

THE TRADE-OFF BETWEEN ESG COMMITMENT AND OPERATIONAL PERFORMANCE: AN ANALYSIS OF CORPORATE COMPANIES IN THE IBERO-MAGHREBI CONTEXT AMIDST CLIMATE CHANGE

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Abstract. The present study investigates the hypothesis that greater efforts in ESG are associated with a deterioration in the operational performance of listed companies in the Ibero-Maghrebi context. The analysis provides a measure of knowledge, from the perspective of trade-off theory, of how environmental, social and governance (ESG) commitment can influence operating behaviour. The objective of this study is to achieve this through an analysis of economic-financial ratios, such as return on assets (ROA) and return on equity (ROE). The sample is derived from a study of 460 firm-year observations of listed companies in Spain and Morocco. The time horizon under scrutiny in this study extends from 2018 to 2022, encompassing the repercussions of the pandemic crisis. Contrary to the findings of previous studies, the present research suggests that companies in the Ibero-Maghrebi context do not typically demonstrate a correlation between increased effort in ESG initiatives and probable deterioration in operating performance. This evidence suggests that the relationship between operating performance and compensatory theory is more complex than previously theorised. Moreover, the findings of this study demonstrate that a greater effort on the part of the companies in this sample for better management of intensive water use translates into better operational performance. In view of the global climate change, companies must consider the environmental implications of investment decisions.

Keywords: industrialized and emerging countries, climate change, ESG, water, operating performance, listed firms, COVID impact.

JEL Classification: G31, M14, Q54, L25, F63.

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1. Introduction

For many companies nowadays, deciding how to invest in their growth is a very important decision. In the context of the fight against climate change, studying the decisions made by companies to orientate part of their resources towards sustainability investment is necessary. The present study investigates the impact of a great effort decision-making on operational performance in two Mediterranean countries, namely Spain (a European nation) and Morocco (a North African state). The regulations in Spain and Morocco relating to investment in sustainability aim to encourage companies in the Ibero-Maghreb region to adopt ESG standards to identify, reduce, eliminate and control the negative impact of their operations,

thus complying with the sustainability regulations established for their business activities. The World Bank classifies Spain among the high-income countries and Morocco among the lower-middle-income countries (World Bank, 2023).

This study contributes to knowledge, from the perspective of environmental factors, how a greater effort in ESG initiatives can influence operational behaviour through an analysis of the ROA and ROE ratios of corporate companies in the Ibero-Maghreb context between the study period from 2018 to 2022. A positive correlation between ESG metric performance and financial performance of organizations has been suggested by previous studies (Amel-Zadeh & Serafeim, 2018; Wong et al., 2021), among others.

In contrast, other authors argument that adopt decisions in ESG its probably has a negative impact on financial performance, particularly asset performance, which is consistent with compensation theory, according to which ESG practices supposed to reduce companies' profitability. In this way, Amarna et al. (2024) suggest that a higher volume of ESG actions may be perceived as counterproductive to short-term profitability. Sun et al. (2024) shows that this trade-off determines the optimal level of ESG investment for a firm. Their model suggests that social preferences regarding's ESG (firm, size, and initial ESG ratings levels) are among others a firm's optimal ESG investment decisions. Consequently, companies must determine an optimal level of ESG investment to reduce the impact related to operational behaviour. Given the current controversy and previous empirical evidence, in this study we ask the following question: To what extent does a greater commitment to ESG initiatives lead to a decrease in companies' operational performance?

Another relevant issue studied in this academic paper derived from increased ESG focus refers to the impact of companies' activities due to their intensive use of water as a significant factor that could negatively affect medium-term profitability in the Iberian-Maghreb region, in a context where climate change is evident due to the trend towards reduced rainfall, as stated in the United Nations World Water Development Report 2023 (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2023).

For this study, the sample will consist of companies listed on the stock exchange in this geographical area. This research covers the period from 2018 to 2022, including 2020 with the COVID-19 pandemic. Thus, previous scientific studies, such as that by Huayu et al. (2020), consider it relevant to examine the impact of COVID-19 on corporate performance. Also, several extant studies have investigated other type of the connection as between the novel Coronavirus (SARS-CoV-2) and oil price (see Gil-Alana & Monge, 2020; Phan & Narayan, 2020), the impact on exchange rates (Ilyke, 2021), and the effect on the US partisan conflict index (N. Apergis & E. Apergis, 2020). Therefore, studying the impact of the pandemic on operational behaviour is an area of interest for the scientific community and the business world.

Regarding the methodology employed, Ordinary Least Squares (OLS) regression with the structure of panel data is utilized, thus enabling the study of operational performance from the point of view of ESG initiatives issues. We would like to highlight the relevance of studies by Elsayed and Paton (2005), Koundouri et al. (2022), Khalil et al. (2024), Bilyay-Erdogan et al. (2023). These authors have focused mainly on different economies, particularly in European countries, Asian countries and on the United States of America.

The methodology used varied in previous studies; in some cases, estimates were made using panel data, as indicated in Elsayed and Paton (2005) and Khalil et al. (2024) have used statistical regression estimations using panel data. Jiang et al. (2025) use this methodology for study the nexus between corporate ESG discord and corporate debt duration.

Moreover, other authors employ Machine Learning (ML) methodology as Gupta et al. (2021) shows that adopting better sustainability was associated with higher ROAs and ROEs. Also, Martin-Melero et al. (2025) use Machine Learning as methodology for making simulations: one composed of the financial data of the funds and the other formed by the involvement of those funds in specific ESG-controversial sectors. As can be seen, there is some diversity in the methodology used to estimate in this area.

The present study makes the following relevant contributions: Firstly, the findings of this research suggest that ESG initiatives on the part of listed companies exert a favorable influence on operating performance, in consideration of both corporate size and geographical location. In addition, the contribution of the leverage variable to the operational performance of the entire sample is evidently negative. This study posits that an elevated leverage level is not conducive to making better profitability within the study horizon.

Secondly, despite a strong focus on ESG initiatives, the combined indicator remained non-significant. This lack of significance, in conjunction with the negligible impact of the ENV and RES variables, provides a paucity of empirical evidence to support trade-off theory in this context.

Thirdly, the findings suggest that a significant focus on ESG initiatives pertaining to intensive water usage in the shows elicits a favourable response, which is statistically significant for ROA. Evidence suggests that the implementation of commitment ESG initiatives is conducive to enhancing water utilisation by companies in the entire sample. These initiatives exert a favourable influence on operational performance, specifically about the variable in question. The findings of this study are in alignment with the recommendations set out in the UNESCO (2023) report.

Fourthly, given the temporal extent of the present research study, which includes the pandemic period, it has been demonstrated that greater effort in ESG does not mitigate the variable COVID. It is evident that there is a negative association between COVID and the operational performance of the companies constituting the sample, particularly return on assets (ROA). However, the evidence obtained suggests that a greater effort directed towards enhancing water utilization by companies in the entire sample results in favorable operational performance. Our results show that an increased commitment to ESG (water) initiatives enhances corporate resilience in the face of shocks like the COVID-19 pandemic.

In summary, we believe this research adds new evidence to the scientific literature on the relationship between industrialized countries and economies in transition in an area where the fight against climate change is so relevant: the Ibero-Maghrebi context.

