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Sustainability Practices and the Corporate Cost of Equity in Emerging and Developed Markets

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Abstract

Sustainability practices have been attracting growing interest from firms and society in general. Their adoption generates the expectation of improving firms' financial performance. However, empirical studies did not reach a consensus on the effects of these practices. This study investigates whether adopting sustainable practices negatively impacts firms' cost of equity. In addition, it analyzes the moderating effect of the country's development level on this relationship. We conducted a multilevel regression analysis using data from the Bloomberg, Capital IQ Pro, and World Bank databases covering the period from 2010 to 2022. The sample included 5,638 non-financial firms from developed countries (the United States, Japan, Germany, the United Kingdom, and France) and emerging countries (China, Indonesia, India, South Africa, and Brazil), considering three levels: time, firm, and country. The results revealed a negative relationship between sustainable practices and firms' cost of equity. Furthermore, firms in developed countries that adopt sustainable practices tend to have a lower cost of equity than those in emerging countries. These findings contribute to the ongoing debate in academic literature and help to reduce investors' uncertainty when allocating capital to sustainable firms. Finally, the results support regulators in confirming the effectiveness of sustainability-oriented policies.

Keywords: sustainable practices, ESG, cost of equity, multilevel model, developed countries, emerging countries

1. Introduction

There is a growing interest among firms in adopting sustainable practices. This is due to increased pressure from society and government regulations. The environmental, social, and governance (ESG) scores measure the firms' adherence to such procedures (Dahiya & Singh, 2020; Chen et al., 2022). In fact, since the beginning of the 21st century, countries such as Brazil, China, Denmark, Hong Kong, India, Malaysia, and South Africa have presented rules for disclosing the sustainability activities of their local firms (Brooks & Oikonomou, 2018). In line with these countries, the United Nations recommends that large firms publish sustainability reports by 2030 (United Nations, 2013).

Some studies identify that the adoption of sustainability practices by firms reduces their cost of equity (COE) due to the mitigation of information asymmetry, agency conflicts, and systematic risk (Ghoul et al., 2018; Li & Liu, 2018; Raimo & Nuccio, 2020; Jiménez & Grima, 2020). Others understand that the adoption of sustainable practices represents an inefficient use of resources, which means that firms that implement them incur higher capital costs, an additional financial burden for their shareholders (Breuer et al., 2018; Nazir et al., 2022). In other words, there are antagonistic or inconclusive results regarding the analysis of the impact of sustainable practices and the COE of firms.

Regardless of this discussion, the Organisation for Economic Cooperation and Development (OECD) has been encouraging the implementation of these practices, especially regarding the environmental dimension (OECD, 2015). In developed countries, capital markets are more mature, there is a better alignment of stakeholders interests, and the quality of the legal environment is higher. These attributes are associated with a robust governance infrastructure and a healthy economy. Therefore, firms in these countries are expected to have higher sustainability standards and lower COEs (Maama, 2021; Ordonez-Ponce & Talbot, 2022). In contrast, emerging countries are often face greater uncertainty regarding their regulatory framework and governance policies, which can lead to higher COEs (Bilgin et al., 2021; Wang et al., 2021).

Therefore, this research investigates whether adopting sustainable practices – represented by ESG scores – negatively impacts firms' COE. In addition, it analyzes the moderating effect of the country's development level on this relationship. A multilevel regression or hierarchical linear model (HLM) was conducted with repeated measures at three levels – time, firm, and country. Additionally, a robustness test was performed by segregating two subsamples, one of firms located in developed countries and the other in emerging countries.

The study examined data from 2010 to 2022, comprising 72,873 observations of 5,638 non-financial firms established in five OECD member countries (developed) and five OECD key partner countries (emerging). Among the contributions of this study is the perception of which dimension of sustainability most significantly impacts reducing the firms' COE. Additionally, it highlights the moderating effect of a country's development level on the relationship between sustainability practices and firms' COE. These findings contribute to the ongoing debate on the subject in academic literature, help reduce investor uncertainty when allocating capital to sustainable firms, and support regulators in formulating policies with incentives for sustainability, potentially attracting foreign direct investment.

2. Literature Review

2.1 ESG Dimensions

ESG scores are becoming increasingly important as firms implement sustainable practices. Environmental scores (ENV) can be verified by achieving targets such as reducing pollutant gas emissions, improving waste management, and increasing energy efficiency. Better environmental performance can bring economic benefits through a more efficient use of resources. Aware of this, regulators should strive to define stricter environmental legislation. In addition, investors value such benefits (Guenster et al., 2011; Yadav et al., 2016; Chouaibi & Zouari, 2024).

Social scores (SOC) are related to working conditions – occupational health and safety, absence of child labor in the supply chain – and the protection of the local community where the firm operates. Ng and Rezaee (2015) suggest that social dimensions may require additional resources. However, good social performance also presents financial compensations, such as mitigating labor and image risks, for example. Chouaibi and Zouari (2024) agree with this argument. For them, firms must act to fulfill their social duty, not only for regulatory reasons but also to obtain (non)financial benefits.

