt pricing, suggesting a more rigid allocation system, therefore, their financial systems have yet to fully align capital allocation with sustainability performance.

Table 8
The impact of ESG Combined score on Cost of Debt and Leverage. Multilevel model

	COST OF DEBT					LEVERAGE RATIO				
	GLOBAL	**US**	**EU**	**CHINA**	**JAPAN**	**GLOBAL**	**US**	**EU**	**CHINA**	**JAPAN**
Fixed effects										
ESGCombScore 1 $_{t-1}$	−0.1310*	−0.4530**	−0.2130**	−0.0711	−0.0326	0.01240	−0.02940	0.0214*	−0.07580**	−0.01990
	(0.0732)	(0.212)	(0.104)	(0.203)	(0.106)	(0.00913)	(0.025)	(0.0122)	(0.0329)	(0.0242)
ESGCombScore 2 $_{t-1}$	−0.3340***	−0.6470***	−0.4510***	−0.1470	−0.1930	0.01500	−0.02160	0.0196	−0.07990**	−0.00033
	(0.0884)	(0.244)	(0.127)	(0.229)	(0.123)	(0.0111)	(0.0286)	(0.0151)	(0.0365)	(0.0282)
Control variables										
Employees $_{t-1}$	−0.1770***	−0.4780***	−0.0334	−0.0229	0.0994*	0.01510***	0.02060***	0.0191***	−0.03980***	0.01270
	(0.0307)	(0.059)	(0.0452)	(0.0812)	(0.0579)	(0.00431)	(0.00765)	(0.00579)	(0.0153)	(0.0133)
LiquidityRatio $_{t-1}$	0.0218	−0.0561	0.2260***	−0.2340***	0.0562	−0.00081	0.00879*	0.0126**	−0.00382	0.00567
	(0.0265)	(0.0407)	(0.052)	(0.0886)	(0.0559)	(0.00338)	(0.0048)	(0.0063)	(0.0142)	(0.013)
SolvencyRatio $_{t-1}$	0.1480***	0.1160**	−0.0153	0.2980***	0.2710***	−0.08130***	−0.04670***	−0.2120***	−0.09460***	−0.31300***
	(0.0339)	(0.047)	(0.0904)	(0.104)	(0.083)	(0.0042)	(0.00532)	(0.0109)	(0.0164)	(0.0192)
Constant	4.7230***	9.2140***	3.6850***	4.2340***	−0.2720	0.72500***	0.68100***	0.9270***	1.24400***	1.16000***
	(0.761)	(0.547)	(0.491)	(0.755)	(0.546)	(0.053)	(0.0861)	(0.0586)	(0.145)	(0.157)
Random effects										
σ1 (Year)	0.2890***	0.2620***	0.3550***	0.3270***	0.1050***	0.03000***	0.02200***	0.0490***	0	0.02600***
σ2 (Zon or Country)	1.3840	—	0.975	—	—	0	—	0.0500***	—	—
σ3 (Zon or Country/Sector)	0.3780***	0.3050*	0.4510*	0.4670**	0	0.20600***	0.16200***	0.1120***	0.15800***	0.29700***
σ4 (Zon or Country/Sector/Id)	2.6890***	3.0650***	2.5700***	1.8870***	1.6970***	0.40000***	0.42300***	0.3420***	0.39200***	0.36500***
σ5 (Residual)	1.7810***	2.1020***	1.9310***	1.3280***	0.6260***	0.21100***	0.22900***	0.2220***	0.19300***	0.14500***
N	13321	4111	5716	1182	2312	13321	4111	5716	1182	2312
R^2_{GLMM} Conditional	0.75	0.7	0.68	0.69	0.89	0.82	0.8	0.75	0.84	0.92
ICC	0.74	0.68	0.67	0.68	0.88	0.81	0.79	0.73	0.82	0.91
LR test vs. linear model Prob> X2	0	0	0	0	0	0	0	0	0	0
Tier (Zone-Country/Sec/Id)	4/40/4275	−/10/1417	27/182/1842	−/10/379	−/10/637	4/40/4275	−/10/1417	27/182/1842	−/10/379	−/10/637

Note: Standard errors are shown in parenthesis below the parameters. ***, **, and * are below the 1%, 5% and 10% statistical significance thresholds, respectively.