The paper proceeds as follows. In Section 1, we offer an introduction and overview of the relevant literature; in Section 2, Hypotheses to be formulated. Sections 3, we describe the data and methodology used in this study. Section 4 presents the results of our analysis. Finally, the discussion and conclusions.

2. Is greater effort in ESG initiatives associated with a deterioration in the company's operating performance?

Literature review and Hypotheses

Nowadays, climate change represents one of the most significant challenges to global sustainability and impacts not only natural ecosystems but also the socioeconomic. In this context, companies' sustainable and operational behaviour plays a relevant role in mitigating and adapting to these changes. It is therefore important to study sustainable behaviour and commitment in countries with different levels of economic development and regulatory environments (Porter & Kramer, 2006).

The 2004 report of United Nations "Who Cares Wins: One Year On" (International Finance Corporation, United Nations, 2024) have emphasised the importance of incorporating ESG considerations into investment decisions. ESG has evolved into a fundamental framework for promote sustainable within corporations (Rezaee, 2016).

In this vein, the role of sustainability companies is significant for two reasons: first, because of the environmental impact of their economic activities; second, because of their ability to innovate, adapt their processes, and lead the change in corporate philosophy towards more sustainable practices, as pointed out by Schaltegger and Wagner (2011).

There is a wide range of evidence relating to the environmental, social and governance (ESG) issues. Amarna et al. (2024) suggest that transparency in the dissemination of ESG information and a realistic management of gains may significantly reduce financing costs. This study is complemented by Bilyay-Erdogan et al. (2023), who establish a direct relationship between ESG performance and a higher distribution of dividends, indicating direct benefits for shareholders. Elsayed and Paton (2005) and Hassel et al. (2005) evidence that a solid environmental performance improves the company's global performance and is appreciated by investors. Another question is research by Moneva and Cuellar (2009) discuss the significance of the value of reporting not only financial information, but also environmental information, which positively affects the companies' market valuation. Hu et al. (2023) study the effect of ESG performance on share price and establish that a good ESG performance contributes to a lower correlation between share price and the general market, which allows investors to base their investment decisions on more specific information that is less likely to global market shifts that may influence their decisions.

The selection of Spain and Morocco for the purposes of comparative analysis is substantiated by different relevant factors. Primarily, both nations are confronted with considerable environmental challenges arising from climate change, most notably water scarcity and rising temperatures. Secondly, despite the geographical similarities and economic ties between the two countries, there are several notable differences between Spain and Morocco, including economic development, industrial structure, and government practices related to climate change and corporate sustainability. This diversity offers an interesting line of research, allowing for analysis of the potential influence of ESG commitment on operational performance. Furthermore, this study contributes to expanding previous evidence on how efforts towards better water-intensive use can reduce the impact of COVID-19 among companies in developing and developed countries, with a particular focus on Mediterranean countries. Schaltegger

and Wagner (2011) examine the differences between industrialised and emerging contexts in the adoption of sustainable practices.

Spain and Morocco, two countries that, although geographically affected by a common problem such as climate change, present significant differences in terms of economic development, environmental policies and business culture. Spain, as a member of the European Union, has implemented a series of measures and policies to foster sustainability as per the European Green Deal (European Commission, 2019). On the other hand, Morocco, as an emerging economy, has made considerable efforts to position itself as leader in renewable energies in North Africa (Daumas, 2009).

The study of ESG scores is relevant practice because it's a non-financial indicator to measure environmental, social and governance practices. Thus, previous research indicates that companies with high ESG scores tend to have a better financial return, as per Khan et al. (2016). Khalil et al. (2024) and Koundouri et al. (2022) analyse how companies' ESG investment not only increases companies' value but also boosts their financial performance in both European and Asian markets. Clarkson et al. (2011) show a positive relationship between environmental return and financial return in the US market. Lastly, another relevant matter addressed in this study is the impact of companies' sustainable behaviour regarding water recycling. Simionescu et al. (2020) shows the impact of water management on companies' profitability. In Morocco, Tekken and Kropp (2015) identify the main problems and pressures related to the critical water situation in the region.

However, previous studies analyse about integrating environmental (E), social (S) and governance (G) criteria requires significant investment which, in the short term and with persistent effects in the medium term (up to 5 years), acts as an initial investment that leads to a deterioration in return on assets (ROA) and return on equity (ROE). Thus, a higher volume of ESG actions may be perceived as counterproductive to short-term profitability,

This article seeks to shed light on the question of whether the increase in the adoption of ESG initiatives has, from an operational point of view, an unproductive effect during the study period. Some authors as Sun et al. (2024) observe that if the cost of adjusting ESG practices are too high, firms may choose not to invest in ESG as the optimal solution. Their model further suggests that social preferences regarding ESG, firm size, and initial ESG rating levels are key factors in determining a firm's optimal ESG investment decisions. In this line, Han and Le Ha (2024) study Asian emerging markets for listed traded non-financial companies. These authors shows that ESG practices have a negative impact on financial metrics for a company, such as return on equity and return on assets. This finding is consistent with the trade-off theory, which holds that investing in ESG practices can result in higher expenses and lower profitability.

This approach is relevant because the tangible benefits of social or environmental responsibility are often offset or negated by short- and medium-term investment, which puts downward pressure on profits. This effect occurs in several countries, as demonstrated in their research study, Géczy et al. (2007) and Margolis and Walsh (2003) who examined this relationship in the US market. Renouard (2011) focused on the European market, and Friede et al. (2015) analysed it in a global context.

Previous scientific studies, such as those suggest that environmental investment correlates negatively with ROA in the short term. Thus, ROA is compromised because environmental investment can have a double negative effect: on the one hand, it increases the volume of assets; and on the other hand, it increases operating expenses such as depreciation and maintenance. The review conducted by Margolis and Walsh (2003) at the USA market reinforces the short-term trade-off hypothesis, pointing to downward pressure on financial indicators due to initial ESG expenditures. In these lines, Alareeni and Hamdan (2020), showed that ESG disclosure positively affects a firms' performance measures. However, measuring ESG sub-components separately showed that environmental (ENV) and corporate social responsibility (CSR) disclosure is negatively associated with ROA and ROE. The study sample covers US S&P 500-listed companies during the period 2009 to 2018. Panel regression analysis was used to examine the study hypotheses and achieve the study aims.

Another relevant question it is water consumption in business activities in the study area, where water resources are limited due to low rainfall. Specifically, intensive water use is a significant factor that negatively affects medium-term profitability in the Ibero-Maghreb context. The chapter in question from the United Nations World Water Development Report 2023 is as follows: In Chapter 5, the industry explicitly states that: "Industrial sectors, are significant consumers of water, primarily due to the consumption associated with processes. These activities contribute to high water demand and pose challenges for sustainable water management." This chapter conducts an analysis of the way industry are characterised by water intensity, establishing a correlation with Environmental, Social and Governance (ESG) risks, including water scarcity and regulatory expenditures. The report under discussion highlights that the water footprint of these sectors is significant, especially when considering the entire chain (agricultural production + industrial processing). The report recommends the optimisation of processes, the reutilisation of water, and the adoption of more efficient technologies with a view to reducing consumption in United Nations Educational, Scientific and Cultural Organization (UNESCO, 2023). This study examined the impact of companies in the construction and food sectors with an intensive water use. These companies were selected for the study because they represent a significant proportion of firms in both countries of the sample and because of their substantial water consumption.