Finally, governance factors (GOV) refer to a set of principles that govern the firm's ethics and integrity, ensuring the alignment of stakeholder interests – transparency, fair negotiation, audit procedures, good functioning of the board of directors, etc. Among the dimensions of sustainability, governance has been observed by the market for the longest time (Bebchuk et al., 2013). According to Hashmi et al. (2024), applying this set of standards and controls reduces corporate risks by preventing potential operational problems and legal disputes.

2.2 Theories Supporting the Relationship Between ESG and the Cost of Equity

According to stakeholder theory, firms able to promote a balance in serving their stakeholders' interests are more likely to achieve sustainable financial results in the long term (Freeman, 1984; Donaldson & Preston, 1995). Currently, firms incorporate ESG practices into their business to strengthen their relationships and create value for stakeholders. In return, investors accept lower returns, resulting in a lower cost of capital for the firm (Sharfman & Fernando, 2008; Peng & Isa, 2020).

In turn, agency theory states that the interests of agents (managers) do not always coincide with those of principals (shareholders). Therefore, ESG scores allow for the mitigation of information asymmetry between both, reducing operational risks and, consequently, the firms' COEs (Jensen & Meckling, 1976; Jiménez & Grima, 2020; Wang et al., 2021). Furthermore, higher ESG scores signal positive actions, making it possible to attract consumers who care about these issues (Spence, 1973; Gillan et al., 2021; Wong & Zhang, 2022).

Finally, legitimacy theory suggests that organizations must ensure their actions align with the norms of the society in which they operate. When a firm's values diverge from those of society, its legitimacy can be threatened, taking the form of legal, economic, or social sanctions. Therefore, firms must provide explanations for their actions. If society does not perceive them as responsible or legitimate, their long-term survival could be jeopardized (Davis, 1973). This theory suggests that promoting ESG practices is a strategic issue. Such actions have a positive impact on the firm's competitiveness and financial situation, affecting its continuity (Suchman, 1995; Sawmar & Mohammed, 2021).

In summary, firms with high ESG scores benefit from a lower COE because they are able to attract more investors, are perceived by the market as less risky, they attract institutional investors interested in these practices, and, finally, they receive more favorable assessments by analysts (Fandella et al., 2023; Drobetz et al., 2024; Ernst & Woithe, 2024; Zhang et al., 2024). Thus, the following hypothesis is proposed:

H1 – The higher a firm's ESG score, the lower its cost of equity

2.3 The Moderating Role of the Country's Development Level

Forti et al. (2011) point out that information asymmetry characterizes the legal and institutional environments of different countries. Firms in regions with solid governance structures, efficient legal environments, and low corruption levels disclose more ESG information than those in countries without this framework (Maama, 2021). Furthermore, when market objectives are at odds with public interests, corporate governance mechanisms may fail to ensure compliance with the country's regulations, resulting in lower returns for investors compared to firms in developed countries. In turn, Lozzano and Ferrero (2022) identify that firms operating in countries with a high level of economic development and governance have a lower COE. In contrast, firms in emerging countries, where legal protections for investors are weaker, tend to have a higher COE. Therefore, a second hypothesis is proposed:

H2 – Firms that adopt sustainable practices in developed countries have a lower cost of equity than those in emerging countries

2.4 Results of Other Empirical Studies About Sustainability Practices and Cost of Equity

As mentioned before, some empirical studies suggest that disclosing ESG scores reduces information asymmetry and agency conflicts between managers and investors, increasing the confidence of the latter. This fact leads to a reduction in the cost of capital for firms (Ghoul et al., 2011; Ng & Rezaee, 2015; Raimo et al., 2020; Jiménez & Grima, 2021; Mulchandani et al., 2022). Indeed, according to Chouaibi et al. (2021), meeting sustainability goals has practical implications for investors and other stakeholders. Among them, the mitigation of idiosyncratic risks – related to corporate decisions – and the systematic component, leading to a reduction in their COE, stands out.

On the other hand, some authors find a positive relationship between adopting sustainability practices and COE. According to Dahiya and Singh (2020) and Nazir et al. (2022), socially and ecologically responsible firms bear a higher COE since there are shareholders who perceive the adoption of ESG practices as an additional financial burden. Other studies point to possible suspicions of managerial opportunism (Borghesi et al., 2014), signs of divestment (Brammer et al., 2006), or even inefficient legal protection for investors (Breuer et al., 2018). Such facts limit the potential for these firms to raise funds, increasing their COE. In summary, there are antagonistic or non-consensual results on the relationship between sustainable practices and firms' COE, which suggest the deepening of these investigations.

