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Article

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Management dynamics in the knowledge economy

Provided in Cooperation with:
National University of Political Studies and Public Administration, Bucharest

Reference: Mititean, Pompei/Sărmaș, Florina-Nicoleta (2023). Harmonizing sustainability disclosure and financial performance : an in-depth exploration within the European energy industry and beyond. In: Management dynamics in the knowledge economy 11 (4/39), S. 385 - 401. https://www.managementdynamics.ro/index.php/journal/article/download/548/485/2555. doi:10.2478/mdke-2023-0024.

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Harmonizing Sustainability Disclosure and Financial Performance. An In-depth Exploration within the European Energy Industry and Beyond

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Received: July 21 2023
Revised: September 3, 2023
Accepted: September 21, 2023
Published: December 10, 2023

Abstract: This study seeks to investigate how the sustainability disclosure influence the financial performance of companies listed in the Top 100 Global Energy Leaders. The Refinitiv Eikon database in the main source where the data was collected for the 2017-2021 period, resulting in a data set of 361 observations for 71 companies. The analysis examined global and regional variables, and the results obtained using the SPSS statistical package were found to be mixed. The findings revealed that the ESG score had a significant negative impact on both Return on Equity (ROE) and Return on Assets (ROA) for the overall sample and Asia. In contrast, the impact was negative but statistically insignificant for Europe and positive but insignificant for North America. Furthermore, the environmental score had a negatively impact on ROA for the overall sample, while its influence was statistically insignificant in Asia, Europe and North America for both ROA and ROE. Additionally, the social score demonstrated a significant negative impact on the overall sample and Asia, while its impact was not significant in other regions. In terms of governance score, it significantly negatively affected ROE for the overall sample, Asia, and Europe, but had a positive and significant impact in North America. This existing literature in the field is completed in new results from the companies acting in the energy sector in different regions of the world. These findings have also some practical implications, being valuable for stakeholders in the decision-making process and for team management who seek to incorporate sustainable practises into corporate strategies.

Keywords: sustainability disclosure; financial performance; environmental, social and governance; energy sector; ESG.

Introduction

The adoption of the sustainability goals once with the Directive 2014/95/EU has become widely debated over the past ten years. At an international level, sustainable disclosure has gained the attention of an increased number of playmakers, such as European Commission and others. The relationship between sustainability disclosure and different financial metrics is an important topic of debate. For example, several studies analyse the effects of sustainability disclosure on the firm value (Constantinescu, 2021; Constantinescu et al., 2021; Qureshi et al., 2020), earnings management (Grimaldi et al., 2020; Velayutham, 2018), investment decision (In et al., 2019; Park & Jang, 2021; Young-Ferris & Roberts, 2021), cost of capital (Gjergji et al., 2021; Gholami et al., 2022; Johnson, 2020) or financial performance (Chen & Xie, 2022; Minutolo et al., 2019; Yoo & Managi, 2022). Moreover, there are studies focussing on a sample that includes all industries (Kumar & Firoz, 2022) or a specific industry: Shakil et al. (2019) and El Khoury et al. (2023) on financial companies, Buallay (2022) and Conca et al. (2021) and Mititean (2023a) on the food industry, and Baran et al. (2022) and Behl (2022) on the energy sector.

How to cite
Mititean, P., & Sărmaş, F.-N. (2023). Harmonizing Sustainability Disclosure and Financial Performance. An In-depth Exploration within the European Energy Industry and Beyond. *Management Dynamics in the Knowledge Economy, 11*(4), 385-401. DOI 10.2478/mdke-2023-0024
ISSN: 2392-8042 (online)
Journal Abbreviation: Manag. Dyn. Knowl. Econ.
https://content.sciendo.com/view/journals/mdke/mdke-overview.xml

Other scholars analyse the impact of corporate sustainability disclosure on the financial performance obtained by companies from various sectors (Alhawaj et al., 2023; Egorova et al., 2022; Mititean, 2023a; Saygili et al., 2022), for a specific industry (El Khoury et al., 2022 for healthcare industry; Buallay, 2022 for food industry or Baran et al., 2022 in the energy sector) or for a specific region (Batae et al., 2021 - Europe; Lee & Isa, 2022 - Malaysia, Ahmad et al. 2021 - UK listed companies).

Existing studies identify mixed results, and the general conclusions for industries or per region remain far from clear. This study seeks to analyse how the financial performance of companies operating in the energy sector, specifically those included in the Top 100 Global Energy Leaders list by Refinitiv are affected by sustainability disclosure. The study focusses on the period from 2017 to 2021 and aims to assess the impact of the sustainability disclosure, performed by ESG scores on financial performance at both a general level and across different regions. The number of studies which analyse this impact for energy sector is relatively small (e.g., Alhawaj et al., 2023; Baran et al., 2022), opening new opportunities for research in this area.

Our results are mixed. For the entire sample and for Asia, a negatively significant impact on financial performance was identified for the ESG scores. For Europe, the score has a negative impact, while for North America the impact is positive, but insignificant. Overall, the ESG scores negatively and significantly affect the financial performance. As we go further, the ESG scores separated have a significant negative impact for Asia. ESG factors of ESG separately show also a negative but insignificant impact for Europe. The impact of the ESG factors for America is positive, but also insignificant.

The main contribution that the study brings to the literature refers to the presentation of arguments regarding the relationship between sustainability disclosure and corporate performance. These arguments are supported by the methodology used and the variables included in the study, especially three distinct dependent variables that strengthen the solidity of the results obtained regarding the analysed relationship. In addition, the relationships obtained, both negative and positive, have the role of stimulating the companies' management to adopt policies regarding more responsible ESG strategies and to help the company's profitability through the adopted policies, thus attracting capital and new investors.

