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ESG-Based Sustainability Performance and its Impact on Cost of Capital: International Evidence from the Energy Sector

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Abstract

The purpose of this article is to examine the impact of firms' sustainability performance, measured through their ESG (environmental, social, and governance) scores, on their cost of capital. Using the data of 125 companies from 24 countries for an eleven-year period from 2009 to 2019, we run panel data regressions to find out the impact of ESG scores on two measures of cost of capital: cost of debt, and cost of equity. We run pooled and panel regressions. The results reveal an inverse relationship between cost of capital and overall ESG scores. As a robustness check, we run the analyses according to the generalized method of moments, leading to similar results. For the individual scores of the environmental, social, and governance pillars, the results are mixed. The results imply that companies should adopt a holistic approach and engage in all dimensions of sustainability.

1. Introduction

Traditionally, it has been assumed that the primary purpose of a firm is to make a profit and to increase its value in the long run. This perspective takes only the shareholders into consideration; however, in recent decades, it has become increasingly widely accepted that firms bear responsibility not only towards their shareholders but also towards a wider group of stakeholders. Although several concepts are used to refer to the same idea, the most commonly used is corporate social responsibility (CSR). The World Bank Council for Sustainable Development defines CSR as "the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large". Sustainability lies at the core of CSR and related concepts because the efforts and initiatives conducted under CSR focus on the survival and wellbeing of all related stakeholders. CSR is thus closely related to the concepts of sustainability and sustainable development (Simionescu, 2015). Therefore, companies should consider environmental, social, and governance issues and integrate them into their operations and processes. In this context, CSR is regarded as a voluntary behavior – the inclusion of social and environmental concerns in operations and strategies to enable positive interactions with stakeholders (Waddock & Graves, 1997). Several stakeholder groups expect companies to address CSR and sustainability concerns and take appropriate initiatives, and the question of how those activities affect the companies, especially from a financial perspective, has attracted considerable attention. In recent decades, many studies in several contexts have attempted to discover the impact of CSR on financial metrics. Some studies have investigated the impact on financial performance, as measured by accounting-based or market-based indicators (Birindelli, Ferretti, Intonti, & Iannuzzi, 2015; Galbreath & Shum, 2012; Mahoney & Roberts, 2007; Plumlee, Brown, Hayes, & Marshall, 2015; Wang & Sarkis, 2017). Another strand of research has focused on CSR's impact on cost of capital, whether the cost of debt, cost of equity, or both (Bhuiyan & Nguyen, 2020; Crifo, Diaye, & Oueghlissi, 2017; Eliwa, Aboud, & Saleh, 2019; Erragragui, 2017; Ge & Liu, 2015). Cost of capital and its components reflect the perception of capital providers. Cost of debt reflects the perception and risk evaluation of creditors, namely banks and bondholders. Cost of equity reflects the perception and prospect evaluation of current and potential shareholders. Therefore, cost of capital is related to the risk profile of a firm, and firms engage in CSR activities to reduce risk (Nguyen & Nguyen, 2015).

Similarly, reputation is another related concept, and firms aim to improve their reputation by investing in CSR projects and sustainable business practices (Hsu, 2012; Pérez, 2015).

Information asymmetry between insiders and external parties is not an important reason for market inefficiencies and affects the cost of capital, yet several studies have reported that reducing information asymmetry is one of the driving factors for firms to engage in CSR activities (Martínez-Ferrero, Ruiz-Cano, & García-Sánchez, 2016; Zhang, Tong, Su, & Cui, 2015).

Using a large sample of 125 listed energy companies from 24 countries over an eleven-year period, we investigate the impact of ESG scores on cost of capital, specifically on cost of debt and cost of equity.

The remainder of the article is organized as follows. Section 2 provides a review of prior literature and develops the hypotheses. Section 3 provides the details of the data sample, methodology, and estimation technique. Section 4 presents the descriptive statistics and the results of regressions. Section 5 includes the discussion of the results, and the final section concludes.