The present study aims to measure the impact of a greater effort in ESG scores on listed companies in the context of climate change. Morocco is a significant case in recent studies on sustainability and social corporate responsibility, particularly in the context of renewable energy and the adoption of Corporate Social Responsibility (CSR). Ahmad and Mokhchey (2023) explore how these responsibilities and investments are boosting the green bonds market in Morocco, highlighting the participation in renewable energy projects that do not only promote economic development but also environmental protection. Demonstrating a correlation between corporate resilience and the adoption of sustainable practices, Harabida et al. (2022, 2023) examine the efficiency of ESG indices in Morocco and how companies with strong ESG practices can better manage financial crises.

In this context, this study must examine the impact of COVID-19 on the operational behaviour of the companies in the sample, given that official data show that economic activity in Spain and Morocco fell by 10.94% and 7.17%, respectively, in terms of gross domestic product variation in 2020, within our study horizon (World Bank, 2025).

Previous studies provide evidence of the impact of COVID-19 on business activity. Therefore, Ouchchikh et al. (2024) analyse how commitment to Corporate Social Responsibility may improve Moroccan companies' resilience in the face of a crisis such as the COVID-19 pandemic, suggesting that these policies do not only benefit the environment and society, but also contribute to companies' financial stability during uncertain times. These studies' results show that the adoption of sustainable practices by companies generates a positive impact on the integration of ESG criteria in entrepreneurial operations. Janah and Sassi (2022) and Kahcha et al. (2023) establish that ESG corporate practices improved the companies' financial and environmental resilience during the COVID-19 pandemic. The companies with strong ESG strategies showed a greater capacity for mitigating negative impacts and ensure their operational continuity during periods of economic uncertainty.

3. Hypotheses

We present the hypotheses formulated following the introduction and the review of the literature:

The initial hypothesis establishes that the relationship between company size, leverage, and the profitability behaviour of companies is the subject of study. It has been shown that company size influences sustainable behaviour and profitability. Choi et al. (2024) empirical evidence is provided financial companies listed on the role of ESG criteria in stability and sustainability, with a focus on emerging markets. As Fan et al. (2017) and Clarkson et al. (2011) argue, larger companies have greater environmental investment capacity than smaller ones, which translates into higher profitability. On the one hand, Elsayed and Paton (2005) postulate that the leverage variable does not provide substantial evidence on ROA and ROS. Moreover, Ali et al. (2021) shows that country status of developing or developed country is significant with ROA.

H1: *In the context of listed companies in the Ibero-Maghreb region, the size of the companies in the sample has been found to exert a positive effect on operating performance, and a negative effect when the variable leverage is taken into consideration.*

The second hypothesis is associated with trade-off theory, which support the notion that a greater ESG score may exert a potential influence on operational performance. In circumstances where a high volume of ESG actions is perceived as counterproductive to operating performance, it is advisable for firms to exercise caution. Previous scientific studies suggested that environmental investment are correlated negatively with profitability. In the study conducted by Han and Le Ha (2024), it is proposed that the adoption of ESG practices has a detrimental effect on the financial performance of a listed company, as evidenced by a decline in return on assets and return on equity. Amarna et al. (2024) shows that a greater volume of ESG actions may be perceived as detrimental to profitability. In this way, Sun et al. (2024) contend that trade-offs determine the optimal level of ESG investment for a firm. It has been demonstrated that investment in Environmental, Social and Governance (ESG) practices can result in increased expenses and diminished profitability. Thus, the following hypothesis arises:

H2: *In the Ibero-Maghrebi context, greater score in Environmental, Social and Governance (ESG) initiatives is associated with a potential decline in listed companies' operational performance.*

Regarding the next hypothesis about the scarcity of water resources in the study area, a consequence of the low rainfall levels that characterise the region, is a significant problem. It has been observed that intensive water use is a significant factor that has a negative effect on the medium-term profitability of companies in the Ibero-Maghreb context. Ali et al. (2021) suggest that all data, including the resource reduction policy, the water efficiency policy and the water efficiency target, indicated that companies have understood the importance of water-related information. As stated in the United Nations World Water Development Report 2023, the increase in water demand from business activities poses significant challenges for the effective management of this precious resource for sustainable development. The water footprint of these sectors is significant for process optimisation, water reuse and the adoption of more efficient technologies to reduce consumption (UNESCO, 2023). Thus, another relevant matter addressed in this study is the impact of companies' sustainable behaviour regarding water recycling. Simionescu et al. (2020) shows the impact of water management on companies' profitability. These authors show with the coefficients of total water use revealed a positive and statistically significant impact only on ROA. Fu and Jacobs (2022) shows for operationally efficient firms, increasing water efficiency increases profit and reduces risk. Tekken and Kropp (2015) identify the main problems and pressures related to the critical water situation in Morocco. Based on the above, the following hypotheses are proposed:

H3: *Increased commitment to water sustainability exerts a favourable influence on operational performance of the company.*

In pandemic context, companies with robust ESG strategies demonstrated greater resilience in mitigating negative impacts and ensuring operational continuity during periods of economic uncertainty. On the one hand, Ouchchikh et al. (2024) suggesting that investment in ESG contributes to companies' financial stability during uncertain times. Janah and Sassi (2022) and Kahcha et al. (2023) establish that ESG corporate practices improved companies' financial and environmental resilience during the pandemic. Harabida et al. (2022, 2023) shows how companies in Morocco with strong ESG practices can better manage financial crises. Against previous literature some authors establish that association between pandemic and firm performance is negative. Thus, Huayu et al. (2020) shows in emerging markets that COVID-19 has a negative impact on firm performance. The last hypothesis we formulated in this study is the following:

H4: *Increased commitment to ESG (water) initiatives enhances corporate resilience in the face of shocks like the COVID-19 pandemic.*

4. Research design: sample and methodology

This section introduces the research design corresponding to the obtention of the sample from the databases consulted and the methodology employed.

4.1. Description of the sample characteristics

Our initial sample corresponds to 320 listed companies in the Refinitiv Eikon database from 2018 to 2022. In Spain, these companies are listed in the continuous market index, which

is managed by the holding company Bolsas y Mercados Españoles (BME). In Morocco, they are listed on the Moroccan All Shares Index (MASI), which reflects the performance of all companies listed on the Casablanca Stock Exchange.

The economic-financing information necessary for this research comes from the ORBIS database, following Hu et al. (2023) and Miralles et al. (2017), among others.

Regarding the sample selection process, it should be noted that Financing and Insurance companies are excluded¹, as are the companies that do not offer complete financing data or an adequate score. The exclusion of financial institutions is due to accounting and, in general, industry peculiarities (Anastasiou et al., 2022). In addition, the sample shows a high level of dispersion of industrial activity. The initial sample consists of 320 companies, from which 20 companies are eliminated for being financial institutions and insurance companies and 208 companies for being companies without a score. Table 1 presents the results for a sample of 92 companies that are representative of their respective stock market index. The companies are distributed between 59 Spanish and 33 Moroccan companies, providing a study of the scoring indices.