The rest of this paper unfolds as follows: the nest section brings an overview of the existing literature and the development of hypotheses. The third section show the research design used in this study. Moving forward, the fourth section presents the results and the subsequent discussions. Lastly, the paper concludes with the findings and implications in the fifth section.

Review of the literature and hypotheses

The association between sustainability factors, also referred to as “ESG factors,” and the financial performance of businesses from various industries has been extensively investigated over the years. For example, in a study conducted by Batae et al. (2021), the authors focused on analysing the concerned relationship within the banking industry. They relied in part on data gathered from 39 European banks from 2010 to 2019.

Extensive research was carried out, with findings indicating that there is a positive relationship between efforts to reduce emissions and waste - mainstream environmental challenges and banks’ financial performance, as assessed by metrics such as Return on Assets (ROA) and stock market returns. Furthermore, the authors indicated that social factors have a detrimental impact on the financial performance of the European banks under consideration. Besides, Velte (2017) examined the impact of sustainability factors on the financial performance of German companies. The study’s findings depended on 412 firm-year observations from 2010 to 2014, suggesting a positive relationship between the

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ESG factors and firm financial performance, i.e., the higher the ESG scores, the better the firm's financial performance. Both studies support the notion that incorporating sustainable practices and considerations into corporate strategies may result in favourable firm financial performance.

Multiple studies have looked into ESC disclosure decisions and the effects they have on firm financial performance, employing different metrics. Duque-Grisales and Aguilera-Caracuel (2021) tackled this topic in a study that focused on 104 South American enterprises from 2011 to 2015. Both academics examined the impact of individual and combined ESG factors on the financial performance of the companies under consideration, revealing a negative association between the two variables. Another noteworthy example is the study of Cek and Eyupoglu (2020). Their findings indicated that while combined ESG factors influenced firm financial performance, the results varied when analysing individual sub-scores. Social and governmental scores (SOC and GOV) demonstrated a significant impact on firm financial performance, whereas environmental scores (ENV) did not show any significant relationship.

Furthermore, Baran et al. (2022) analysed the energy sector in Poland and found that ESG factors had no meaningful impact on firm financial performance in that particular context. Another in-depth study was conducted by Whelan et al. (2021), analysing over 1,000 articles discussing the connection between ESG factors and firm financial performance. According to the findings, 58% of those articles exhibited a positive connection between the two variables, whereas only 8% showed otherwise. Last but not least, Hwang et al., 2021, evaluated the above-mentioned impact during uncertain times. The results of their research study suggested that companies that engage in more ESG activities tend to demonstrate more rewarding financial performance in such circumstances.

Moreover, it is worth noting that Alareeni and Hamdan (2020) studied how ESG disclosure affects firm financial performance listed in the US Standard & Poor's 500 from 2009 to 2018. Findings uncovered a favourable correlation between ESG disclosure and firm financial performance. After analysing the ESG scores individually, it was found that they had a negative impact on Return on Equity (ROE) and Return on Assets (ROA). Nonetheless, considering governance disclosure solely, it exhibited a positive impact on Return on Assets (ROA) and a negative relationship with Return on Equity (ROE). Similarly, Ademi and Klungseth (2022) explored the relevant influence in a study based on the data from 150 companies listed in the Standard & Poor's 500. Their observations suggested that the higher a firm's ESG scores, the better its financial performance. Additionally, Nguyen et al. (2022) revealed that incorporating sustainable practices and considerations into corporate strategies positively improved the financial performance of 57 businesses listed in the Standard & Poor's 500 from 2018 to 2020. Petitjean (2019) also shed light on a general positive connection between a firm's ESG scores and financial performance.

Another remarkable research endeavour investigated the importance of ESG mechanisms concerning firm financial performance, focusing on non-financial companies listed in the Borsa Istanbul Corporate Index (XKURY) from 2007 to 2017. Saygili et al. (2022) utilized the Global Reporting Initiative (GRI) indicators to calculate the Environmental Disclosure Score (EDS). Findings highlighted that environmental factors had a negative impact on firm financial performance, while social factors had a positive impact, especially when stakeholders were involved, contributing to operational efficiency. Furthermore, Atan et al. (2018) conducted a study with the objective of analysing the influence of ESG factors on firm financial performance, concentrating on 54 businesses listed in Bloomberg's ESG database between 2010 and 2013. On the one hand, their investigation revealed that ESG factors did not exhibit any significant relationship with firm profitability and financial performance when analysed separately. On the other hand, when these factors were considered as a whole, they had a positive and significant effect on capital cost. Moreover, Lee and Isa (2022) directed their attention to Malaysian companies from 2020 to 2017 in order to further explore the impact of ESG factors on firm financial performance. They

utilized financial performance metrics such as Return on Equity (ROE), Return on Assets (ROA), and Tobin's Q ratio. The results of their study indicated a positive relationship between ESG factors and firm financial performance. They also indicated that employing double screening methods could strengthen this relationship.