Source: Own elaboration.

The variability in the CostofDebt and LeverageRatio models is also strongly influenced by the clusters: Country/Sector and Country/Sector/Id. Nevertheless, Zone or Country is not significant for the *CostofDebt*, evidencing that financial harmonization is leading to a convergence in the price of money; however, it has not yet homogenized leverage ratios (*LeverageRatio*), neither in the Global mode nor in the European one.

Table 9 displays the outcomes of Equation (1) for ROE. The findings are consistent with the patterns previously identified. Consequently, the Global model shows increments in ROE when ESG increases (1.469% for level 1 and 3.246% for level 2). The US continues to exhibit the greatest impact of ESG scores on ROE, with increases of 7.01% for Level 1 and 8.98% for Level 2. This is followed by the EU and China, which show Level 1 gains of 2.09% and 3.97%, and Level 2 increases of 3.92% and 2.58%, respectively. In contrast, the impact of corporate ESG strategies on ROE is more modest in Japan. Thus, results consistently indicate a general trend of increases in ROE values when ESG increases, confirming Hypothesis 1.3 for the Global model, US and EU, finding only partial support for China and Japan, where coefficients for level 2 are lower than the previous level. This leads to significant heterogeneity in the impact of ESG across regions, consistent with previous models and Hypothesis 2, using regions as a hierarchical variable within a multilevel modeling framework.

Table 9
The impact of ESG Combined score on *ROE*. Multilevel model

	GLOBAL	US	EU	CHINA	JAPAN
Fixed effects					
ESGCombScore 1 $_{t-1}$	1.469**	7.018***	2.096**	3.970***	1.834***
	(0.602)	(1.42)	(1.004)	(1.418)	(0.653)
ESGCombScore 2 $_{t-1}$	3.246***	8.987***	3.924***	2.588*	1.577**
	(0.718)	(1.628)	(1.145)	(1.593)	(0.748)
Control variables					
Employees $_{t-1}$	1.794***	4.442***	0.584*	0.838	–0.514*
	(0.223)	(0.433)	(0.341)	(0.561)	(0.292)
LiquidityRatio $_{t-1}$	–0.753***	–1.024***	0.697	–1.906***	1.022***
	(0.214)	(0.273)	(0.446)	(0.619)	(0.353)
SolvencyRatio $_{t-1}$	–1.170***	–0.747**	–2.469***	1.230*	–2.390***
	(0.285)	(0.303)	(0.8)	(0.73)	(0.529)
Constant	–1.875	–31.34***	10.850***	1.983	18.330***
	(2.317)	(4.407)	(3.356)	(5.047)	(2.915)
Random effects					
σ1 (Year)	1.587	1.954*	1.800	1.066	1.665
σ2 (Zon or Country)	1.096	—	3.096**	—	—
σ3 (Zon or Country/Sector)	4.216***	6.050***	3.261***	2.044	1.547
σ4 (Zon or Country/Sector/Id)	17.357***	23.951***	15.105***	13.197***	6.580***
σ5 (Residual)	16.151***	13.053***	21.200***	9.346***	5.176***
N	13321	4111	5716	1182	2312
R^2_{GLMM} Conditional	0.57	0.8	0.37	0.68	0.65
ICC	0.55	0.78	0.35	0.67	0.64
LR test vs. linear model Prob> X2	0	0	0	0	0
Tier (Zone-Country/Sector/Id)	4/40/4275	–/10/1417	27/182/1842	–/10/379	-/10/637

Note: Standard errors are shown in parenthesis below the parameters. ***, **, and * are below the 1%, 5% and 10% statistical significance thresholds, respectively.