Table 1. Sample selection process

	Spain	Morocco	Observations
<i>Initial sample</i>	245	75	320
<i>Less:</i>			
Financial institutions and insurance companies	(8)	(12)	(20)
Companies without a score	(178)	(30)	(208)
<i>Final sample</i>	59	33	92

The subsequent presentation in the Table 2 offers a detailed analysis of the distribution of the sample by sector, number of companies and geographical, with a focus on Spain and Morocco based on Industry Thomson Reuters Business Classification (TRBC) (Thomson Reuters, n.d.). Regarding this classification analysis, the following sectors stand out with the number of companies in percentage: Construction & Engineering (10.87%), Electric Utilities & IPPs (6.52%), Freight & Logistics Services (6.52%), Professional & Commercial Services (6.52%), Metals & Mining (5.43%), Pharmaceuticals (5.43%), Real Estate Operations (5.43%), Specialty Retailers (5.43%), Food & Beverages (4.35%), Hotels & Entertainment Services (4.35%), Machinery, Tools, Heavy Vehicles, Trains & Ships (4.35%), Media & Publishing (3.26%) and the rest of the sectors are below 3%.

¹ We apply this criterion as seen in Hassel et al. (2005), Moneva and Cuellar (2009), La Rosa et al. (2018) and Martínez-Ferrero et al. (2016).

Table 2. Distribution of the sample by sector, firms and country

Sector	Number of firms by sector	Spain	Morocco
Automobiles & Auto Parts	2	2	
Biotechnology & Medical Research	1	1	
Chemicals	2	1	1
Construction & Engineering	10	7	3
Construction Materials	2		2
Containers & Packaging	1	1	
Diversified Industrial Goods Wholesale	1		1
Electric Utilities & IPPs	6	5	1
Food & Drug Retailing	2	1	1
Food & Beverages	4	1	3
Freight & Logistics Services	6	4	2
Healthcare Providers & Services	1		1
Hotels & Entertainment Services	4	3	1
Investment Banking & Investment Services	1	1	
Leisure Products	1	1	
Machinery, Tools, Heavy Vehicles, Trains & Ships	4	3	1
Media & Publishing	3	2	1
Metals & Mining	5	2	3
Natural Gas Utilities	2	1	1
Oil & Gas	2	1	1
Oil & Gas Related Equipment and Services	1	1	
Paper & Forest Products	2	2	
Pharmaceuticals	5	4	1
Professional & Commercial Services	6	5	1
Real Estate Operations	5	4	1
Renewable Energy	1	1	
Software & IT Services	2	2	
Specialty Retailers	5		5
Telecommunications Services	2	1	1
Textiles & Apparel	1	1	
Transport Infrastructure	2	1	1
Total	92	59	33

Notes: elaboration based on Industry Thomson Reuters Business Classification. Number of companies from each of the sectors by country.

4.2. Methodology

Next, in Section 4.2.1, we present the methodology for the study of the multivariate model.

4.2.1. Estimation of economic-financial ratios to measure the operational behaviour of Spanish vs Moroccan companies

Based on prior literature (Hong, 2019; Hu et al., 2021; Wang et al., 2022; Xing et al., 2021), this paper controls for a series of factors that may affect the operational performance of enterprises, including among others, enterprise size (Size), return on assets (ROA), return on equity (ROE) and asset-liability ratio (Leverage).

The estimation of the ESG indicator is a clear standard to promote corporate sustainability. Hu et al. (2023) and Serrano et al. (2025) indicate that ESG performance is a type of non-financial information that reflects the company's situation. ESG score is a quantitative measure that indicates the degree of transparency and scope in reporting ESG data. The empirical indicators we used to measure operational behaviour are shown in Table 3. As a result of the well-known asymmetry of economic-financial ratios, and as previous evidence indicates, we calculate the data for each variable of Spanish and Moroccan companies: the ESG score indicator, the *Environmental Pillar Score* and the *Resource Use Score* by the serious problem of water scarcity in both countries. Specific, we estimate the ESG, ENV, RES by country and ESG, ENV, RES by water-intensive companies. These scores quantify company performance in terms of ESG issues. Furthermore, we consider the indicators that allow us to calculate the leverage (LEV), size (SIZE), Country, COVID and Activity.

The next table introduces all the variables used in the four models and their definition description.

Table 4 presents, in panels A and B, the data corresponding to the sample made up of 92 companies listed on the Morocco and Spanish stock exchanges for the period 2018–2022. This table includes the economic-financial variables, such as total assets. According to our research, the ESG rating is assessed, including Environmental Pillar and Resource Use scores.

If we consider the total assets variable, both countries show an upward trend. This high growth rate in Morocco could indicate an emerging investment context, in contrast to the Spanish market, which is characterised by consolidation and economic maturity. In Spain, the negative impact of the pandemic in 2020 is significant, with a fall in total assets in Spain and a more moderate decline in Morocco.

Spain has registered an increase in ESG Rating more than Morocco between 2018 and 2022, showing an effective and conscious integration of responsibilities regarding social and environmental governance within the companies' corporate structures. The ESG rating and environmental pillar score declined significantly in Morocco during 2020, a year marked by COVID-19, while Spain's results were more moderate. In addition, the water use score in Spain and Morocco increased significantly during every year of the study period. This implies that both countries are aware of the problem of climate change resulting from low rainfall. Therefore, there is an upward trend in investment for better water use by companies.

Table 3. Description of the variables

Variables	Symbols	Calculation	Source	Model
<i>Dependent variable</i>				
Profitability	ROA	Return on assets = profit before tax divided by total assets.	Orbis	Model 1, 2, 3
Profitability	ROE	Return on Equity = net profit divided by own resources	Orbis	Model 4, 5, 6
<i>Independent variable</i>				
ESG general	ESG Score	(Environmental, Social, and Governance Rating) is a metric employed to assess the performance of a company in environmental aspects, social responsibility, and corporate governance. From 0 to 1.	Refinitiv Eikon Database	
Environmental Pillar Score	ENV	Environmental Pillar Score measures the management and exposure of the index components to the main environmental risks and opportunities. Scores go from 10 (best) to 0 (worst). Weighted average environmental score of the benchmark index. From 0 to 1.	Refinitiv Eikon Database	
Resource Use Score	RES	This metric reflects performance and the company's capacity for reducing the use of materials, energy or water, and for finding more eco-efficient solutions, thus improving the management of the supply chain. From 0 to 1.	Refinitiv Eikon Database	
ESG, ENV, RES by country	ESGCOUNTRY ENVCOUNTRY RESCOUNTRY	The impact of ESG, ENV and RES factors is measured by multiplying the dummy variable by corresponding scores.	Refinitiv Eikon Database	
WI	Water-intensive companies	Dummy variable equal to 1 for water-intensive companies and 0 for rest companies.	World Water Development Report	
ESG, ENV, RES by water-intensive companies	WATERINTEN.ESG WATERINTEN.ENV WATERINTEN.RES	The impact of ESG, ENV and RES factors is measured by multiplying the dummy variable by corresponding scores.	Refinitiv Eikon Database	
ESG by COVID	ESGCOVID	The impact of ESG factors is measured by multiplying the dummy variable by ESG score.	Refinitiv Eikon Database	
<i>Control variables</i>				
Size	SIZE	Natural logarithm of total assets	Orbis	
Leverage	LEV	Leverage over total assets = Total debt/ Total assets	Orbis	
Country	COUNTRY	Dummy variable equal to 1 for Morocco and 0 for Spain.	Refinitiv Eikon Database	
COVID	COVID	Dummy variable equal to 1 for the year 2020 when COVID was reported and 0 for the rest of the years.	Refinitiv Eikon Database	
Activity	ACTIVITY	Classification activities.	Thomson Reuters	

Note: elaboration based on Guillem (2022), Refinitiv Eikon database and Thomson Reuters Business Classification.