Yet another noteworthy study is Ahmad et al. (2021), which was centred on 351 FTSE350 listed companies in Europe and aimed to examine the debatable connection between ESG disclosure and firm financial performance measured by market value and Earnings Per Share (EPS). The study's results displayed a positive relationship, indicating that higher ESG reporting was associated with improved financial performance. Secondly, the study revealed that the results of this relationship might be influenced by the size of the company. What I mean is that firms that invested in ESG initiatives showed superior financial performance. Moreover, Giannopoulos (2022) explored the impact of ESG factors on firm financial performance, using publicly traded Norwegian companies as their case study. In this research, Return on Assets (ROA) and Tobin's Q ratio were analysed as dependent variables, while ESG score was analysed as an independent variable, with firm size and leverage serving as control variables. The results indicated a considerable association between the ESG score and firm financial performance, yet the outcomes were varied. While ESG initiatives had a negative impact on Return on Assets (ROA), they showed a positive effect on Tobin's Q ratio.

Another observation pointed out that larger organizations, which were more actively engaged in ESG initiatives, attained higher scores in this regard. Rahi, Akter and Johansson (2022), however, adopted another approach in their attempt to study the relationship between ESG factors and firm financial performance, focusing on 39 financial firms in Sweden, Norway, Denmark, and Finland spanning from 2014 to 2019. The study applied different financial performance metrics, encompassing Return on Investment Capital (ROIC), Return on Equity (ROE), Return on Assets (ROA), and Earnings Per Share (EPS). Additionally, control variables such as total debt, total assets, and leverage were taken into account. The outcomes showcased a predominantly negative relationship between ESG factors and firm financial performance across most variables, except for Return on Assets (ROA), which exhibited a non-significant relationship. In a broader context, Bruna et al. engaged in a similar study, investigating the correlation between ESG factors and firm financial performance with an emphasis on 350 European listed companies from 2014 to 2019. To evaluate firm financial performance, they used an FP score that incorporated various financial measures, along with the combined ESG score provided by Definitive Eikon Datastream for their ESG analysis. The results revealed that the impact of ESG factors on firm financial performance varies in a nonlinear manner, influenced by both ESG scores and company size. These findings aligned with those of Giannopoulos (2022) in terms of the association between company size and ESG.

Numerous research studies have illustrated that the nature of the relationship between ESG disclosure and firm financial performance varies across different industries. Egorova et al. (2022) found that higher ESG ratings have a positive effect on company value within the IT sector. In contrast, El Khoury et al. (2022) revealed that a lower environmental score is associated with a more favourable firm financial performance in the healthcare industry, whereas the social score negatively impacts Return on Assets (ROA). Furthermore, Mititean (2023a) concentrated on the European agricultural sector and concluded that higher ESG scores tend to exhibit better firm financial performance. Conversely, Alhawaj et al. (2023) suggested that there is no significant connection between ESG scores and Return on Equity (ROE) in the energy sector. As for Buallay (2022), whose research focused on the food industry, he found that ESG disclosure significantly influences Return on Equity (ROE) but has zero impact on Return on Assets (ROA). In another research study, Buallay et al. (2022) identified a substantial relationship between ESG disclosure and operational performance within the tourism sector, while the influence on firm financial performance, as evaluated by Return on Equity (ROE), was deemed non-significant.

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Drawing on accessible literature and various outcome reports, the study's main objective is to investigate the relationship between sustainability disclosure and firm financial performance in the energy sector, encompassing both a global and a regional perspective.

As a result, our primary hypothesis is as follows:
H1. ESG disclosure has a significant impact on financial performance.

From the main hypothesis results some several secondary assumptions, such as:
H2. The financial performance is affected by the disclosure of environmental performance.
H3. The financial performance is affected by the disclosure of social performance.
H4. The financial performance is affected by the disclosure of governance performance

Research design

Sample and data

The main objective of this study is to explore the influence of sustainability disclosure on the financial performance of companies operating in the energy industry. Specifically, the study focuses on companies that were listed in Top 100 Global Energy Leaders in 2017 By Thomson Reuters.

Table 1. Data sample distribution

Regional distribution / Energy industry sub-category	Asia	Australia	Europe	North America	South America	Total
Panel A. Number of companies included in the study						
Oil & Gas	20	2	17	13	2	54
Oil & Gas Related Equipment and Services	1	1	7	4		13
Renewable Energy			3	2		5
Uranium				1		1
Total countries	**21**	**3**	**27**	**20**	**2**	**73**
Panel B. Number of company-year observations included in the analysis						
Oil & Gas	99	10	85	65	10	269
Oil & Gas Related Equipment and Services	5	5	35	17		62
Renewable Energy			15	10		25
Uranium				5		5
Total country year-observations	**104**	**15**	**135**	**97**	**10**	**361**

Source: own processing

The energy sector is relevant for research on the impact of ESG and financial performance as it is considered a sensitive industry, exposed to environmental issues, and the most polluting sector of all industries. Data are collected from Refinitiv Eikon Datastream, for 2017-2021. Out of 100 companies, only 73 companies disclose ESG aspects, providing a number of 361 year-observation, shown below in Table 1.

The data used in this study are taken from Refinitiv Eikon Datastream, a widely recognised and credible database known for its comprehensive collection of ESG scores and other financial information for many companies acting in different sectors and worldwide regions. The Refinitiv Eikon Datastream has been extensively utilized by various researchers, including Constantinescu et al. (2021), Constantinescu (2021), Mititean (2022) Radu et al. (2022), and Mititean (2023a). By leveraging this robust database, we ensure the reliability and availability of multiple data points for our analysis. The sample for this study includes companies from five distinct regions and four sectors within the energy industry, ensuring a diverse representation in different geographical areas and sectors.

Europe stands out as the continent with the most significant representation of companies reporting ESG factors, comprising 27 companies across three sectors. Oil and Gas (17 companies), Oil & Gas Related Equipment and Services (7 companies), and Renewable Energy (3 companies). Additionally, Asia provides ESG data for 21 companies, resulting in a total of 99 year-observations for oil and Gas (99 observations) and Oil & Gas Related Equipment and gas related equipment and services (5 observations).