Moreover, according to Breuer et al. (2018), developed countries have more mature capital markets, with more investors and higher liquidity levels. Furthermore, the quality of a country's legal environment, which includes legislation that guarantees the rule of law, is a key component of governance infrastructure in developed regions. This characteristic is generally more prevalent in developed countries than in emerging ones. Consequently, better public governance is often associated with stronger firm performance (Sun et al., 2015; Wu, 2021). Thus, a negative relationship between ESG scores and the firms' COE is expected for firms operating in developed countries. However, these findings are based on studies of East Asian countries, leaving out other developed and emerging economies.

3. Methodology

The final sample comprised 72,873 observations of 5,638 non-financial firms located in 5 developed and 5 emerging countries. The data was collected from the Bloomberg, Standard & Poor's Capital IQ, Federal Reserve St. Louis, and World Bank databases for the period 2010 to 2022. The five developed countries are the OECD members with the highest GDP in USD in 2021: the United States, Japan, Germany, the United Kingdom, and France (World Bank, 2023). The five emerging countries are the OECD key partners: China, Indonesia, India, South Africa, and Brazil (OECD, 2012). Projections from international organizations show that these emerging countries will grow above the world average in the coming years, will be the largest economies in the near future, and are likely to take on leadership roles in the global scenario. Thus, the results obtained for firms in these countries can be extended to other emerging economies (PwC, 2017; OECD, 2021; Goldman Sachs, 2022).

The hypotheses are investigated using HLM regression with panel data or repeated measures at three levels: time, firm, and country. This procedure allows us to verify whether there is variability in COE over time between firms in the same country and between those in different countries, identifying whether there are characteristics of firms and countries that explain this variability. According to Hair Jr. and Fávero (2019), multilevel models allow us to identify and analyze individual and group heterogeneities, enabling the analysis of random components at each level. Robustness tests are also performed for two subsamples of firms operating in developed and emerging countries. Table 1 presents the description of the HLM variables.

The general adequacy of the model was verified using the chi-square likelihood ratio test. In addition, it is worth

noting that the fixed effects parameters were estimated using maximum likelihood estimation (MLE). The variance components of the error terms can be estimated by both MLE and restricted estimation of maximum likelihood (REML) (Fávero & Belfiore, 2019; Mohammed et al., 2020).

Equations (1a) – (1d) present the development of the null model, which evaluates random effects that decompose the dependent variable, ignoring fixed effects. The model focuses on the random effects of the intercepts that provide information relevant to the decomposition of the variance of the dependent variable. The null model estimates the relative importance of each level in the variance of the COE.

$$\mathrm{CoE}_{tjk} = \beta_{0jk} + e_{tjk} \quad (1a)$$

$$\beta_{0jk} = Y_{00k} + r_{0jk} \quad (1b)$$

$$Y_{00k} = \delta_{000} + u_{00k} \quad (1c)$$

$$\mathrm{CoE}_{tjk} = \delta_{000} + u_{00k} + r_{0jk} + e_{tjk} \quad (1d)$$

Next, the explanatory variables were included as determinants of the random intercepts, resulting in a mixed-effects model. The intercepts at the three levels are random. Equation (2d) consolidates equations (2a) – (2c), presenting the mixed-effects model, in which the intercepts at the three levels are random. In it, the COE is a function of the set of variables at the firm and country levels – and their respective random errors.

$$\mathrm{CoE}_{tjk} = \beta_{0jk} + \beta_{1jk}\mathrm{YEAR}_{tjk} + e_{tjk} \quad (2a)$$

$$\beta_{0jk} = Y_{00k} + Y_{1jk}\mathrm{ESG}_{tjk} + Y_{2jk}X_{tjk} + r_{0jk} \quad (2b)$$

$$Y_{00k} = \delta_{000} + \delta_{001}\mathrm{DEV}_{001} + \delta_{002}W_{002} + u_{00k} \quad (2c)$$

$$\mathrm{CoE}_{tjk} = \delta_{000} + \delta_{001}\mathrm{DEV}_{001} + \delta_{002}W_{002} + Y_{1jk}\mathrm{ESG}_{tjk} + Y_{2jk}X_{tjk} + \beta_{1jk}\mathrm{YEAR}_{tjk} + u_{00k} + r_{0jk} + e_{tjk} \quad (2d)$$

After including random intercepts in the model, the slopes of the variables at the firm level – which are random and impacted by country factors – were added. Thus, it is possible to analyze the indirect influences of the levels of country characteristics on the COE. The system of equations (3a) - (3d) presents the influence of the variables and hierarchical relationships of levels 1, 2, and 3 on the COE. Finally, equation (3e) presents the final mixed-effect model. In it, the interaction variables are included.