2. Literature Review

The discussion on whether firms have responsibilities toward only their shareholders or toward a wider group of stakeholders dates to several decades ago. On one side, there is the argument that a firm's only responsibility is to make a profit and provide economic gains to maximize shareholders' wealth (Friedman, 1970). On the other side, the opposing argument claims that firms have responsibilities toward stakeholders and must have objectives other than profit and the maximization of shareholder wealth (Freeman, 1984). Among the concepts used to refer to this phenomenon, the most commonly accepted is CSR, which can be described as the way companies take environmental, social, and governance factors into consideration when making business decisions and designing processes, motivated by good relationships with various stakeholders (Oikonomou, Brooks, & Pavelin, 2014). ESG, which stands for environmental, social, and governance, is a commonly used concept within CSR terminology, and firms' performance in these areas is evaluated and reported by some institutions. A good level of ESG performance produces positive synergies between the firm and its stakeholders, resulting in improved social capital and increased stakeholder loyalty (Fernández, Luna, & Baraibar, 2015; Flammer, 2015).

The relationship between a firm's CSR performance and its cost of capital has attracted considerable attention in the literature, although studies have reported mixed results. Prior studies have reported a high level of correlation between CSR performance and financing costs (Attig, Ghoul, Guedhami, & Suh, 2013; Liang, Lin, Chou, & Hsiao, 2021; Weber, 2018) and have suggested that a better CSR performance may lead to a lower cost of capital, basing their arguments on several factors, such as increased reputation (Hsu, 2012; Pérez, 2015), decreased information asymmetry (Ghoul, Guedhami, Kwok-Chuck, & Mishra, 2011; Martínez-Ferrero et al., 2016; Zhang et al., 2015), and reduced firm risk (Albuquerque, Koskinen, & Zhang, 2019; Harjoto & Laksmana, 2018; Nguyen & Nguyen, 2015). Most studies examined the relationship by focusing either on cost of equity or cost of debt. Since debt and equity are different sources of finance, and the providers may have different perceptions of the firm, it is rational to analyze them separately. In line with this argument, we examine the prior literature in more detail below.

The cost of equity is the required rate of return for holding a firm's share and reflects the investors' risk perception of the firm's future cash flow. As the perceived risk increases, the required risk premium increases, resulting in a higher cost of equity capital and vice versa. The cost of equity is thus closely related to the firm's risk level (Botosan, Plumlee, & Wen, 2011; Taylor & Verrecchia, 2015); therefore, the relationship between ESG performance and cost of equity depends on how and at what level ESG performance affects a firm's risk. ESG performance plays an important role in reducing both systematic and unsystematic risk (Chollet & Sandwidi, 2018). One of the factors affecting cost of equity is a firm's investor base; an increase in the size of a firm's investor base results in a decrease in cost of equity (Merton, 1987). An improved CSR performance is expected to increase a firm's investor base because investors tend to care more and more about sustainability and CSR issues (Petersen & Vredenburg, 2009). Firms with high CSR scores tend to have a lower cost of equity capital compared to firms with low CSR scores (Ghoul et al., 2011). Disclosures by firms about their activities and initiatives toward environmental, social, and governance issues also have a significant effect on cost of equity through several mechanisms. Better CSR disclosures reduce information asymmetry (Cui, Jo, & Na, 2018) and estimation risk (Dhaliwal, Li, Tsang, & Yang, 2014; Singh, Jain, & Yadav, 2016) and result in a decrease in cost of equity capital (Li & Liu, 2018).

Although many studies have focused on CSR performance's impact on cost of equity, for several reasons, cost of debt, especially in the bond market, could be more suitable for investigating whether CSR performance leads to a reduction in a firm's financial risk. Debt markets are mostly larger, more active, and dynamic, and firms need to refinance in the debt market more frequently; hence, socially aware groups can more effectively exercise their stakeholder activism through the debt market. Similarly, the credit market is also composed of mostly institutional players, who are more conscious of CSR issues (Oikonomou et al., 2014). It has been argued that lending institutions consider firms' ESG information when making lending decisions to help them evaluate firms' default risk and reputational risk (Eliwa et al., 2019; Weber, Scholz, & Michalik, 2010; Weber, Diaz, & Schwegler, 2014). Traditionally, it was a common practice for lending institutions to evaluate a firm's

default risk by analyzing financial performance and financial position (Devalle, Fiandrino, & Cantino, 2017). However, in recent decades, it has been argued and mostly accepted that financial metrics are not a solid enough basis for credit decisions (Birindelli et al., 2015; Hoepner, Oikonomou, Scholtens, & Schröder, 2016). From the perspective of lending institutions, if they do not pay attention to borrowing firms' ESG performance, they risk being perceived as supporting those firms' negative ESG practices, which may result in adverse stakeholder reactions. Thus, this risk encourages lending institutions to consider ESG information in their credit decisions (Eliwa et al., 2019), and the use of non-financial information, including ESG dimensions, may enable lending institutions to make more accurate predictions of borrowers' credit quality (Grunert, Norden, & Weber, 2005).