Variables measurement

Table 2 presents an overview of the variables used to assess our hypothesis. To comprehensively gauge the financial performance of companies, we consider two indicators based on financial accounting information. Return on assets (ROA) and Return on Equity (ROE). These metrics have been used by various researchers, such as Sassen et al. (2016), De Lucia et al. (2020), Chouaibi et al. (2022), and Baran et al. (2022). Return on Assets (ROA) is calculated as the net profit of the period divided by the total assets, while Return on Equity (ROE) is computed by dividing the company's net income by its total equity.

We used four independent variables to measure sustainable disclosure. The ESG combined score (ESG) and its individual pillar scores, represented by ENV (environmental score), SOC (social score), and GOV (governance score). This is consistent with Mititean (2023a), Mititean (2023b), Giannopoulos et al. (2022), Batae et al. (2021), DasGupta (2022), or Lee and Isa (2022). The measurement of each of these variables are defined by the Thomson Reuters Refinitiv Eijon (2021).

Table 2. Variable explanations

Variable	Abbreviation	Authors
Return on Assets	ROA	Sassen et al. (2016), De Lucia et al. (2020), Chouaibi et al. (2021), Baran et al. (2022), Giannopoulos et al. (2022), Saygili et al. (2022), Lee and Isa (2022) and Mititean (2023a)
Return on Equity	ROE	Sassen et al. (2016), De Lucia et al. (2020), Chouaibi et al. (2021) or Baran et al. (2022), Batae et al. (2020); Batae et al. (2021); Alsayegh et al. (2020), Lee and Isa (2022) and Mititean (2023a)
ESG combined score	ESG	Giannopoulos et al. (2022), Batae et al. (2020), Batae et al. (2021), DasGupta (2022), Lee and Isa (2022), Mititean (2023a) and Mititean (2023b)
Environmental pillar score	ENV	Giannopoulos et al. (2022), Batae et al. (2020), Batae et al. (2021), Lee and Isa (2022) Mititean (2023a) and Mititean (2023b)
Social score	SOC	Giannopoulos et al. (2022), Batae et al. (2020), Batae et al. (2021) Lee and Isa (2022) Mititean (2023a) and Mititean (2023b)
Governance Score	GOV	Giannopoulos et al. (2022), Batae et al. (2020), Batae et al. (2021) Lee and Isa (2022) Mititean (2023a) and Mititean (2023b)
Firm size	FZT	Orazalin (2020) and Biswas et al. (2018); Mititean (2023a) and Mititean (2023b)
	FZE	Batae et al. (2020), Batae et al. (2021), Saygili et al. (2022); Mititean (2023a) and Mititean (2023b)
Leverage	LV	Orazalin and Mahmood (2021); Biswas et al. (2018); Alsayegh et al. (2020), Lee and Isa (2022); Mititean (2023a) and Mititean (2023b)

Source: own processing

To ensure control in our regression model, we incorporate three control variables. Following the approach outlined by Orazalin (2020) and Biswas et al. (2018), we measure firm size (FZT) as the natural logarithm of total assets. Additionally, based on the methodologies employed by Batae et al. (2020), Batae et al. (2021), and Saygili et al.

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(2022), we measure firm size (FZE) the total number of company employees being transformed using the natural logarithm. Furthermore, the third control variable is leverage, being calculated as the ratio between total debts and total assets, aligning with the practises of Baydauletov (2020), Orazalin (2020), Biswas et al. (2018), Batae et al. (2020), Batae et al. (2021), Alsayegh et al. (2020), and Lee and Isa (2022) in their respective studies.

Advancing with the discussion for our sub hypothesis, Figure 1 shows the region differences for our dependent and independent variables. Europe is at the forefront with the highest levels of combined and individual scores. Following Europe, northern and Southern America show relatively high average disclosure rates of ESG combined scores, reaching approximately 65%. Regarding financial performance, South America emerges as the leader, exhibiting the highest rates within the sample, with a 15% return on equity and a 6% return on assets. In contrast, North America demonstrates the lowest financial performance rates in the sample.

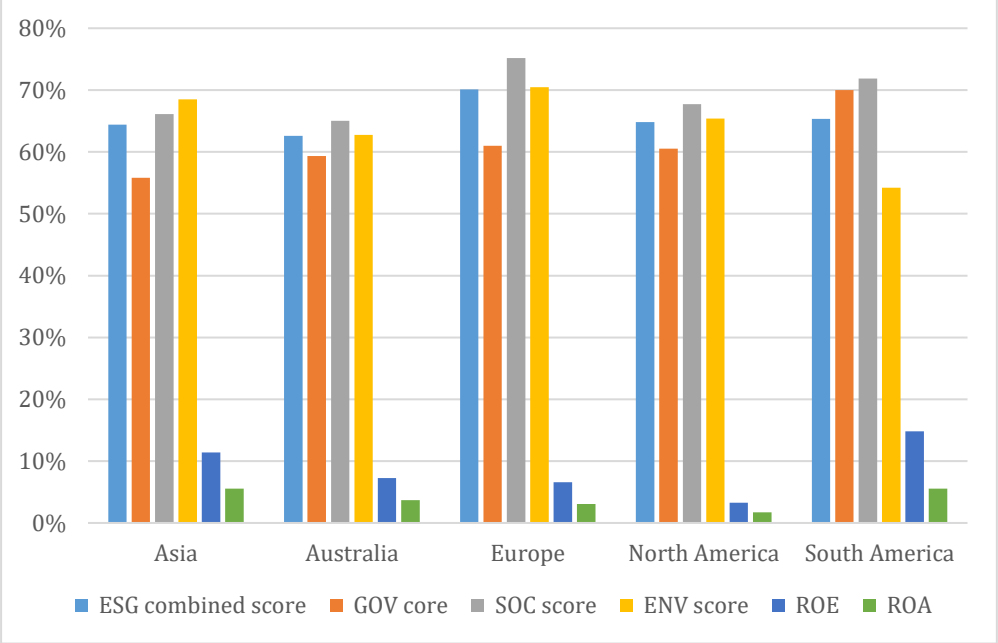

Figure 1. Average of combined ESG scores and individual and financial performance distributed by geographical region
Source: own processing