$$\mathrm{CoE}_{tjk} = \beta_{0jk} + \beta_{1jk}\mathrm{YEAR}_{tjk} + e_{tjk} \quad (3a)$$

$$\beta_{0jk} = Y_{00k} + Y_{1jk}\mathrm{ESG}_{tjk} + Y_{2jk}X_{tjk} + r_{0jk} \quad (3b)$$

$$Y_{1jk} = \delta_{10k} + \delta_{11k}\mathrm{DEV}_{001} + r_{1jk} \quad (3c)$$

$$Y_{00k} = \delta_{000} + \delta_{001}\mathrm{DEV}_{001} + \delta_{002}W_{002} + u_{00k} \quad (3d)$$

$$\mathrm{COE}_{tjk} = \delta_{000} + \delta_{001}\mathrm{DEV}_{001} + \delta_{002}W_{002} + Y_{1jk}\mathrm{ESG}_{tjk} + Y_{2jk}X_{tjk} + \beta_{1jk}\mathrm{YEAR}_{tjk} + \delta_{200}(\mathrm{DEV}_{001} * \mathrm{ESG}_{tjk}) + u_{00k} + r_{0jk} + e_{tjk} \quad (3e)$$

Where: t = time (level 1); j = firm (level 2); k = country (level 3); COE = cost of equity dependent variable; DEV = developed country dummy independent variable; W = level 3 control variables – countries; ESG = ESG score independent variable; X = level 2 control variables – firms; YEAR = year dummy independent variable; $e_{tjk}, r_{0jk}, u_{00k}$ = error terms, respectively of levels 1, 2, and 3; $\beta_{0jk}, Y_{00k}, \delta_{000}$ = intercepts, respectively of levels 1, 2 and 3; Other terms = slopes of the explanatory variables. Table 1 presents the description of the dependent, independent, and control variables at the firm and country levels, and the source of these data.

Table 1. Description of variables

Var.	Description	ES	Formula	Components	Ref.	Sources
Dependent variable						
COE	Cost of equity or capital asset pricing model (CAPM)	n/a	COE = CAPM = R_f + Beta (R_m – R_f) + CR	R_f = United States Treasury bond yield with a 10-year maturity, obtained on the last business day of each year Beta = Systematic risk (*) R_m = S&P 500 annual return obtained by the monthly average of each year CR = Country risk = CDS = Country Default Swap (**)	(a)	R_f: FRED CIQ: All others
Independent variables						
ESG	ESG score	–	ESG disclosure score	Scores varies from 1 to 100	(b)	Bloomberg
ENV	Environmental score	–	Environmental disclosure score	Scores varies from 1 to 100	(c)	Bloomberg
SOC	Social responsibility score	–	Social responsibility disclosure score	Scores varies from 1 to 100	(d)	Bloomberg
GOV	Corporate governance score	–	Corporate governance disclosure score	Scores varies from 1 to 100	(e)	Bloomberg
DEV	Developed country	–	DEV = Dummy of developed country	0 = OECD key partner countries (China, Indonesia, India, South Africa, and Brazil) 1 = OECD member countries (the United States, Japan, Germany, the United Kingdom, and France)	(f)	OECD
Firm control variables						
SIZE	Size	–	SIZE = ln (TA)	Ln = Natural logarithm TA = Total asset	(g)	CIQ Pro
LEV	Leverage	+	LEV = TDBV / TA	TDBV = Total debt book value = short + long term TA = Total assets	(h)	CIQ Pro
UB	Unlevered beta	+	UB = Beta / [1 + (1-T) * (Debt/Equity)]	Beta = Systematic risk of a Firm T = Country corporate tax Debt = Short and long-term debt Equity = Equity book value	(i)	OECD: Statutory corporate income tax rates CIQ Pro: All others
BTM	Book-to-market ratio	+	BTM = EBV / EMV	EBV = Equity book value EMV = Equity market value = Total number of outstanding shares * Share price	(j)	CIQ Pro
Country control variables						
GDP	GDP per capita growth rate	–	GDP = (GDP_t / GDP_{t-1}) - 1	GDP_t = Gross domestic product per capita of the current year GDP_{t-1} = Gross domestic product per capita of the previous year	(k)	World Bank
WGI	World Governance Indicators	–	WGI = It varies between -2.5 and 2.5. The higher the regulatory environment index, the better	The index is derived from the average six-dimensional estimate - control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law, and voice and accountability. The estimate gives the country score for each dimension in units of a standard normal distribution.	(l)	World Bank

Note. Var = Variables; ES = Expected signal; Ref = References; n/a = Not applicable; CIQ Pro = Capital IQ Pro (S&P); FRED = Federal Reserve St. Louis; (*) For the annual beta, the market returns (S&P500) of the last 60 months are considered; (**) For the annual CDS, the spread between the CDS of each country and that of the United States is considered.