The prior literature on the relationship between ESG performance and cost debt has reported mixed results; some studies found a negative relationship (Crifo et al., 2017; Ge & Liu, 2015; Hasan, Hoi, Wu, & Zhang, 2017), while others found a positive relationship (Erragragui, 2017; Hoepner et al., 2016; Magnanelli & Izzo, 2017). Goss and Roberts (2011) examined the relationship between CSR and bank loans, using the data of US firms, and found that borrowers' profiles matter; low-quality borrowers who engage in CSR activities have higher loan spreads and shorter maturities, whereas banks are indifferent toward whether high-quality borrowers engage in CSR or not. A recent study by Gracia and Siregar (2021) reported that in ASEAN countries, sustainability practices have a negative effect on debt financing, and the relationship between sustainability and cost of debt is no more pronounced.

3. Methodology

3.1. Data and Sample

The sample used in the study comprises 125 firms from 24 countries in the energy sector. The data covers an eleven-year period from 2009 to 2019. The dataset is a balanced panel that includes 1375 firm-year observations. Table 1 shows the details of the sample firms and their countries of origin.

Table 1. Number of firms in the sample per country.

Country	Number	Country	Number	Country	Number
Australia	10	Greece	2	Poland	1
Austria	1	Hungary	1	Portugal	1
Belgium	1	Ireland	1	Russia	5
Canada	24	Italy	4	Spain	2
Denmark	1	Japan	2	Sweden	1
Finland	1	Luxembourg	1	Switzerland	1
France	4	Netherlands	4	United Kingdom	10
Germany	1	Norway	6	United States	40
Total					125

Table 2 presents the details of the industry sectors of the sample firms.

Table 2. Number of firms in the sample per industry sector.

Industry	Number
Coal	5
Integrated Oil & Gas	12
Oil & Gas Drilling	7
Oil & Gas Exploration and Production	37
Oil & Gas Refining and Marketing	21
Oil & Gas Transportation Services	14
Oil Related Services and Equipment	22
Renewable Energy Equipment & Services	4
Uranium	3
Total	125

3.2. Estimation Method and Model

This section presents the models and estimation methods. For each model, we run three regressions: pooled regression, fixed effects regression, and random effects regression. There is a potential endogeneity problem because cost of capital may also affect sustainability performance. In this case, a dynamic model needs to be used. To address this endogeneity problem and to provide a robustness check, we also run a model using the generalized method of moments (GMM), adding one-year lags of cost of capital variables as independent variables.

3.3. Models

The models of the study comprise two groups, based on the independent variables. In the first group, TESG is used as the independent variable; in the second group, the components of TESG, namely ES, SS, and GS, are used as independent variables. Each group includes two models based on the dependent variables, COD and COE. The group 2 models aim to separately explore the impact of the components of the total ESG score. The details of all variables are explained in Table 3.

Group 1

- Model 1 $COD_{i,t} = \beta_0 + \beta_1 \text{TESG}_{i,t} + \beta_n Control\ Variables_{i,t} + \varepsilon_{i,t}$
- Model 2 $COE_{i,t} = \beta_0 + \beta_1 \text{TESG}_{i,t} + \beta_n Control\ Variables_{i,t} + \varepsilon_{i,t}$

Group 2

- Model 3 $COD_{i,t} = \beta_0 + \beta_1 \text{ES}_{i,t} + \beta_1 \text{SS}_{i,t} + \beta_1 \text{GS}_{i,t} + \beta_n Control\ Variables_{i,t} + \varepsilon_{i,t}$
- Model 4 $COE_{i,t} = \beta_0 + \beta_1 \text{ES}_{i,t} + \beta_1 \text{SS}_{i,t} + \beta_1 \text{GS}_{i,t} + \beta_n Control\ Variables_{i,t} + \varepsilon_{i,t}$

Table 3. Variable details.