Research method

To test our hypothesis, we run a linear regression model, an approach consistent with Constantinescu et al. (2021), Duque-Grisales, and Aguilera-Caracuel (2021), Radu et al. (2022) or Mititean (2023a).

First, to test our first hypotheses, the following model is developed:

$$ROA = \beta_0 + \beta_1 ESG_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (1)$$
$$ROE = \beta_0 + \beta_1 ESG_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (2)$$

Further, to test our sub hypothesis, six models were developed as follows:

$$ROA = \beta_0 + \beta_1 ENV_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (1.1)$$
$$ROA = \beta_0 + \beta_1 SOC_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (1.2)$$
$$ROA = \beta_0 + \beta_1 GOV_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (1.3)$$
$$ROE = \beta_0 + \beta_1 ENV_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (2.1)$$
$$ROE = \beta_0 + \beta_1 SOC_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (2.2)$$
$$ROE = \beta_0 + \beta_1 GOV_t + \beta_2 FZT_t + \beta_3 FZE_t + \beta_4 LV_t + \varepsilon_t \quad (2.3)$$

ROA and ROE represent the financial performance of companies. ESG represents the environmental, social, and governance score. ENV represents the environmental score. The SOC represents the social score. GOV represents the governance score. All four of these variables represent our independent variables. Firm size (FZT and FZE) and LV leverage are control variables. The details of the variable's calculation are presented in above section. Figure 2 presents all the hypotheses developed for this study and simplify the research model.

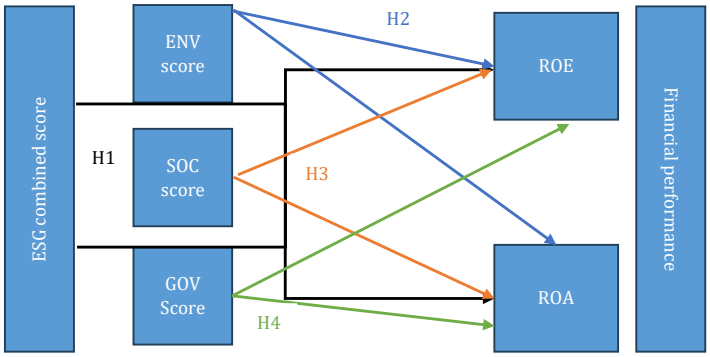

Figure 2. Research model
Source: own processing

Research results

Descriptive statistics and correlation analysis

The descriptive data for ESG scores, financial performance indicators, and control variables are shown in Table 3. The mean value of the ESG score is observed to be 66.61, which closely aligns with the ENV score of 67.76. The minimum scores for the SOC score and GOV components are 2.68 and 0.92, respectively. Furthermore, the maximum scores reach 94.74 and 94.47 for SOC and GOV scores.

Table 3. Descriptive statistics of variables

Variable	N	Min	Max	Mean	Std. Dev.	Skewness		Kurtosis	
						S	SE	S	SE
ESG	361	1.16	92.72	66.61	15.36	-1.360	0.128	3.390	0.256
GOV	361	2.68	94.47	59.54	22.21	-0.426	0.128	-0.856	0.256
SOC	361	0.92	94.74	70.07	18.49	-1.393	0.128	2.311	0.256
ENV	361	0.00	96.31	67.76	17.32	-1.325	0.128	3.094	0.256
ROE	315	-1.88	1.17	0.07	0.22	-4.272	0.137	36.614	0.274
ROA	305	-0.28	0.35	0.04	0.05	-0.433	0.140	9.638	0.278
FZT	321	21.16	27.08	23.94	1.38	0.323	0.136	-0.708	0.271
FZE	332	5.87	13.11	9.37	1.47	0.485	0.134	-0.025	0.267
LV	321	0.01	1.21	0.28	0.15	1.270	0.136	4.074	0.271

Source: own processing

The mean return on Assets (ROA) is positive, at 0.04, and the average return on Equity (ROE) is 0.07. The minimum score for ROE is -1.88, with a mean of 0.07 and a maximum value of 1.17. The firm size variable (FZT) has a mean value of 23.94, with a minimum of 21.16 and a maximum score of 27.08 while a minimum of 5.87 and a maximum score of 13.11 for the natural logarithm of the number of employees (FZE) with a mean of 9.37. The standard deviation for FZT is 1.38, and for FZE it is 1.47, indicating a relatively moderate dispersion in the data. The mean value for the leverage variable is 0.28, with a

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standard deviation of 0.15. In addition, the descriptive statistics presented in Table 3 support the hypothesis that the data are normally distributed, supporting the appropriateness of using regression models based on these variables (Lungu et al., 2019).