Source: Own elaboration.

Lastly, Table 10 presents the moderating role of the regional variable across the financial indicators discussed above. The analysis of the financial metrics in Table 10 reveals that ESG performance levels 1 and 2 in EE. UU. (the baseline) exert a substantial positive influence on profitability and leverage capacity. In line with previous studies, transitioning to the first level of ESG performance (ESGCombScore 1) yields an increase of 4.282% in ROA and 10.84% in ROE, while the second level further elevates these metrics to 6.586% and 16.17% respectively. However, the interaction coefficients for the European Union, China, and Japan indicate a significant moderating effect that attenuates these returns. The increment to ROA for firms in the European Union at level one is only 0.540% (calculated as the 4.282 base minus the 3.742 interaction), while in level 2 we can observe a moder-

ate increment of 0.642% (6.586-5.914). These distances between EEUU and the rest of zones are more prominent in ROE, where the experimented increment for EU in level 1 is only 0.88% (10.84-9.96) and a modest 1.29% for level 2 (16.17-14.88). In this line, China achieves an increment of 3% in level 1 (10.84-7.84) but decreases to 2% in level 2 (16.17-14.17) and Japan shows no improvement in ROE as ESG levels increase. Nevertheless, it is important to consider the country effect, where the EU present the highest coefficient (+14.98) followed by Japan (+11.71) and China (+9.58), suggesting different structural circumstances. In this way, in the EU ESG is a legal obligation, since all companies comply, it no longer serves to generate excess returns; profitability is instead driven by the country effect.

Similarly, the robust expansion in financial leverage seen in the United States at level one (6.522%) is essentially neutralized in Japan, where the interaction term of –7.213 results in a marginal decrease of 0.691%, suggesting that regional market dynamics significantly constrain the capital expansion advantages associated with sustainability. Regarding debt obligations, the United States baseline experiences a pronounced decrease in the Cost of Debt, with level one achieving a reduction of 0.655% and level two reaching 0.974%. These risk mitigation benefits are considerably diluted or even reversed in other geographical contexts. In China, the net reduction in the cost of debt for level one is nearly negligible at 0.011%, while in Japan, the interaction coefficient of 0.902 is so high that it leads to a net increase in debt costs of 0.247%. Furthermore, the baseline reduction in the Leverage Ratio observed in the United States (0.0474 at level one) is countered by positive interaction terms in the European Union, resulting in a net increase of 0.0367 for level one and 0.0423 for level two. These disparities across all five financial indicators underscore that while the primary effect of ESG performance is globally significant, the magnitude and direction of its impact are heavily contingent upon the regional environment, with the United States consistently realizing the most favorable financial outcomes across both ESG levels analyzed. The preceding findings validate Hypothesis 2 by using regions as a moderating variable to assess the impact of ESG performance across the different geographic zones.

Table 10
Moderating role of the regional variable in financial performance metrics. Multilevel models