References:

a. Ghoul et al. (2011); Ng & Rezaee (2015); Breuer et al. (2018); Dahiya & Singh (2020); Jiménez & Grima (2020); Raimo et al. (2020)

b. Ghoul et al. (2011); Ng & Rezaee (2015); Breuer et al. (2018); Dahiya & Singh (2020); Raimo et al. (2020);

Jiménez & Grima (2020); Wang et al. (2021); Yang & Yulianto (2022)

c. Guenster et al. (2011); Ng & Rezaee (2015); Dahiya & Singh (2020); Yang & Yulianto (2022)

d. Ng & Rezaee (2015); Dahiya & Singh (2020); Wang et al. (2021); Yang & Yulianto (2022)

e. Bebchuk et al. (2013); Ng & Rezaee (2015); Dahiya & Singh (2020); Yang & Yulianto (2022)

f. Forti et al. (2011); Chen et al. (2022)

g. Fama & French (1993); Breuer et al. (2018); Dahiya & Singh (2020); Raimo et al. (2020); Wang et al. (2021)

h. Modigliani & Miller (1958); Breuer et al. (2018); Dahiya & Singh (2020); Raimo et al. (2020); Wang et al. (2021); Yang e Yulianto (2022)

i. Sharpe (1964); Breuer et al. (2018); Dahiya & Singh (2020); Raimo et al. (2020); Yang & Yulianto (2022)

j. Fama & French (1993); Breuer et al. (2018); Dahiya & Singh (2020); Raimo et al. (2020); Wang et al. (2021); Yang & Yulianto (2022)

k. Hail & Leuz (2006); Ghoul et al. (2018); Breuer et al. (2018); Wang et al. (2021)

l. Vitolla et al. (2020)

4. Results and Discussions

Table 2 presents the mean, standard deviation, and number of observations of the COE variable by country. On average, it can be seen that the COE means of emerging countries are higher (16.54%) than those of developed countries (12.8%). On the contrary, there is a greater dispersion of data among developed countries (9.03%) than among emerging countries (8.34%). Furthermore, the number of observations for developed countries (51,285) is more than double that of emerging countries (21,588).

Among emerging countries, China stands out as the one with the lowest cost of equity (13.52%), differing from the average of the others – around 21% and 22%. This is because it has a CDS (4.89%) close to that of developed countries and has the lowest betas in the sample. In addition, China has the largest number of observations (13,173). As for developed countries, Japan has the lowest (11.43%), and France has the highest (16.6%) COE. Finally, Japan and the United States have the largest number of observations – over 20,000.

Table 2. Descriptive statistics of the COE variable by country

Country	Mean	SD	OBS	Country	Mean	SD	OBS
Emerging	0.1654	0.0834	21,588	Developed	0.1288	0.0903	51,285
Brazil	0.2190	0.0956	1,001	France	0.1660	0.1084	1,638
China	0.1352	0.0610	13,173	Germany	0.1446	0.1027	1,573
India	0.2098	0.0901	5,841	Japan	0.1143	0.0724	23,101
Indonesia	0.2111	0.0905	780	United Kingdom	0.1356	0.0953	4,255
South Africa	0.2263	0.0947	793	United States	0.1393	0.1013	20,718
Total					0.1396	0.0899	72,873

Note. SD = Standard deviation; OBS = Observation.

Table 3 shows the descriptive statistics of the variables presented in Table 1, considering the total sample and subsamples of developed and emerging countries. Regarding the ESG scores – overall and individual, firms located in developed countries have higher averages than those in emerging countries. It is worth noting that the corporate governance score is about four times higher than those of the other dimensions. As for the social dimension score, there is a closeness in its value between developed (16.30) and emerging (15.44) countries, which is not the case with the social dimension score.

Regarding the level 2 variables (firm level), it can be seen that firms from developed countries are larger than those from emerging countries. Regarding the level of leverage, it is similar in both subsamples, around 24%. Regarding the unlevered beta, it can be seen that firms located in developed countries present a higher systematic risk (0.6027) than those established in emerging countries (0.4806). On the contrary, the market value of firms established in emerging countries is greater than the book value of their equity compared to those in developed countries. In emerging countries, there is a greater expectation of growth opportunity for firms than in developed countries, increasing the value of their shares – which causes the book-to-market ratio to be lower.

Finally, regarding the level 3 variables (country level), it is clear that the growth of GDP per capita – during the

sample period – of emerging countries (6.13%) is higher than that of developed countries (1.46%). The global governance index of developed countries (1.2549) is higher than that of emerging countries (-0.3338). This implies that the former have greater control over corruption, more effective government, greater political stability, less violence/terrorism, better regulatory quality, and other institutional regulatory aspects.

Table 3. Descriptive statistics of the (sub) samples

Sample	Full sample			Developed countries			Emerging countries		
Var	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs
Dependent variable									
COE	0.1396	0.0899	72,873	0.1288	0.0903	51,285	0.1654	0.0834	21,588
Independent variables									
ESG	32.65	10.86	55,376	33.27	11.06	39,968	31.04	10.18	15,408
ENV	19.65	17.99	34,275	22.67	18.55	23,336	13.22	14.82	10,939
SOC	16.07	9.66	46,853	16.30	9.81	33,944	15.44	9.21	12,909
GOV	71.80	13.27	51,576	72.67	13.56	37,943	69.37	12.13	13,633
Firm-level variables–level2									
SIZE	7.0194	1.8754	68,380	7.0809	1.9430	48,178	6.8730	1.6944	20,202
LEV	0.2461	0.1754	62,444	0.2477	0.1769	44,001	0.2424	0.1717	18,443
UB	0.5662	0.3015	60,929	0.6027	0.3123	42,728	0.4806	0.2548	18,201
BTM	0.8189	0.6512	63,563	0.8589	0.6567	45,224	0.7205	0.6267	18,339
Country-level variables–level3									
GDP	0.0284	0.0329	72,873	0.0146	0.0220	51,285	0.0613	0.0313	21,588
WGI	0.7843	0.7384	72,873	1.2549	0.1181	51,285	-0.3338	0.1760	21,588

Note. Var = Variables; SD = Standard deviation; Obs = Number of observations.