Table 4. Data on listed companies in Spain and Morocco

YEAR	2018	2019	2020	2021	2022
PANEL A MOROCCO					
Number of companies	33	33	33	33	33
Total assets (thousands of euros)	21,230,252.25	22,972,347.2	23,127,397.36	25,094,202.98	26,768,753.07
ESG Rating (%)	25.46	26.13	22.81	34.03	37.98
Environmental Pillar Score (%)	10.84	10.62	9.73	21.05	28.82
Resource Use Score (%)	10.32	10.57	15.67	21.07	25.48
PANEL B SPAIN					
Number of companies	59	59	59	59	59
Total assets (thousands of euros)	351,615,623	359,276,931	306,253,442	335,927,703	439,768,250
ESG Rating (%)	59.25	61.52	65.06	66.00	68.26
Environmental Pillar Score (%)	55.35	59.24	64.30	67.70	69.20
Resource Use Score (%)	61.28	64.12	70.90	73.75	75.63

Note: elaboration based in Refinitiv Eikon.

Figure 1 shows greater investment in ESG scores in Morocco throughout the time series under study. Investment in the Environmental Pillar Score and Resource Use Score was similar in 2018 and 2019, increasing more significantly from 2020 onwards.

Spain's ESG scores show a similar increase, but a much greater investment in the resource use score is clear to optimise companies' intensive water use over time (Figure 2).

4.2.2. Regression analysis of panel data structure. Estimations of the sustainability index oriented towards Spanish vs Moroccan companies

We employed Ordinary Least Squares (OLS) because it is the best-known regression technique. It is also a starting point for all spatial regression analyses. Provides a global model of the variable or process you are trying to understand or predict; Create a simple regression equation to represent that process. In this manner, as previously outlined, we analyse the relationship between ESG Commitment of a firm and its operational behaviour. The operational performance is approximated by the return on assets (ROA) and return on equity (ROE). In this study, we use control variables that have been included in the previous literature such as leverage (LEV), size (SIZE), Country, COVID and Activity. The control variables are selected following previous research that measures the effect of company size on profitability, starting with the seminal work of Simon (1962), who shows a positive relationship between company size and profitability. Furthermore, the studies by Elsayed and Paton (2005), Khalil et al. (2024) and Bilyay-Erdogan et al. (2023) offer scientific evidence of the impact of ESG on the variables that study operational behaviour of a company and allow us to design our regression model. In line with similar studies, we introduced relevant financial variables: ROA and ROE, as per previous research (Latorre Guillem, 2020; Flammer, 2021; Koundouri et al., 2022; Guillem, 2022; Hu et al., 2023; García et al., 2023; Amarna et al., 2024).

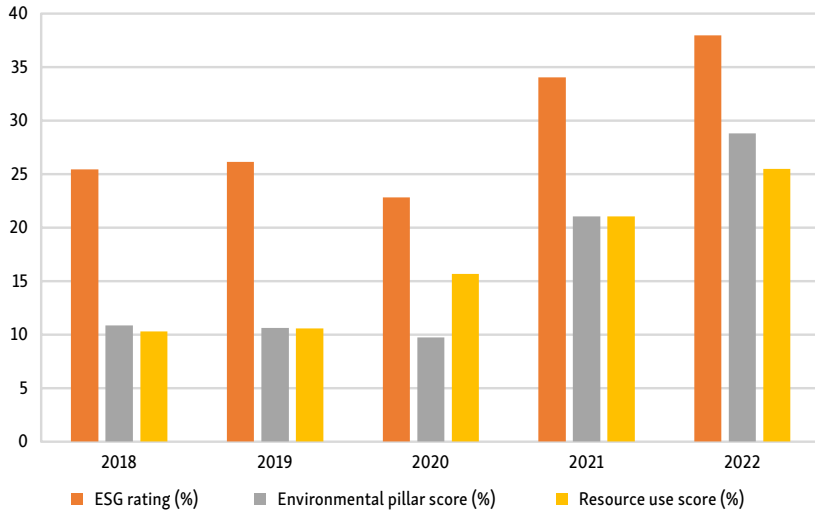


Figure 1. ESG scores for Morocco

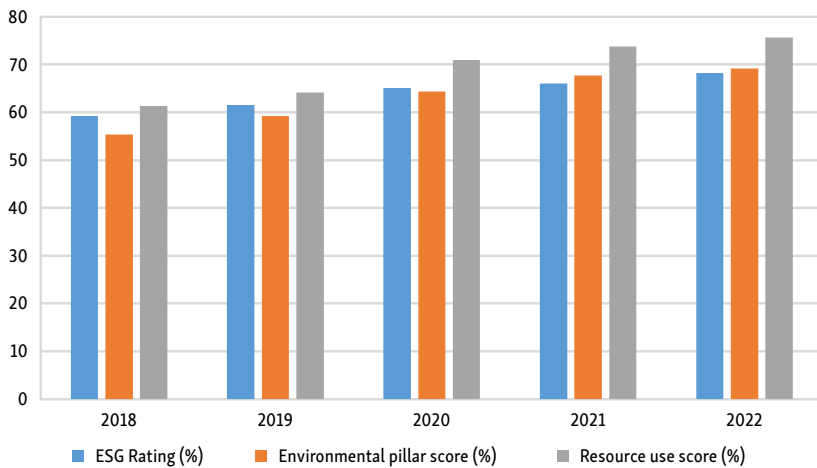


Figure 2. ESG scores for Spain

Specifically, the results of Desoky and Mousa (2013) evaluated the performance of the companies in the sample using two different metrics: return on assets (ROA) and return on equity (ROE). These were measured using ordinary least squares (OLS) regression analysis. In a similar vein, Bhagat and Bolton (2008) utilise OLS estimates in the context of inadequate corporate performance. The probability of managerial disciplinary renewal is found to be positively associated with the share ownership of board members and the degree of independence of the board. Liang and Zeger (1986) employ a class of estimating equations that provide consistent estimates of the regression parameters. Finally, Rashid and Naeem's (2017) study examined the impact of mergers on business performance, employing both OLS and empirical Bayesian methodologies in their empirical evaluation. The findings are consistent

and congruent across both methodologies. we consider it pertinent to address another salient issue in this section on the methodology of our scientific paper. About the potential endogeneity issues of the control variables of leverage (LEV) and company size (SIZE).

In this study, when using dummy variables, fixed factors and variables cannot be performed, nor can the Hausman test be performed. In econometrics, endogeneity is defined as the correlation between an explanatory variable and the error term, which generates biased and inconsistent estimators if OLS is used (Hausman, 1978, pp. 1251–1253). The Durbin–Wu–Hausman (DWH) test was developed to evaluate the hypothesis of exogeneity in key regressors, thereby comparing estimators that are consistent under the null hypothesis with others that are consistent under the alternative hypothesis (Wu, 1973; Durbin, 1954). Wooldridge (2010, chap. 6, pp. 118–122) emphasises that these types of tests are applied to variables that, based on theory or empirical evidence, could be correlated with the error, such as the main explanatory variables. In contrast, control variables – in this case, leverage (LEV) and firm size (SIZE) variables – are generally considered exogenous by construction, since their inclusion seeks to capture fixed effects or observable characteristics that are not related to the error term (Gujarati & Porter, 2010, chap. 13, pp. 421–423). The relevance of testing endogeneity in controls is contingent upon the existence of a robust theoretical foundation that substantiates the suspicion of a correlation with the error (Guo et al., 2018, pp. 175–177). However, this is rarely observed in standard practice. In the absence of such evidence, OLS estimators remain consistent with respect to these variables, so we consider, based on the scientific evidence cited in this paragraph, that there is no justification for applying the DWH test to exogenous controls.