Variable Name	Abbreviation	Description
Dependent		
Cost of Debt Capital	COD	Required rate of return by lenders
Cost of Equity Capital	CEC	Required rate of return by equity investors
Independent		
Environmental Score	ES	Score for environmental performance, covering carbon footprint, climate change, energy consumption, etc.
Social Score	SS	Score for social performance, covering engagement with the community, employee satisfaction, human rights, etc.
Governance Score	GS	Score for corporate governance performance, covering board size and independence, CEO-Chairman duality, gender equality on board, committees.
Total ESG Score	TESG	Combined score for environmental, social, and governance.
Control		
Firm Size	SIZE	Natural logarithm of total assets
Profitability	ROA	Net income/Average total assets
Leverage	LEV	Total debt/total assets
Liquidity	LIQ	Net operating cash flow/total assets
Market Value/Book Value	MVBV	Market value/total shareholders' equity
Country Sustainability Score	COUSS	Country's sustainable development index
Industry Dummy	INDD	Dummy variable for each industry

4. Results

This section presents the descriptive statistics of all variables and the regression results.

Table 4. Descriptive statistics.

Variables	Mean	Standard Deviation	Min	Max
TESG	47.680	17.523	5.770	90.410
ES	47.863	25.169	0.220	96.820
SS	49.741	23.503	1.920	95.830
GS	57.494	23.290	2.460	98.510
COD	0.034	0.031	0.000	0.189
COE	0.113	0.058	-0.001	0.317
SIZE	23.010	1.585	18.012	26.743
ROA	0.014	0.105	-0.789	0.846
LEV	0.265	0.174	0.000	1.358
LIQ	0.094	0.072	-0.343	0.467
MVBV	1.517	2.398	-22.218	62.235
COUSS	73.843	17.523	57.440	85.610

4.1. Descriptive Statistics

Table 4 reports the mean, standard deviation, minimum and maximum values for all variables. The total ESG score ranges from 5.77 to 90.41, with a mean value of 47.68; considering the full score is 100, the average

score for the sample companies is less than 50 % of the full score. This indicates that firms need to improve their sustainability dimensions. Of the component scores, the governance score has the highest mean, with a value of 57.49; this can be explained by the fact that most governance metrics are compulsory and regulated, while environmental and social dimensions are mostly voluntary. Cost of debt ranges from 0 % to 18.9 %, indicating that some companies are entirely equity financed. Cost of equity has a mean value of 11.3 % and a maximum of 31.7 %; as is commonly known in corporate finance theory, equity is a more expensive source of finance for firms. The natural logarithm of total assets, a measure of firm size, ranges from 18.01 to 26.74, with a standard deviation of 1.585, indicating that there is little variation in the sizes of the sample firms. Return on assets, on the other hand, has a high standard deviation, indicating a high variability among firms, from a negative 78.9 % to a positive 84.6 %. Leverage shows that some firms are all equity financed while others are highly leveraged, with a mean value of 26.5 %. Liquidity ranges from negative 34.3 % to positive 46.7, indicating that some firms face liquidity problems. The market value to book value ratio ranges from negative 22.218 to positive 62.235, with a mean of 1.517, indicating that some firms have a low market capitalization rate while others are highly valued by markets. The average country sustainability score for the sample countries is 73.843, which is a satisfactory level.

4.2. Correlation

Table 5 reports the correlations among the variables. Both cost of debt and cost of equity are negatively correlated with the total ESG score, as well as with the component scores. They are also negatively correlated with size, return on assets, leverage, and market value to book value ratio, whereas they are positively correlated with liquidity and country sustainability scores. The total ESG score and the component scores all show the same pattern of positive correlation with size, return on assets, and leverage, while there are different patterns for the other control variables. Except for the environmental score, the corporate sustainability scores have positive correlations with the country sustainability scores, indicating that a country's sustainability performance contributes to the firms' sustainability performance.

Table 5. Correlation matrix.