Table 4 shows the variance decomposition of the null model – presented in Equation (1d) – for the total sample (Model 1) and subsamples of developed (Model 2) and emerging (Model 3) countries. It allows the verification of the variability of the COE of firms located in different countries (country level), among those in the same country (firm level), or over time (time level). Its analysis also allows the definition of the most appropriate type of modeling. The null hypothesis is H0 – The random intercepts are equal to zero. Since the value of Prob>chi2 is equal to 0.000 in all models, H0 is rejected. This leads to discarding the estimation of a traditional linear regression model in favor of a multilevel model.

In Model 1, the variance between countries (39.53%) is greater than between firms (25.58%) and over time (34.88%). This means that the COE of firms is influenced, above all, by the macroeconomic characteristics of each country. As for Model 2, the variance of the COE is greater between firms (46.67%) and over time (43.33%). In fact, the variance between the economies of these countries is smaller than in emerging countries – Model 3 (39.39%). The time variance – from 34.88% to 43.33% – demonstrates the relevance of the economic scenarios. Also, the COVID-19 period had a strong and negative impact on all countries in 2020 and 2021.

Table 4. Variance decomposition of the full sample

Levels	Model 1 Total sample	Model 2 Developed countries	Model 3 Emerging countries
Variance decomposition			
Country	0.0017	0.0003	0.0013
Firm	0.0011	0.0014	0.0007
Time*	0.0015	0.0013	0.0013
Prob >= chibar2	0.0000	0.0000	0.0000
Percentage of total variance or residual intraclass correlation			
Between countries	39.53%	10.00%	39.39%
Between firms	25.58%	46.67%	21.21%
Over time*	34.88%	43.33%	39.40%
Total	100.00%	100.00%	100.00%

Note. *Time is analogous to error term in the variance component analysis.

Table 5 presents the results of the HLM model and considers only the random effect of the intercepts, with Models 1 to 4 gradually adding the variables of Equation (2d). Models 1 and 2 add the level 2 (firm) variables – ESG and control (SIZE, LEV, UB and BTM). For each additional overall ESG score (GOV), there is a reduction of 0.01%

(0.01%) in the firms' COE. Model 2 also shows that ENV and SOC did not present significance, which characterizes their lower relevance to the market.

Regarding the control variables – at level 2, the positive and statistically significant relationship between SIZE, LEV, and UB in relation to their COE stands out. The BTM variable, on the other hand, presents a negative and statistically significant relationship in relation to the COE. The positive (negative) relationship between SIZE (BTM) and COE is contrary to expectations. However, in the case of SIZE, this result is similar to that obtained by Breuer et al. (2018) and Dahiya and Singh (2020) – see Table 1. Regarding the BTM variable, this may be due to a tendency for investors to perceive a higher level of risk in firms that present greater profits and growth opportunities – which is reflected in their market value (Mazzotta & Veltri, 2014).

Models 3 and 4 add level 3 (country level) variables – development dummy (DEV) and control (GDP and WGI). In Model 3, the ESG score is the overall score, and in Model 4, the individual scores are considered. In Model 3, the overall ESG score is not statistically significant. On the other hand, in Model 4, the SOC and GOV scores are statistically significant, with negative and positive relationships, respectively. It can be seen that for every 1-point increase in SOC (GOV), there is a reduction (increase) of 0.01% (0.02%) in the COE. When the country effect is added, there is an inversion of the relationship between GOV and COE. This may be due to the fact that in emerging countries, there is a greater concentration of ownership and entrenchment of family members in management and governance positions. This positive relationship between GOV and COE is also obtained by Dahiya and Singh (2020) and Wang et al. (2021).

A similar and unexpected relationship is also found between countries' DEV and GDP and firms' COE. The expectation was that countries with a higher level of investor protection and more developed capital markets would reduce firms' COE. This same relationship was also found by Breuer et al. (2018). As for WGI, there is a negative relationship with firms' COE. In fact, a more structured institutional environment is expected to reduce organizations' risk.

Regarding the random effects components, there is a statistical significance (LR test – Prob > chi2 = 0.0000) of the variances of the error terms (r_{0jk}, u_{00k}). This result allows us to rule out the estimation of a traditional linear regression model (OLS) with only fixed effects. Another aspect to be highlighted is that the intraclass correlations (ICC) of Models 1 to 4 are higher than those of the null model – see Table 4. This demonstrates the importance of including level 2 and 3 variables.