Therefore, we apply the regression model 1,2,3 and 4 of the Eqs. (1), (2), (3) and (4) respectively:

$$R_{it} = \alpha_i + \beta_1 ESG_{it} + \beta_2 ENV_{it} + \beta_3 RES_{it} + \beta_4 COUNTRY_{it} + \beta_5 ESGCOUNTRY_{it} + \beta_6 ENV COUNTRY_{it} + \beta_7 RES COUNTRY_{it} + \beta_8 LEV_{it} + \beta_9 SIZE_{it} + \beta_{10} ACTIVITY_{it} + \beta_{11} COVID_{it} + \varepsilon_{it} \quad (1)$$

$$R_{it} = \alpha_i + \beta_1 ESG_{it} + \beta_2 ENV_{it} + \beta_3 RES_{it} + \beta_4 COUNTRY_{it} + \beta_5 ESGCOUNTRY_{it} + \beta_6 ENV COUNTRY_{it} + \beta_7 RES COUNTRY_{it} + \beta_8 LEV_{it} + \beta_9 SIZE_{it} + \beta_{10} ACTIVITY_{it} + \beta_{11} COVID_{it} + \beta_{12} WATERINTEN.ESG_{it} + \beta_{13} WATERINTEN.ENV_{it} + \beta_{14} WATERINTEN.RES_{it} + \varepsilon_{it} \quad (2)$$

$$R_{it} = \alpha_i + \beta_1 ESG_{it} + \beta_8 LEV_{it} + \beta_9 SIZE_{it} + \beta_{10} ACTIVITY_{it} + \beta_{11} COVID_{it} + \beta_{15} ESGCOVID_{it} + \varepsilon_{it} \quad (3)$$

$$R_{it} = \alpha_i + \beta_8 LEV_{it} + \beta_9 SIZE_{it} + \beta_{10} ACTIVITY_{it} + \beta_{11} COVID_{it} + \beta_{12} WATERINTEN.ESG_{it} + \beta_{15} ESGCOVID_{it} + \varepsilon_{it} \quad (4)$$

where R_{it} represents the operational performance variables (ROA and ROE) of company i in year t , ESG_{it} is the variable that measures the performance of a company in areas related to the environment, social responsibility and corporate governance for company i in the year t , ENV_{it} is the variable that measures management and exposure of index components to the main environmental risks and opportunities for company i in the year t , RES_{it} is the variable that measures performance and the capacity of a company for reducing the use of materials,

energy or water, for company i in the year t , $COUNTRY_{it}$ is Dummy variable equal to 1 for Morocco and 0 for Spain of the company i in the year t , $ESGCOUNTRY_{it}$, $ENVCOUNTRY_{it}$ and $RESCOUNTRY_{it}$ is the impact of ESG, ENV and RES factors is measured by multiplying the dummy variable by country of company i in the year t , LEV_{it} is the leverage of the company i in the year t , and $SIZE_{it}$ is the logarithm of total assets of company i in the year t , $ACTIVITY_{it}$ is a dummy variable that takes the value 1 for all companies belonging to the same sector as company i in the year t , $COVID_{it}$ is Dummy variable equal to 1 for the year 2020 when COVID was reported and 0 for the rest of the years, $WATERINTEN.ESG_{it}$, $WATERINTEN.ENV_{it}$ and $WATERINTEN.RES_{it}$ is the impact of ESG, ENV and RES factors is measured by multiplying corresponding Score by the dummy variable Water-intensive companies i in the year t . $ESGCOVID_{it}$ represents the interaction term between the ESG score and a COVID-19 dummy variable for company i in year t . The standard errors are clustered at the firm level to avoid concerns of auto-correlation and cross-sectional dependence (Petersen, 2009). In this study, we employ the variables SIZE, LEV, Country, COVID and Activity as control variables. All the variables were organized in a structure panel data. The structure panel data comprise sets of data made of multiple observations for each sample unit. Using a structure panel data allows us to obtain better estimations and to test more sophisticated behavioural models, with less restrictive scenarios. We use Stata 14 to work with the data. This software enables us to use various techniques to estimate models with specific effects StataCorp (2015).

5. Results of the multivariate analysis

This section presents a multivariate analysis by both countries. To this end, this section of the study highlights the results of *Ordinary Least Squares (OLS)* techniques.

Results of the multivariate analysis by Ibero-Maghrebi context

Table 5 shows the descriptive statistics of the dependent and independent variables, calculated for the full sample in this study. The number of observations country-year varies for the 460 observations of the ROA, ROE, LEV, SIZE, ESG, ENV and RES, variables. Companies had a mean ROA of 4.95%, ROE of 6.93% in the period 2018–2022, with SD of 8.31% and 31.07%, respectively. Regarding other variables, we highlight the large SD found, which is due to the differences between control variables and sustainable characteristics in this geographical region. The LEV variable indicates that, on average, companies have a high level of leverage, around 61.81%. The variable SIZE with a maximum value of 18.85 and a minimum value of 0.00, which reflects the large difference in the size of listed enterprises. Regarding the dependent variables, the results indicate that the mean of ESG, ENV and RES is relatively similar, at 42.40%, 40.17% and 43.96%, respectively. Consequently, the ESG, ENV and RES variables indicate that, on average, companies score slightly above the average level of the maximum Score. Finally, RES Score has an indicator that reflects greater commitment in the company's capacity to reduce the use of materials, energy or water, possibly due to the climate problem of rainfall scarcity in the area under study.

Table 5. Descriptive statistics of the variables ($n = 460$)

Variables	Mean	Std.Dev.	Min	Max
ROA	0.0495	0.0831	−0.6836	0.4408
ROE	0.0693	0.3107	−3.4040	1.3362
LEV	0.6181	0.2424	0.0000	1.6079
SIZE	13.984	2.2650	0.0000	18.856
ESG	0.4240	0.3116	0.0000	0.9091
ENV	0.4017	0.3351	0.0000	0.9839
RES	0.4396	0.3643	0.0000	0.9967

Note: own estimation with Stata 14.

Table 6 shows Pearson's correlation coefficients between each pair of variables. A high Pearson coefficient value, above 0.8, indicates that there is a strong correlation, which can be identified among the variables ESG, ENV, RES, WATERINTEN.ESG, WATERINTEN.ENV, WATERINTEN.RES, ESGCOUNTRY, ENVCOUNTRY and RESCOUNTRY. Therefore, correlations above 0.8 can cause multicollinearity among the variables (Fayed & Dubey, 2016). Given that the multicollinearity problem may affect the results of the models, ENV, RES, WATERINTEN.ENV, WATERINTEN.RES, ENVCOUNTRY and RESCOUNTRY are discarded. However, in our study we perform separate regressions with the variables that are correlated.