Variables	TESG	ES	SS	GS	COD	COE	SIZE	ROA	LEV	LIQ	MVBV	COUSS
TESG	1											
ES	0.805*	1										
SS	0.811*	0.783*	1									
GS	0.487*	0.271*	0.243*	1								
COD	-0.167*	-0.215*	-0.181*	-0.173*	1							
COE	-0.174*	-0.323*	-0.2624*	0.108*	0.409*	1						
SIZE	0.364*	0.554*	0.427*	0.264*	-0.181*	-0.148*	1					
ROA	0.059*	0.085*	0.062*	0.071*	-0.133*	-0.134*	0.215*	1				
LEV	0.108*	0.075*	0.101*	0.121*	-0.177*	-0.084*	-0.048	-0.340*	1			
LIQ	-0.090*	-0.125*	-0.105*	0.069*	0.111*	0.138*	0.136*	0.294*	-0.274*	1		
MVBV	0.036*	0.032*	-0.057*	-0.061*	-0.065*	-0.054*	0.243*	0.155*	-0.112*	0.127*	1	
COUSS	0.088*	-0.082*	0.098*	0.123*	0.095*	0.098*	-0.299*	-0.106*	0.017*	-0.047	-0.03*	1

Note: * Significance at 10%.

4.3. Regression Results

Table 6 reports the pooled regression and panel regression results for Models 1 and 2, in which cost of debt and cost of equity are the dependent variables, respectively, and the total ESG score is the independent variable. The results of pooled regression for Model 1 show a significantly negative relationship between cost of debt and total ESG score, indicating that better sustainability performance results in a lower cost of debt. This can be explained by banks charging lower rates for firms with higher ESG performance by integrating environmental, social, and governance considerations in their lending decisions. This finding is consistent with those of previous studies (Crifo et al., 2017; Eliwa et al., 2019; Hasan et al., 2017; Weber et al., 2010; Weber. et al., 2014). We found a negative relationship for size and profitability (ROA) and a positive relationship for leverage. These results indicate that larger firms have lower borrowing costs, and as leverage levels increase, firms have a higher cost of debt. Liquidity and the market value to book value ratio do not have any significance in the model. An interesting finding is that the country sustainability score has a positive coefficient, implying that an increase in a country's sustainability score results in a higher cost of capital for firms, which is contrary to the common expectation. The results of Model 2 are remarkably similar to those of Model 1; there is an inverse relationship between total ESG score and cost of equity. In contrast to Model 1, however, leverage has no significance, and MVBV has significance at the 10 % level. Both models have overall model significance under panel regressions. The results of panel regression for Model 1 also reveal a significant negative relationship between cost of debt and total ESG score; however, Model 2 does not produce significant results under panel regressions. In other words, there is no significant relationship between cost of equity and total ESG score. Regarding the control variables, profitability and country sustainability have a negative significance.

Table 6. Pooled regression and panel regression results for Group 1 models.

Variables	Pooled Regressions		Panel Regressions	
	1 COD	2 COE	1 COD	2 COE
TESG	-0.000366***	-0.000359***	-0.000683***	0.0000842
	(-3.61)	(-3.50)	(-2.9)	(0.98)
SIZE	-0.004979***	-0.003208***	-0.000686	-0.000176
	(-4.24)	(-2.69)	(-0.8)	(-0.53)
ROA	-0.0213772*	-0.0925856***	-0.0059709***	-0.0016174
	(-1.39)	(-5.92)	(-2.13)	(-1.38)
LEV	0.0633804***	0.0120447	-0.0021736	-0.003245***
	(6.75)	(-1.26)	(-0.6)	(-2.16)
LIQ	0.0295756	0.1404676***	0.0052027*	0.002167
	(1.28)	(5.98)	(1.53)	(1.29)
MVBV	-0.0005357	0.0009889*	-0.0000376	-0.0000765
	(-0.83)	(1.50)	(-0.66)	(-1.22)
COUSS	0.0011667***	0.0011758***	0.00065***	0.00000932
	(3.31)	(3.29)	(2.47)	(0.20)
Constant	0.0881625**	0.119174***	-0.4232876	-0.1188294
	(2.13)	(2.84)	(-1.05)	(-1.01)
Fixed/Random	-	-	Random	Random
R^2	0.1044	0.0934	0.0969	0.0435
Adj R^2	0.0992	0.0881	-	-
F value	19.91***	17.59***	-	-
Wald chi2	-	-	38.99***	22.58***
Industry dummies	Yes	Yes	Yes	Yes

Note: ***, **, *: Significance at 1%,5%,10% respectively. t-statistics are in the parentheses.