	ROA	Financial Leverage	Cost of Debt	Leverage Ratio	ROE
Fixed effects					
ESGSCombScore 1 $_{t-1}$	4.28200***	6.522***	–0.6550***	–0.047400**	10.84***
	(0.634)	(0.842)	(0.178)	(0.0229)	(1.436)
ESGSCombScore 2 $_{t-1}$	6.58600***	9.494***	–0.9740***	–0.052400**	16.17***
	(0.71)	(0.944)	(0.2)	(0.0256)	(1.609)
Control variables					
Employees $_{t-1}$	0.58800***	1.196***	–0.1850***	0.015300***	1.793***
	(0.098)	(0.133)	(0.0308)	(0.00434)	(0.224)
LiquidityRatio $_{t-1}$	–0.31700***	–0.564***	0.0259	0.000489	–0.853***
	(0.0909)	(0.126)	(0.0265)	(0.00338)	(0.214)
CostofDebt $_{t-1}$	–0.23600***				
	(0.0711)				
LeverageRatio $_{t-1}$	0.00341				
	(0.00909)				
SolvencyRatio $_{t-1}$		–0.932***	0.1390***	–0.082000***	–1.078***
		(0.167)	(0.0339)	(0.00421)	(0.285)
Zone EU	5.66000***	9.070***	–1.9250***	–0.109000***	14.980***
	(0.66)	(0.875)	(0.192)	(0.0257)	(1.489)
Zon China	4.09400***	5.376***	–1.2330***	–0.079500**	9.585***
	(0.846)	(1.135)	(0.257)	(0.0355)	(1.924)
Zon Japan	3.86300***	7.371***	–4.3560***	–0.183000***	11.710***
	(0.767)	(1.012)	(0.228)	(0.0313)	(1.716)
ESGSCombScore 1 $_{t-1}$**Zone EU*	–3.74200***	–6.191***	0.5410***	0.084100***	–9.966***
	(0.713)	(0.946)	(0.198)	(0.0251)	(1.614)
ESGSCombScore 1 $_{t-1}$**Zone China*	–2.74600**	–5.146***	0.6440**	–0.068400*	–7.846***
	(1.074)	(1.433)	(0.308)	(0.0399)	(2.44)
ESGSCombScore 1 $_{t-1}$**Zone Japan*	–4.25900***	–7.213***	0.9020***	0.036500	–11.510***
	(0.965)	(1.288)	(0.279)	(0.0366)	(2.191)
ESGSCombScore 2 $_{t-1}$**Zone EU*	–5.91400***	–8.888***	0.6340***	0.094700***	–14.880***
	(0.781)	(1.039)	(0.22)	(0.0282)	(1.771)
ESGSCombScore 2 $_{t-1}$**Zone China*	–5.67700***	–8.517***	0.9350***	–0.089700**	–14.170***
	(1.179)	(1.573)	(0.339)	(0.044)	(2.676)

	ROA	Financial Leverage	Cost of Debt	Leverage Ratio	ROE
*ESGSCombScore 2 $_{t-1}$*Zone Japan*	−6.92500***	−10.980***	1.2560***	0.062600	−18.030***
	(1.002)	(1.343)	(0.298)	(0.0397)	(2.278)
Constant	−3.21700***	−9.478***	6.7390***	0.832000***	−13.420***
	(1.184)	(1.536)	(0.37)	(0.0656)	(2.604)
Random effects					
σ1 (Year)	0.65800	0.920	0.2730***	0.030000***	1.589
σ3 (Sector/Id)	1.18500	1.679**	0.4720***	0.149000***	2.812***
σ4 (Id)	7.57600***	10.433***	2.6780***	0.405000***	17.444***
σ5 (Residual)	7.19900***	9.365***	1.7810***	0.211000***	16.151***
N	13321	13321	13321	13321	13321
R2GLMM Conditional	0.54	0.58	0.74	0.81	0.56
ICC	0.53	0.56	0.7	0.8	0.54
LR test vs. linear model Prob> X2	0	0	0	0	0
Tier (Sector/Id)	10/4275	10/4275	10/4275	10/4275	10/4275

Note: Standard errors are shown in parenthesis below the parameters. ***, **, and * are below the 1%, 5% and 10% statistical significance thresholds, respectively.

Source: Own elaboration.

In the aforementioned tables, the validity of this multilevel approach is confirmed by two key metrics: firstly, the p-value of the likelihood Ratio LR Test is 0.000 across all models indicating that the multilevel structure is statistically necessary and provides a significantly better fit than a simple linear model. Second, the high intraclass Correlation Coefficient (ICC) (ranging from 0.53 to 0.91) demonstrates that a substantial portion of the total variance in financial outcomes is explained by the grouping levels.