We estimated Models (1,2,3 y 4) OLS methodology. For the full sample, the vce (cluster company) option in Stata is utilised. Thus, vce (cluster company) corrects the standard errors so that they are valid.

Table 7 reports the results of the estimation of Models 1, 2 and 3 for the ROA variable and Models 4, 5 and 6 for the ROE variable for Eq. (1). Specifically, Models 2, 3, 5 and 6, the estimation is performed by isolating the variables that we have eliminated when verifying the multicollinearity problem. The results of the full sample show that there is a negative relationship between the leverage variable and ROA and ROE. However, it is only significant within the scope of Models 1, 2 and 3 on ROA.

Regarding, size as control variable, a positive and significant relationship is identified (see models 1, 2 and 3). Consequently, company size has been demonstrated to be positively and significantly related to ROA 0.016, 0.023 and 0.020, respectively. There is a potential influence of ESG initiatives on operational performance when we consider in our model the size variable. The results agree with Simon (1962) shows a positive relationship between company size and profitability. Moreover, Sun et al. (2024) who highlight the importance of adjusting the company size to the optimal level of ESG investment.

In the event of the impact of the pandemic being considered as a control variable, a negative and significant effect on the results is observed in Model 1, 2 and 3 for return on assets (ROA) and a negative and non-significant relationship with return on equity (ROE). The findings of this study demonstrate a congruence with the results previously reported by Shen et al. (2020). The present analysis substantiates the notion that the COVID-19 has a negative effect on corporate performance.

Table 6. Correlations between variables

	ROA	ROE	LEV	SIZE	ESG	ENV	RES	WATERINTEN.ESG	WATERINTEN.ENV	WATERINTEN.RES	ESG COUNTRY	ENV COUNTRY	RES COUNTRY
ROA	1.000												
ROE	0.5177	1.000											
LEV	-0.3786	-0.1411	1.000										
SIZE	-0.0602	-0.0014	0.3562	1.000									
ESG	-0.1077	-0.0098	0.2859	0.5769	1.000								
ENV	-0.1240	-0.0446	0.2953	0.5811	0.9377	1.000							
RES	-0.1111	-0.0162	0.3052	0.5692	0.9271	0.9600	1.000						
WATERINTEN.ESG	0.1153	0.0830	0.0022	0.1934	0.2642	0.3018	0.2955	1.000					
WATERINTEN.ENV	0.0932	0.0494	0.0162	0.2032	0.2642	0.3174	0.3066	0.9872	1.000				
WATERINTEN.RES	0.1059	0.0830	0.0800	0.0125	0.2055	0.2702	0.3173	0.9797	0.9853	1.000			
ESGCOUNTRY	0.1962	0.0978	-0.0376	-0.1325	-0.0231	-0.1406	-0.1388	-0.0018	-0.0313	-0.0505	1.000		
ENVCOUNTRY	0.1821	0.0918	-0.0456	-0.1325	-0.0210	-0.0898	-0.0981	0.0176	-0.0091	-0.0352	0.9248	1.000	
RESCOUNTRY	0.1839	0.0745	-0.0545	-0.1320	-0.0117	-0.0892	-0.1287	-0.0140	-0.0356	-0.0458	0.8949	0.9306	1.000

Note: own estimation with Stata 14.

In the case of the independent variables, the results of the estimation demonstrate that the ESG, ENV, and RES variables exhibit alternating positive and negative values. In contrast to the findings reported by Alareeni and Hamdan (2020), the ESG variable exhibited a negative yet non-significant p-value in relation to the ROA variable. In a similar vein, the ENV and RES variables exhibited a positive, albeit non-significant, p-value in relation to ROA. These observations were recorded in models 1, 2 and 3. In accordance with these findings, the results obtained for ROE in models 4, 5, and 6 demonstrate a non-significant p-value.

Consequently, it is evident that a strong focus on ESG activities exerts a different influence on operating performance. The results of the study provide valuable insights into the operational efficiency of the ESG firm effort, thereby addressing the research question of whether the investment can be considered non-productive over the study period and these are consistent with the various results obtained previously, which have proven to be positive, negative, or non-existent with respect to operational performance. The findings of this study demonstrate a certain degree of congruence with the tenets of trade-off theory. This theoretical framework posits the proposition that the adoption of ESG practices may culminate in increased expenditures and diminished profitability (Han & Le Ha, 2024).

In relation to the utilisation of COUNTRY as a control variable, a positive and significant (0.090) and (0.044) effect on ROA in the model 2 and 3, is observed. The findings of this study imply a positive and significant effect in the case of Morocco, which contradicts the trade-off theory and the evidence obtained by authors such as Khan et al. (2016), who indicate that only companies with a high score tend to have better operating performance.

Furthermore, it is essential to consider the investment in the variables ESGCOUNTRY, ENVCOUNTRY and RESCOUNTRY. As we have discussed in the results obtained, in some cases a great effort in environmental variables have no effect on operating performance. The results demonstrate a non-significant relationship in all the models. In the regressions conducted in models 1, 2, 3, 4, 5 and 6 the effects of year and activity were controlled for.

Table 7. Multivariate analysis results: greater commitment to ESG activities

Independent Variables	ROA Model 1	ROA Model 2	ROA Model 3	ROE Model 4	ROE Model 5	ROE Model 6
LEV	-0.1505 (0.000)	-0.1519 (0.000)	-0.1545 (0.000)	-0.1613 (0.140)	-0.1565 (0.146)	-0.1640 (0.127)
SIZE	0.0095 (0.016)	0.0096 (0.023)	0.0092 (0.020)	0.0117 (0.363)	0.0132 (0.308)	0.1205 (0.392)
ESG	-0.0017 (0.945)			0.0224 (0.740)		
ENV		0.0012 (0.958)			-0.0178 (0.774)	
RES			0.0146 (0.532)			0.2498 (0.725)
COVID	-0.0265 (0.027)	-0.0265 (0.028)	-0.0271 (0.024)	-0.0362 (0.317)	-0.0343 (0.338)	-0.0345 (0.304)
COUNTRY	0.0333 (0.156)	0.0382 (0.090)	0.0455 (0.044)	0.0661 (0.272)	0.0583 (0.259)	0.0800 (0.158)
ESGCOUNTRY	0.0548 (0.245)			0.1618 (0.202)		
ENVCOUNTRY		0.0445 (0.364)			0.1581 (0.175)	
RESCOUNTRY			0.0257 (0.569)			0.1056 (0.335)
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
ACTIVITY	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0061 (0.912)	-0.0106 (0.849)	-0.0097 (0.863)	-0.0289 (0.843)	-0.0404 (0.781)	-0.0385 (0.796)
Adjusted R-squared	0.3876	0.3854	0.3865	0.2973	0.1740	0.1742

Notes: "Robust standard errors are clustered by firm, and the p-values are provided in parentheses".

Table 8 shows the results of the regression analysis for models 1, 2 and 3 for the ROA variable and models 4, 5 and 6 for the ROE variable for equation (2). In models 2, 3, 5 and 6 the regression is performed by isolating the variables that we have eliminated when verifying the multicollinearity problem between the independent variables. Table 8 we present the results when estimate the great commitment to its ESG goals in intensive use of water by the companies in the full sample for Eq. (2).