Table 7 reports the results of pooled regressions and panel regressions for Model 3 and Model 4, in which the components of total ESG score, namely environmental score (ES), social score (SS), and governance score (GS) are dependent variables.

Table 7. Pooled regression and panel regression results for Group 2 models.

Variables	Pooled Regressions		Panel Regressions	
	3 COD	4 COE	3 COD	4 COE
ES	-0.0002828***	-0.000799***	0.0000222	0.0000098
	(-2.62)	(-7.65)	(0.62)	(0.82)
SS	-0.0001391	-0.0001308	-0.000123**	-0.0000205*
	(-1.32)	(-1.28)	(-2.66)	(-1.64)
GS	0.0000435	0.0004627***	0.0000053	0.00000947*
	(0.62)	(6.84)	(0.28)	(1.68)
SIZE	-0.0029628**	0.0022416*	-0.0007849	-0.0002224
	(-2.15)	(1.68)	(-0.87)	(-0.65)
ROA	-0.020202	-0.0824995***	-0.0056361***	-0.0014949
	(-1.31)	(-5.54)	(-2.02)	(-1.32)
LEV	0.0635723***	-0.0064145	-0.0020772	-0.0032102**
	(6.79)	(-0.71)	(-0.56)	(-2.13)
LIQ	0.0158734	0.0932357***	0.0049501	0.0020344
	(0.68)	(4.11)	(1.48)	(1.21)
MVBV	-0.0005056	0.0012104**	-0.0000577	-0.0000789
	(-0.78)	(1.93)	(-0.79)	(-1.34)
COUSS	0.0012654***	0.0012367***	0.0006853***	0.0000127
	(3.51)	(3.55)	(2.57)	(0.26)
Constant	0.0340325	-0.0172648	-0.5602401	-0.1583954
	(0.75)	(-0.39)	(-1.43)	(-1.30)
Fixed/Random	-	-	Random	Random
R^2	0.111	0.1806	0.1061	0.0467
Adj R^2	0.1045	0.1746	-	-
F value	17.04***	30.07***	-	-
Wald chi^2	-	-	37.49***	22.76**
Industry dummies	Yes	Yes	Yes	Yes

Note: ***, **, *: Significance at 1%,5%,10% respectively. t-statistics are in the parentheses.

Under pooled regressions, both models have overall significance, but only environmental score has a negative significant coefficient; social and governance scores do not have a significant impact on cost of debt. Size has a negative coefficient, indicating that larger firms have a lower cost of debt. Leverage has a positive coefficient, indicating that increases in leverage level result in a higher cost of debt due to increased financial risk. The country sustainability score also has a positive coefficient, as noted regarding the Group 1 models; this is an unexpected result because an increase in country sustainability is expected to benefit all pillars of companies' sustainability performance.

4.4. Robustness Test

Table 8 reports the results of the generalized method of moments (GMM) regression for all models. Due to the potential endogeneity problem between sustainability performance and cost of capital, the GMM regressions include a one-year lag of the dependent variable as an independent variable in the models. The main reason for this is that a firm's decision on whether to engage in sustainability activities may not be completely independent of its cost of debt and cost of equity (Ghoul et al., 2011). The results of these robustness checks are similar to the results of the pooled and panel regressions. In Models 1 and 2, lagged cost of debt and cost of equity have significantly positive coefficients, indicating that the previous year's cost of capital significantly affects the current year's cost of capital. The total ESG score is found to have a significant negative coefficient, which is consistent with the other models. The relationship is stronger for cost of debt than for cost of equity.

Table 8. Generalized method of moments results for Group 1 and Group 2 models.