Below of the diagonal, in Table 4, shows the Pearson correlation while the Spearman correlations is above the diagonal, which reveal the relationships between all variables. Based on Pearson's correlation analysis (below the diagonal), it is observed that the ENV score exhibits a negative correlation with ROE at a significance level of 0.05, and the SOC score demonstrates a negative correlation at a significance level of 0.01.

Table 4. Pearson/Spearman correlation matrix

Variable	ESG	GOV	SOC	ENV	ROE	ROA	FZT	FZE	LV
ESG	1	0.678**	0.872**	0.762**	-0.079	-0.144*	0.127*	0.148**	0.016
GOV	0.694**	1	0.408**	0.220**	-0.080	-0.072	0.227**	0.086	0.031
SOC	0.909**	0.443**	1	0.619**	-0.024	-0.106	0.037	0.115*	-0.005
ENV	0.795**	0.291**	0.683**	1	-0.040	-0.156**	0.037	0.177**	-0.002
ROE	-0.103	-0.103	-0.090	-0.041	1	0.794**	0.049	-0.033	-0.100
ROA	-0.130*	0.003	-0.201**	-0.112*	0.531**	1	0.175**	-0.024	-0.323**
FZT	0.131*	0.205**	0.000	0.059	0.092	0.199**	1	0.621**	-0.193**
FZE	0.092	0.033	0.029	0.126*	-0.006	0.012	0.691**	1	-0.247**
LV	-0.025	0.017	-0.016	-0.060	-0.281**	-0.390**	-0.223**	-0.270**	1

Notes: *The correlation is significant at the 0.05 level **The correlation is significant at the 0.01 level (1 tailed).
Source: own processing

Additionally, ROA shows a negative correlation with the combined ESG score at a significance level of 0.05, while the SOC and ENV scores are negatively correlated at a significance level of 0.01. Furthermore, a positive correlation at a significance level of 0.01 is established between ROA and the GOV score.

The Spearman correlation confirms the results obtained by the Pearson correlation with only one exception. A negative correlation was found, but at an insignificant level, between GOV and ROA, while in the Pearson correlation a positive correlation was identified.

Results

This research investigates the correlation between sustainability disclosure, represented by both combined ESG scores and individual ESG components, and the financial performance of companies operating within the energy industry. Analysis is carried out for the overall sample as well as for five distinct regions (Africa, Asia, Europe, North America and South America). By running multiple linear regression for each region, the study aims to explore the importance of the relationship between sustainability disclosure and financial performance. In particular, three regions, namely Asia, Europe and North America, reveal significant models with considerable sample sizes and notable F statistics. These findings emphasize the need of taking regional differences into account when studying the influence of sustainability reporting on financial performance in the energy industry.

Table 5 presents the impact of ESG factors and each environmental, social, and governance score individually both for the overall sample and for Asia, Europe, and North America. According to the findings of the regression analysis, our econometric model can account for a variation in return on Equity (ROE) ranging from 8.1% to 29.1%, after controlling for firm size (FZT), Number of Employees (FZE), and leverage (LV), both at the global level and within each specific region. Furthermore, the validity of our model is confirmed, as

evidenced by the statistical significance of the analysis of Variance (ANOVA) with a significance level of less than 0.05, except for the environmental and governance scores.

The findings obtained in Table 5 suggest at the same time a positive and a negative association between sustainability factors and financial performance as measured by ROE. Furthermore, we identify a negative impact of the disclosure of ESG factors on ROE at the level 0.01 for the sample in general and for Asia. For Europe and North America, the impact is not significant. Our results are contrary to those of Nguyen et al. (2022), Naeem and Cankaya (2022) and DasGupta (2022) who identified a significant positive influence at the level 0.01 of the ESG factors on ROE but similar with the results identified by Zhou et al. (2022), who identified a negative impact of ESG scores on ROE.

Table 5. The impact of sustainability disclosure on return on equity

Variable	Overall Sample		Asia		Europe		North America	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
(Constant)	-0.094	0.648	0.459	0.096	-0.695	0.077	-0.345	0.298
ESG	*-0.002***	0.007	*-0.004***	0.001	-0.003	0.069	0.000	0.816
FZT	*0.028***	0.007	0.002	0.899	*0.107***	0.000	0.012	0.435
FZE	*-0.027***	0.008	-0.015	0.176	*-0.131***	0.000	0.014	0.341
LV	*-0.360***	0.000	0.083	0.424	*-0.965***	0.000	-0.305	0.023
F	9.108		3.413		12.291		2.820	
Durbin-Watson	2.059		1.995		1.712		1.435	
Adjusted R Square	0.099		0.108		0.277		0.093	
Anova Sig.	<.001[b]		.013[b]		<.001[b]		.032[b]	
(Constant)	-0.152	0.469	0.083	0.758	-0.602	0.132	-0.317	0.336
ENV	-0.001	0.217	-0.001	0.220	-0.001	0.595	0.000	0.980
FZT	*0.027**	0.012	0.010	0.492	*0.095***	0.000	0.012	0.441
FZE	*-0.026***	0.010	-0.011	0.352	*-0.132***	0.000	0.015	0.349
LV	*-0.378***	0.000	-0.007	0.951	*-0.992***	0.000	*-0.305**	0.025
F	7.515		0.554		11.217		2.804	
Durbin-Watson	2.053		2.136		1.719		1.409	
Adjusted R Square	0.081		0.071		0.282		0.092	
Anova Sig.	<.001[b]		.697[b]		<.001[b]		.032[b]	
(Constant)	-0.070	0.742	0.531	0.082	-0.680	0.087	-0.203	0.559
SOC	*-0.001**	0.035	*-0.002***	0.003	-0.003	0.211	-0.001	0.447
FZT	*0.025**	0.019	-0.009	0.557	*0.104***	0.000	0.010	0.530
FZE	*-0.026***	0.010	-0.006	0.614	*-0.132***	0.000	0.016	0.283
LV	*-0.367***	0.000	0.011	0.911	*-0.969***	0.000	*-0.307**	0.022
F	8.327		2.540		11.668		2.975	
Durbin-Watson	2.032		2.136		1.698		1.351	
Adjusted R Square	0.090		0.071		0.266		0.100	
Anova Sig.	<.001[b]		.047[b]		<.001[b]		.025[b]	
(Constant)	-0.249	0.219	-0.035	0.889	-0.803	0.042	-0.267	0.382
GOV	*-0.001***	0.007	*-0.001**	0.039	*-0.002**	0.019	*0.002**	0.048
FZT	*0.033***	0.002	0.014	0.332	*0.110***	0.000	0.000	0.978
FZE	*-0.031***	0.003	-0.012	0.306	*-0.138***	0.000	0.025	0.106
LV	*-0.358***	0.000	-0.037	0.711	*-0.981***	0.000	*-0.348***	0.009
F	9.124		1.277		13.099		3.988	
Durbin-Watson	2.105		2.061		1.786		1.536	
Adjusted R Square	0.099		0.014		0.291		0.144	
Anova Sig.	<.001[b]		.286[b]		<.001[b]		.006[b]	