5. DISCUSSION

Overall, the empirical results substantiate Stakeholder Theory (Gao & Wan, 2023; Melo & Garrido-Morgado, 2012) and Signaling Theory (Flammer, 2013). They demonstrate that corporate ESG investments, alongside their disclosure through indices and formal reporting, are perceived favorably by key market participants, including customers, suppliers, and the general public. This positive reception facilitates the efficient execution of ESG strategies, which yield superior profitability compared to conventional, non-sustainable alternatives. Specifically, the findings reveal a global ROA improvement of 1.487% for companies within the Level 2 ESG combined index relative to the control group of non-indexed firms.

These perspectives are further supported by Legitimacy Theory (Suchman, 1995; Zhang *et al.*, 2020) and Agency Theory (Harjoto *et al.*, 2015). These frameworks suggest that ESG commitments bolster management credibility, thereby mitigating financial risk and reducing the cost of borrowing (Phan *et al.*, 2022). In this context, the results indicate a global enhancement in financial leverage of 1.735% for the Level 2 ESG combined index, which ultimately drives a 3.246% increment in ROE.

This study establishes a distinct positive correlation between regional average ESG scores and improvements in key performance indicators, specifically ROA, financial leverage, and ROE. However, the nexus between ESG behavior and financial performance remains multifaceted and exhibits significant regional variation. Drawing upon Institutional Theory (Aguilera *et al.*, 2007; Brammer *et al.*, 2012), these findings suggest that heterogeneous regulatory frameworks may result in divergent outcomes. Furthermore, cultural dimensions, market maturity, and prevailing economic or monetary policies act as pivotal determinants of these regional effects (Eliwa *et al.*, 2021).

U.S. firms achieve the highest scores in the ESG index and, consequently, present strong ESG performance, with a mean increase in ROA of 3.391%, while the EU achieves an increase of 1.785%. In contrast, China and Japan hold modest positions in the index, and the proportion of enterprises with ESG scores remains low compared to the US and the EU. Consequently, the impact of ESG on ROA is a modest 1.131% and 0.837%, respectively (table 6). Furthermore, the empirical findings reveal a significant regional gap in capital market efficiency regarding sustainability. While a robust transmission mechanism exists in the United States and the European Union, where ESG performance translates directly into a lower cost of debt, markets in China and Japan exhibit weaker ESG transmission power (table 8). This asymmetry suggests that, despite China's ambitious decarbonization goals, its implementation of a green credit policy since 2007 (Li *et al.*, 2022; Liu *et al.*, 2017), and the efforts of Japanese companies (Miyamoto & Nohara, 2023), Asian systems maintain more rigid capital allocation structures that have yet to fully integrate sustainability metrics into credit valuation.

Consequently, US firms attain the highest scores within the ESG index and exhibit robust performance in table 9, characterized by a mean ROE increase of 8.98% for enterprises scoring above 50 points in the Combined ESG Index (Level 2). The European Union follows this trend, reporting a more moderate average improvement of 3.92% at the same level. While both regions exert significant influence on sustainability markets, they operate under distinct institutional frameworks. This fact is notably observed across the interactions model presented in

table 10. The US is the most efficient at converting sustainability efforts into ROA and ROE, probably because prioritizes corporate initiatives grounded in Stakeholder Theory (Freeman, 2010), whereas the EU has implemented stringent mandates such as the Corporate Sustainability Reporting Directive (European Commission, 2022) and the European Green Deal (European Commission, 2019). Therefore, the impact of sustainability on profitability is captured by the country level more than by sustainability firms' actions. Accordingly, the European model is more fundamentally rooted in Institutional Theory (González *et al.*, 2026).

In contrast, in Table 9, China demonstrates more attenuated ROE outcomes, with a 2.58% increase for Level 2. Japan exhibits average ESG scores comparable to those of China, resulting in a relative ROE impact of 1.577% at Level 2. Regarding China, results in Tables 9 and 10 show that the first level of ESG provides a higher increment in ROE than the second level. These results could be explained by transparency gaps in reporting requirements, complex institutional factors, and restricted access for international investors to domestic public markets (Zhu *et al.*, 2023). Nevertheless, concurrently, ESG practices in China are undergoing rapid evolution; notably, the three major domestic stock exchanges have issued official guidelines for sustainability reporting among listed companies (United Nations Environment Programme [UNEP], 2025). For its part, Japan is frequently perceived as lagging behind its European counterparts regarding ESG initiatives (EY, 2023); however, its burgeoning focus on corporate sustainability and transparency has recently bolstered key metrics. Therefore, future research could reveal improvements in this comparison.