Table 5. Results of the model with random intercepts – COE

Description	Model 1	Model 2	Model 3	Model 4
Fixed effects				
Intercept	0.1341***	0.1333***	0.1516***	0.1309***
Year fixed effects	Yes	Yes	Yes	Yes
Firm variables				
ESG	-0.0001***		0.0000	
ENV		0.0000		0.0000
SOC		0.0000		-0.0001***
GOV		-0.0001***		0.0002***
SIZE	0.0011***	0.0011***	0.0011***	0.0013***
LEV	0.1058***	0.1106***	0.1030***	0.1069***
UB	0.1231***	0.1290***	0.1247***	0.1298***
BTM	-0.0025***	-0.0026***	-0.0017***	-0.0019***
Country variables				
DEV			0.1150***	0.1373***
GDP			0.0641***	0.0836***
WGI			-0.1314***	-0.1427***
LR test (Prob > chi2)	0.0000	0.0000	0.0000	0.0000
ICC Country (u_{00k}) – level 3	0.5274	0.4574	0.4538	0.4648
ICC Firm (r_{0jk}) – level 2	0.5384	0.4629	0.4673	0.4682
Number of obs	47,725	30,962	47,725	30,962

Note. The coefficients (***), (**), (*) are statistically significant at the 1%, 5% and 10% level, respectively.

Table 6 presents the results of the full HLM model, including intercepts, slopes, and random coefficients. In addition, the interaction variables between the ESG scores and the countries' level of development (DEV) are added. Models 5 and 6 have the COE as the dependent variable. Model 5 considers the overall ESG scores, whereas Model 6 considers individual ESG scores for each dimension. Models 5 and 6 gradually add the variables from equation (3e), including the year dummies with fixed effects.

Model 5 indicates that a 1-point increase in the overall ESG score increases the firm's COE by 0.01%. This result is contrary to expectations. However, it is similar to that obtained by Dahiya and Singh (2020) and Wang et al. (2021). This positive relationship may signal that investors understand that there is a shift from investments in assets with short-term to long-term returns, which implies an increase in the risk of these firms.

Model 6 – which analyzes the three individual dimensions of the ESG score – shows that for each additional score in the social (governmental) dimension, there is a reduction (increase) of 0.01% (0.04%) in the firms' COE. Similar to Model 4, the environmental dimension (ENV) does not present statistical significance. These results confirm H1 of this study only in relation to the social dimension – **The higher the firm's ESG score, the lower its cost of equity**. They are similar to those obtained by Yang and Yulianto (2022) – for the social dimension and by Dahiya and Singh (2020) and Wang et al. (2021) – for the governance dimension.

In turn, the analysis of the interaction variables indicates that for firms located in developed countries, for each additional overall ESG score and governance dimension (GOV), there is a reduction of 0.01% and 0.04% in their COE, respectively. These results confirm **H2 – Firms that adopt sustainable practices in developed countries have a lower cost of equity than those in emerging countries**. Regarding the level 2 (firm level) and 3 (country level) control variables, they have behavior similar to those presented in Table 5 – Results of the model with random intercepts – COE.

Table 6. Results of the full model

Dependent variables	COE	
Description	Model 5	Model 6
Fixed effects		
Intercept	0.1467***	0.1094***
Year fixed effects	Yes	Yes
Firm variables		
ESG	0.0001***	
ENV		-0.0000
SOC		-0.0001**
GOV		0.0004***
SIZE	0.0012***	0.0013***
LEV	0.1031***	0.1071***
UB	0.1248***	0.1299***
BTM	-0.0017***	-0.0020***
Country variables		
DEV	0.1245***	0.1790***
GDP	0.0682***	0.0922***
WGI	-0.1342***	-0.1507***
Interaction variables		
ESG_DEV	-0.0001***	
ENV_DEV		0.0000
SOC_DEV		0.0000
GOV_DEV		-0.0004***
LR test (Prob > chi2)	0.0000	0.0000
Number of obs	47,725	30,962

Note. The coefficients (***), (**), (*) are statistically significant at the 1%, 5% and 10% level, respectively.

Finally, Table 7 presents the results of the robustness test, considering the full model. It includes results from Models 7 and 8, which focus on emerging countries, and Models 9 and 10, which focus on developed countries. Models 7 and 9 consider general ESG scores, while Models 8 and 10 examine ESG scores individually, for each dimension. When the sample is split into two, the general ESG scores are no longer statistically significant. In fact, in Model 5, its coefficient was already very low, at only 0.01%. In turn, Model 8 points to the same results as Model 6 – for the social and governance scores.