Notes: * significant at the 0.05 level **significant at the 0.01 level (1 tailed).
Source: own processing

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Environmental performance impacts in a negative way when we analyse by the regions, except for North America where we identify a positive nonsignificant impact, and the model is invalid for Asia. Our results are similar to those of El Khoury et al. (2022) who identify a negative and insignificant impact of environmental score on ROE.

The impact of social performance on ROE is negative at the 0.05 level for the overall sample and 0.01 for Asia, and negative and significant for Europe and North America. El Khoury et al. (2022) identified a negative and insignificant impact of the social score on ROE. Furthermore, we identify a positive and negative impact of the governance score on ROE. A negative and significant impact was identified for the overall sample (at level 0.01) and for Europe (at the level 0.05), while for North America the impact is significant and positive at level 0.05.

Table 6 presents the impact of the ESG scores and each specific environmental, social, and governance score for the total sample and our three included areas. The regression study demonstrates that when we account for FZT, FZE, and LV, the econometric model explains between 13.4% and 36.7% of the variation in ROA, both globally and by area. Furthermore, our model is valid for all regions included in the study (Anova sig. 0.05).

Table 6. The impact of sustainability disclosure on return on assets

Variable	Overall Sample		Asia		Europe		North America	
	Coef.	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**	**Coef.**	**Sig.**
(Constant)	-0.033	0.521	0.077	0.572	-0.180	0.013	-0.042	0.653
ESG	*-0.001***	0.000	*-0.002***	0.000	-0.001	0.061	0.000	0.578
FZT	*0.010***	0.000	0.013	0.054	*0.024***	0.000	0.002	0.672
FZE	*-0.008***	0.001	*-0.018**	0.001	*-0.027***	0.000	0.008	0.067
LV	*-0.120***	0.000	*-0.109**	0.038	*-0.198***	0.000	*-0.125***	0.001
F	18.808		8.309		16.376		5.153	
Durbin-Watson	1.900		2.064		2.284		1.627	
Adjusted R Square	0.200		0.268		0.365		0.190	
Anova Sig.	<.001[b]		<.001[b]		<.001[b]		.001[b]	
(Constant)	-0.044	0.399	-0.103	0.441	-0.151	0.039	-0.028	0.758
ENV	*-0.001***	0.003	-0.001	0.088	0.000	0.063	0.000	0.298
FZT	*0.010***	0.000	*0.017**	0.016	*0.022***	0.000	0.001	0.827
FZE	*-0.008***	0.002	*-0.017***	0.006	*-0.026***	0.000	*0.009**	0.043
LV	*-0.128***	0.000	*-0.146**	0.011	*-0.202***	0.000	*-0.131***	0.001
F	16.099		4.918		16.354		5.410	
Durbin-Watson	1.877		2.096		2.298		1.608	
Adjusted R Square	0.175		0.164		0.365		0.199	
Anova Sig.	<.001[b]		.001[b]		<.001[b]		<.001[b]	
(Constant)	-0.003	0.951	0.212	0.140	-0.182	0.012	-0.014	0.882
SOC	*-0.001***	0.000	*-0.002***	0.000	-0.001	0.051	0.000	0.307
FZT	*0.009***	0.001	0.004	0.518	*0.025***	0.000	0.001	0.838
FZE	*-0.008***	0.001	*-0.013**	0.015	*-0.027***	0.000	0.008	0.055
LV	*-0.122***	0.000	*-0.132***	0.006	*-0.198***	0.000	*-0.125***	0.001
F	19.617		10.325		16.501		5.396	
Durbin-Watson	1.846		2.098		2.283		1.596	
Adjusted R Square	0.207		0.318		0.367		0.199	
Anova Sig.	<.001[b]		<.001[b]		<.001[b]		<.001[b]	
(Constant)	-0.089	0.081	-0.174	0.184	-0.189	0.011	-0.046	0.596
GOV	*0.000**	0.039	0.000	0.607	0.000	0.196	0.001	0.093
FZT	*0.011***	0.000	*0.017**	0.019	*0.024***	0.000	-0.001	0.819
FZE	*-0.009***	0.000	*-0.015**	0.017	*-0.028***	0.000	*0.010**	0.023
LV	*-0.124***	0.000	*-0.183***	0.001	*-0.202***	0.000	*-0.135***	0.000
F	14.789		4.095		15.631		5.999	
Durbin-Watson	1.889		2.185		2.262		1.778	
Adjusted R Square	0.162		0.134		0.354		0.220	
Anova Sig.	<.001[b]		.005[b]		<.001[b]		<.001[b]	

Notes: * significant at the 0.05 level **significant at the 0.01 level (1 tailed).