An important conclusion regarding the interaction of table 10 is that the market rewards ESG in inverse proportion to the region's regulatory maturity. In the US, where ESG regulation is less stringent, the market provides higher premiums; conversely, in the highly regulated EU, the market no longer offers additional rewards, while China and Japan also present important limitations.

Regarding the random effects of the model, while ROA shows substantial variation across geographic areas, these disparities are attenuated in the financial leverage models. However, significant differences persist across sectors and within individual firm-level effects. The sector cluster proves especially persistent in the US, as capital structure strategies are more heavily shaped by sectoral norms and specialized pressure groups than by centralized national policies. In contrast, financial harmonization in the EU is leading to a convergence in the interest rate levels. Nevertheless, ROE in the EU maintains significant differences across both countries and sectors.

6. CONCLUSIONS AND LIMITATIONS

Despite the robustness of the multilevel structure employed (Zone/Sector/Id), this study faces certain limitations regarding the underlying institutional drivers. Specifically, the model does not explicitly control for varying degrees of state interventionism or the differing market orientations, such as bank-based versus market-based systems, across the geographical areas studied. Consequently, the observed cluster effects might be partially influenced by these unobserved institutional characteristics, which could explain why certain sectors or zones exhibit greater persistence than others.

This paper contributes to the growing discourse by analyzing the interplay between ESG performance and financial performance across the four leading economic regions, highlighting both convergent trends and regional disparities. While regions like the US, EU, and Asia follow different rules, they are all heading in the same direction: sustainability leads to better financial health. As global standards improve, the link between ESG and profit will only get stronger, making it a key strategy for any company that wants to thrive in the long run.

Future lines of research should delve deeper into the interplay between institutional frameworks and sustainable finance. It would be of great interest to incorporate macro-level indicators, such as state-ownership prevalence or indices of economic freedom, to determine the extent to which market orientation influences the effectiveness of ESG strategies. Furthermore, an analysis of the relative weight of specific sectors within national economies could clarify whether sectoral persistence is driven by industry-specific lobbying or by broader national economic policies. Other lines of research could also introduce variables that capture the stringency of public ESG policies by geographic area, to analyze their causal effect on firms' initiatives and their ultimate impact on corporate performance.

The geographic areas of this study are the most developed and influential regions in the world. Therefore, analyzing their future trends in ESG development advances is of central relevance. China and Japan are moving towards data standardization and comprehensive adoption of ESG practices, so future research could verify if ESG advances are internationally converging, as well as their subsequent impact on financial variables.

Understanding the role of ESG in enhancing ROA and ROE is essential not only for investors and corporate decision-makers but also for policymakers seeking to foster sustainable economic growth. As global markets increasingly embed sustainability principles into their core operations, identifying the financial advantages of ESG performance offers a compelling argument for its adoption across diverse geographic regions.

A significant methodological limitation of this study is the potential presence of endogeneity, specifically regarding reverse causality between ESG initiatives and financial performance. While the multilevel structure effectively accounts for hierarchical variance, it may not fully address the dynamic nature of corporate profitability. To address this concern, we have retarded one period the independent variables. Nevertheless, future research could employ the Generalized Method of Moments (GMM) estimator to mitigate these concerns. By utilizing a dynamic panel data approach with internal instruments, such as lagged values of the regressors, the GMM framework would better control for unobserved firm-level heterogeneity and simultaneity bias, thereby providing more robust evidence of the causal mechanisms at play.

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8. AUTHORSHIP

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