In Model 10, the governance score has a negative relationship with the COE. This means that for emerging countries, the social dimension is more relevant than the others, whereas for developed countries, the governance is more relevant than the others. These results confirm H1 of this study regarding the social and governance dimensions – **The higher the firm's ESG score, the lower its COE**. Regarding the control variables of levels 2 (firm level) and 3 (country level), they have a behavior similar to those presented in Tables 5 and 6.

Table 7. Robustness test results

Subsample	Emerging countries		Developed countries	
Dependent variables	COE		COE	
Description	Model 7	Model 8	Model 9	Model 10
Fixed effects				
Intercept	0.1242***	0.0877***	0.2396***	0.1963***
Year fixed effects	Yes	Yes	Yes	Yes
Firm variables				
ESG	-0.0000		0.0000	
ENV		0.0000		0.0000
SOC		-0.0002***		-0.0000
GOV		0.0003***		-0.0001***
SIZE	0.0013***	0.0012***	0.0011***	0.0015***
LEV	0.0754***	0.0780***	0.1131***	0.1204***
UB	0.1122***	0.1187***	0.1274***	0.1339***
BTM	-0.0006	-0.0014**	-0.0022***	-0.0024***
Country variables				
GDP	-0.1133***	-0.1173***	0.4041***	0.3911***
WGI	-0.0844***	-0.0955***	-0.1138***	-0.0790***
LR test (Prob > chi2)	0.000	0.000	0.000	0.000
Number of obs	13,022	9,400	34,703	21,562

Note. The coefficients (***), (**), (*) are statistically significant at the 1%, 5% and 10% level, respectively.

5. Conclusion

The adoption of sustainability practices by firms is a growing demand in markets worldwide. However, there is still an ongoing debate regarding the impacts of these practices on the firms' cost of equity. According to Benlemlih et al. (2018), the expectation is that the application of sustainable procedures will reduce idiosyncratic risks – related to corporate decisions – and the systematic component, leading to a decrease in COE (Ghoul et al., 2011; Gregory et al., 2014). However, some investors understand that these actions are an additional financial burden, causing an inefficient allocation of resources.

Furthermore, another factor that can impact a firm's COE is the country's development level. In developed countries, capital markets are more mature and have greater liquidity, which leads to a lower COE for firms located there. Another aspect that distinguishes them from emerging countries is their superior regulatory environments, governance, social welfare, and infrastructure. Thus, a negative relationship is expected between ESG scores and the COE of firms operating in developed countries.

Given the above, this study aimed to test the following hypotheses: **H1 – The higher the firm's ESG score, the lower its COE**; and **H2 – Firms that adopt sustainable practices in developed countries have a lower cost of equity than those in emerging countries**. This verification was done through an HLM regression based on a final sample comprising 72,873 observations of 5,638 firms from five developed countries (the United States, Japan, Germany, the United Kingdom, and France) and five emerging countries (China, Indonesia, India, South Africa, and Brazil). The data were obtained for the period from 2010 to 2022.

As a result, both hypotheses were confirmed. In Table 6, Model 6 indicates that for every additional score in the social dimension, there is a 0.01% reduction in the firms' COE. This result is similar to that obtained by Yang and Yulianto (2022) and confirms the theories of stakeholder, agency, signaling, and legitimacy. Furthermore, the robustness tests in Table 7 indicate that the social dimension is especially relevant for emerging countries in reducing the COE of firms – see Model 8. This may be related to the fact that in developed countries, attention to diversity issues has been a natural occurrence for longer, and is a new element in emerging countries.

Table 7 shows that for developed countries, the governance dimension presents a negative relationship with the COE. Historically, compliance mechanisms are more rigorous in mature markets. Furthermore, this result is in line

with the high global governance indices. On average, the WGI of developed and emerging countries were 1.2549 and -0.3338 respectively (Table 3). Regarding the moderating effect of the level of development of the countries, Models 5 and 6 of Table 7 indicate a negative relationship between (ESG_DEV) and (ESG_GOV) and the COE of firms. For firms located in developed countries, for each additional overall ESG score and governance dimension score, there is a reduction of 0.01% and 0.04% in the COE of firms, respectively.

This study contributes to academia by confirming the corporate finance theories mentioned in item 2.2 – Theories that support the relationship between ESG and the cost of equity. As for markets and firms, the finding that the social dimension reduces firms' cost of equity sheds light on the relevance of this topic. For country regulators, the perception of the type of sustainable practice that most impacts investors' opportunity cost can help direct policies to attract a greater volume of foreign direct investment.

As for the sample limitations of this research, the low volume of general and individual ESG scores for firms located in emerging countries stands out. Furthermore, it is worth noting that the choice of developed and emerging countries is associated with their condition as OECD members or key partners. Regarding the methodological limitation, the multilevel model allows studying other levels, such as industry. However, in the case of emerging countries, there are industries with a small number of firms, which may jeopardize the analysis. Finally, this study can be further developed in the future by the analysis of other hierarchical levels associated with firms, such as industries. It is also suggested the analysis of new cost of capital proxies – e.g., debt and weighted average cost of capital, and, expanding the sample, including more countries years.

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