Source: own processing

A significant negative impact was identified for ESG scores on ROA for the overall sample and for Asia at the level 0.01, while for Europe a negative and insignificant impact is identified. For North America, we identify a positive and insignificant impact. Carnini Pulino et al. (2022) identified a negative impact of ESG factors on ROA for the largest Italian listed companies and Naeem and Cankaya (2022) for companies operating in the energy and power generation sector. Giannopoulos et al. (2022) also identified a negative impact of the ESG score on ROA for Norwegian companies. Our results are in contrast to Kumar and Firoz (2022), who identify a positive and significant impact on ROA.

Environmental performance has a negative and significant impact on ROA for the overall sample at level 0.01. By region, the impact is insignificant and negative for Asia, but positive for Europe and North America. The results are in accordance with Carnini Pulino et al. (2022), but contrary to Almeyda and Darmansya (2019).

In addition, the social score has a negative significant impact on ROA for the overall sample and Asia at the level 0.01. A negative, but insignificant, impact was identified for Europe, while for North America, the impact is positive but insignificant. These findings are similar to those of Almeyda and Darmansya (2019) for Europe. On the other hand, Gholami et al. (2022) infirms our results, as they find a significant positive and significant impact of social score on ROA for Australian nonfinancial companies. The governance score has a significant positive influence on ROA for the overall sample only. This is consistent with Gholami et al. (2022) and Kim and Li (2021).

Discussion of the findings

In their venture to attract new investors, companies are also focussing on ESG activities and disclose information about environmental, social, and governance activities in their reports. For investors, this information can be used for their future investment decisions. This study aims to outline how ESG disclosure affects the financial performance of companies in the energy sector.

This research adopts a quantitative approach, employing a multiple linear regression analysis to investigate the relationship between sustainability disclosure and financial performance. The study uses four sustainability disclosure variables, namely the combined ESG score, environmental score, social score, and governance score, all measured on a scale ranging from 0 to 100. Financial performance is assessed using two accounting-based indicators, Return on Equity (ROE) and Return on Assets (ROA). The econometric model is controlled by three variables: two indicators of firm size and leverage. We choose our variables based on the prior literature: Giannopoulos et al. (2022), Batae et al. (2020), Batae et al. (2021), DasGupta (2022), or Lee and Isa (2022). To analyse the impact of sustainability disclosure on financial performance, we choose the companies included in the Top 100 Global Energy Leaders, by Thomson Reuters (2017). Moreover, we develop one main hypothesis and three secondary hypotheses to analyse this impact, both globally (the sample overall) and per region (Asia, Europa, and North America).

The impact of the ESG score on the financial performance of companies in the energy industry is negative and significant, therefore, our main hypothesis H1 is accepted, our results being in line with those of Zhou et al. (2022) and Carnini Pulino et al. (2022) who identified a significant impact of ESG scores on financial performance. Furthermore, Hypothesis H2, on the impact of environmental performance on financial performance, is partially accepted. We identify a negative and significant impact for ROA, whereas for ROE the impact is negative and insignificant. The results are in agreement with Carnini Pulino et al. (2022) who also identified a negative impact of ENV scores on financial performance and El Khoury et al. (2022) who identify a negative and insignificant impact of environmental score on ROE and Mititean and Sărmaș (2023) who found an insignificant impact of ENV score on ROE. Social performance negatively affects financial performance,

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both for ROA and ROE, at the level 0.05 and 0.01, thus hypothesis H3 is accepted. El Khoury et al. (2023) identified a negative and insignificant impact of the social score on ROE. The governance score has a negative and significant impact on ROE at the level 0.01 while on ROA the impact is significant and positive at the level 0.05. Thus, hypothesis H4 is accepted. Analysing by regions, for Asia a negative and significant impact was identified for ESG, SOC, and GOV on ROE and a negative significant impact was identified for ESG and SOC on ROA. For Europe and North America, a significant impact was identified for the governance score (negative for Europe and positive for North America). These results are partially confirmed by Alareeni and Hamdan (2020), who identified a negative and significant relationship between governance score and ROE.

Conclusions

Our paper has several contributions to the literature. The study's key contribution to the literature is the presenting of arguments concerning the relationship between sustainability disclosure and company performance. These reasons are backed by the methodology utilized and the variables included in the study, particularly three distinct dependent variables that strengthen the robustness of the conclusions produced regarding the investigated relationship. Furthermore, the obtained relationships, both good and negative, have the role of pushing the firms' management to implement policies relating to more responsible ESG strategies and to aid the company's profitability through the adopted policies, thereby attracting capital and new investors. Secondly, this research presents information for investors, with the disclosure of ESG factors becoming more and more considered when establishing strategies for future investment. Third, this research fills the gap among studies on this relationship in the energy sector.

Due its positive contribution to the literature and to the managerial implications, the papers have some limitations. First, only one industry is analysed, and the number of observations is limited to four years. Future research can include more industries separately or consider a longer period to increase the number of observations. Second, we relied only on accounting-based measurements for financial performance. Future studies could include other variables to analyse the impact on financial performance, such as Return on Sales or Tobin's Q ratio.

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