Variables	Generalized Method of Moments			
	1 COD	2 COE	3 COD	4 COE
Lag of dependent variable	0.19297*** (48.87)	1.000*** (194.21)	0.1945*** (27.86)	1.001919*** (205.45)
TESG	-0.0000433*** (-4.52)	0.0000107** (2.25)	- -	- -
ES	- -	- -	0.0002*** (14.78)	-0.000003 (-0.72)
SS	- -	- -	-0.0004*** (-18.91)	0.000017*** (3.97)
GS	- -	- -	0.00003*** (3.09)	0.000005* (1.77)
SIZE	-0.0060881*** (-14.75)	0.0003375*** (3.17)	-0.0064*** (-12.34)	0.000342*** (3.12)
ROA	0.0000491 (0.07)	-0.000034 (-0.14)	0.0024** (2.11)	-0.000028 (-0.11)
LEV	-0.0029952*** (-3.54)	-0.000125 (-0.35)	-0.0019 (1.14)	-0.000090 (-0.25)
LIQ	0.0006107 (0.46)	0.0002377 (0.44)	-0.0003 (-0.15)	-0.000100 (-0.17)
MVBV	-0.000289*** (-5.17)	0.00000715 (1.39)	-0.00028** (-2.49)	0.000003 (0.49)
COUSS	0.0014624*** (28.47)	0.00022*** (10.07)	0.0013*** (16.29)	0.000217*** (9.81)
Constant	1.303727*** 14.9	0.2104616*** (9.89)	0.3888*** (3.68)	0.236902*** (9.73)
No. of instruments	63	63	65	65
Wald chi²	5490.94***	53719.92***	8089.51***	54754.72***
Sargan	94.79	87.35	83.48	85.38
AR 1	-2.7565***	-5.7271***	-2.9749***	-5.7284***
AR 2	0.96024	2.7691	0.19065	2.8082
Industry dummies	Yes	Yes	Yes	Yes

Note: ***, **, *: Significance at 1%,5%,10% respectively. t-statistics are in the parentheses.

Firm size, leverage, the market value to book value ratio, and the country sustainability score are the control variables with significant coefficients in Model 1, while in Model 2, only firm size and the country sustainability score have significant coefficients.

In Models 3 and 4, the independent variables are the components of the total ESG score. Similar to Models 1 and 2, the lagged dependent variable is found to have significant effects on both cost of debt and cost of equity. In Model 3, all components of the total ESG score have significant coefficients, and firm size, profitability, the market value to book value ratio, and the country sustainability score are found to have

significant effects. In Model 4, social score has a high significance level; however, governance score has significance at the 10 % level, and environmental score is not significant.

5. Conclusions

This study aimed to discover the relationship between the sustainability performance of firms and their cost of capital. We used environmental, social, and governance pillars to evaluate firms' sustainability performance, and we used cost of debt and cost of equity as the two main sources of capital. We aimed to answer the question of whether the providers of finance reward firms based on their engagement and performance in sustainability dimensions; this reward can be in the form of lower borrowing costs, in the case of lending institutions, or it can be in the form of lower required rates of return, in the case of equity holders. Both those cases are intricately linked to a decreased level of firm risk, and sustainability performance is thus expected to result in lower firm risk and lower cost of capital.

The study used a sample of 125 energy companies from 24 countries for the period from 2009 to 2019, resulting in a total of 1375 firm-year observations. We utilized the data of companies from the energy sector because, first, we wanted to eliminate the potential differences that may arise when focusing on multiple sectors, and second, the energy sector is more closely associated with sustainability concerns due to the potential impacts of their activities on the environment. Our results indicate that there is an inverse relationship between sustainability performance and cost of capital; this relationship is more acute in the case of cost of debt compared to cost of equity. Our findings are consistent with previous studies on cost of debt (Crifo et al., 2017; Ge & Liu, 2015; Hasan et al., 2017) and cost of equity (Dhaliwal et al., 2014; Li & Liu, 2018; Singh et al., 2016). The results imply that as firms perform better in the pillars of sustainability, they have a lower perceived riskiness, which may result in a lower cost of capital. This finding highlights the role of capital providers in encouraging firms to engage in a holistic approach to sustainability, and firms should actively engage in environmental and social initiatives and improve their governance mechanisms.

This study used total ESG score, as well as its three components. These are the overall scores for each pillar and are composed of several detailed items. Many rating institutions measure and publish details of these sustainability pillars, for instance, energy consumption, air pollution, carbon emission, etc. Future studies may opt to investigate the relationship between sustainability and cost of capital by using these detailed item scorings. This will enable us to draw more accurate conclusions and develop better policy implications. Furthermore, future studies may conduct similar analyses in different sectors and multiple sectors, such as only financial institutions or only non-financial institutions. Another potential avenue for future research might be to focus on countries in a single region or those with similar characteristics, such as emerging economies.

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