In these models, when considering leverage as a control variable, we observe significant negative coefficients (see models 1, 2, 3, 4, 5 and 6). Consequently, in models 1, 2 and 3, the effect of indebtedness is significantly more negative when we are measuring the profitability of the company's total assets (ROA), but significantly less negative than for ROE. Regarding size, a positive and significant relationship was identified (see models 1, 2 and 3). Consequently, it has been demonstrated there is a preference by firm size as company variable because is positively and significantly 0.006, 0.004 and 0.007 related to ROA in the models 1, 2 and 3, but not to ROE.

As for the use of COUNTRY as a control variable, it demonstrates a positive and significant effect on ROA (model 2 and 3), favouring Morocco more. Regarding the impact of the pandemic our results present is statistically significantly negatively associated with return on assets (ROA) in model 1, 2, and 3 when it is considered as a control variable. The relationship in the models 1, 2 and 3 is -0.0270 with pvalue 0.024 , -0.0271 with pvalue 0.025 and -0.0275 and pvalue 0.022 , respectively.

In the case of independent variables, the regression results show that the ESG, ENV, and RES variables display alternating positive and negative values, but these are not significant in models 1, 2, 3, 4, 5 and 6. Therefore, it can be concluded that focus in ESG, ENV, and RES initiatives do not benefit ROA and ROE. These findings show that relation between operating performance and compensatory theory is more complex.

However, when considering the country variable, it is imperative to take into account the variables ESGCOUNTRY, ENVCOUNTRY and RESCOUNTRY. The results does not demonstrate a positive or significant relationship with the country variable. The ESGCOUNTRY, ENVCOUNTRY and RESCOUNTRY variables were found to be non-significant in all models.

Furthermore, the results obtained from the regression analyses. About the impact of intensive water usage: WATERINTEN.ESG, WATERINTEN.ENV, WATERINTEN.RES and WATERINTEN.COUNTRY variables are considered. The WATERINTEN.ESG variable demonstrates a positive 0.5193 and significant value in ROA (see Model 1). This suggests that commitment ESG aimed at reducing intensive water usage by the selected companies would result in a favourable return on assets (ROA) for the firms, while suppose a minimal impact on return on equity (ROE). Regarding the WATERINTEN.ENV variable, the results show a positive p-value of 0.0582 and a significance level of 0.005 for ROA in Model 2, and a positive p-value of 0.2009 and a significance level of 0.075 for ROE in Model 5. In addition, the WATERINTEN.RES variable, the results show a positive p-value of 0.0491 and a significance level of 0.010 for ROA in Model 3, and a positive p-value of 0.1612 and a significance level of 0.0099 for ROE in Model 6. Finally, WATERINTEN.COUNTRY variable does not present significant values in any of the models for ROA and ROE.

The findings suggest that when companies manage their water use effectively, it can lead to an improvement in their profitability. It is also expected that this management approach will not have a negative effect on return on assets (ROA) and return on equity (ROE). So, when companies use water in a way that's good for the environment (ESG, ENV and RES), it helps them do better. When we did the regressions in models 1, 2, 3, 4, 5 and 6, we made sure to control for the effects of year and activity.

Table 9 shows the results of the regression analysis for models 1 and 3 for the ROA variable and models 2 and 4 for the ROE variable for Eq. (3) and (4). Specifically, on the one hand, the results of models 1 and 2 estimate whether a higher ESG score improves corporate resilience face to COVID-19 pandemic. On the other hand, the results of models 3 and 4 estimate whether a higher ESG (water) score improves corporate resilience to systemic shocks, such as the COVID-19 pandemic. The empirical results indicate that leverage exerts a negative and statistically significant impact on ROA in Models 1 and 3. Conversely, firm size shows a positive and significant relationship with ROA in the same models. Regarding the impact of the crisis, the COVID-19 variable yields a significant negative coefficient in Model 1 for ROA. However, the ESG score and the interaction term (ESGCOVIDit) do not reach statistical significance in Models 1 and 2. Consequently, we find no empirical evidence to suggest that increased ESG

Table 8. Multivariate analysis results: ESG activities related to intensive water use

Independent Variables	ROA Model 1	ROA Model 2	ROA Model 3	ROE Model 4	ROE Model 5	ROE Model 6
LEV	-0.1533 (0.000)	-0.1560 (0.000)	-0.1578 (0.000)	-0.1816 (0.083)	-0.1820 (0.077)	-0.1843 (0.074)
SIZE	0.0101 (0.006)	0.0103 (0.004)	0.0099 (0.007)	0.0130 (0.239)	0.0153 (0.153)	0.0139 (0.221)
ESG	-0.0069 (0.784)			0.0084 (0.896)		
ENV		-0.0040 (0.861)			-0.3496 (0.551)	
RES			0.0080 (0.732)			-0.0080 (0.991)
COVID	-0.0270 (0.024)	-0.0271 (0.025)	-0.0275 (0.022)	-0.0369 (0.305)	-0.0355 (0.318)	-0.0366 (0.301)
COUNTRY	0.0377 (0.128)	0.0430 (0.064)	0.0483 (0.042)	0.0500 (0.414)	0.0453 (0.399)	0.0599 (0.329)
ESG.COUNTRY	0.0462 (0.318)			0.0148 (0.263)		
ENV.COUNTRY		0.0332 (0.486)			0.1267 (0.301)	
RES.COUNTRY			0.2393 (0.583)			0.1203 (0.289)
WATERINTEN.ESG	0.5193 (0.006)			0.1687 (0.101)		
WATERINTEN.ENV		0.0582 (0.005)			0.2009 (0.075)	
WATERINTEN.RES			0.0491 (0.010)			0.1612 (0.099)
WATERINTEN.COUNTRY	-0.0154 (0.598)	-0.0155 (0.602)	-0.0142 (0.637)	0.0750 (0.394)	0.0720 (0.412)	0.0790 (0.377)
YEAR	√	√	√	√	√	√
ACTIVITY	√	√	√	√	√	√
Constant	-0.0055 (0.918)	-0.0114 (0.830)	-0.0097 (0.859)	-0.0817 (0.577)	-0.0998 (0.480)	-0.0941 (0.524)
Adjusted R-squared	0.3960	0.3963	0.3966	0.1837	0.1838	0.1828

Notes: Robust standard errors are clustered by firm, and the p-values are provided in parentheses.

efforts mitigate the impact of COVID-19 on ROA or ROE in these specific models 1 and 2. In contrast, the results of Models 3 and 4 provide a different perspective. These estimates suggest that a heightened commitment to ESG (specifically water sustainability) improves corporate resilience in the face of systemic shocks, such as the COVID-19 pandemic. Specifically, in these models, an increased ESG score enhances operational performance during the crisis period. These findings suggest that water sustainability initiatives act as a strategic buffer that strengthens organizational resilience against external disruptions.

Table 9. Multivariate analysis results: environmental resilience of companies during the pandemic

	ESG	ESG	WATER	WATER
Independent Variables	ROA Model 1	ROE Model 2	ROA Model 3	ROE Model 4
LEV	-0.1341 (0.000)	-0.1282 (0.209)	-0.1388 (0.000)	-0.1437 (0.142)
SIZE	0.0067 (0.075)	0.0053 (0.657)	0.0063 (0.047)	0.0066 (0.459)
ESG	-0.0115 (0.527)	0.0070 (0.917)		
ESGCOVID	-0.0349 (0.190)	-0.0768 (0.461)	-0.0448 (0.083)	-0.0841 (0.335)
WESG			0.0539 (0.002)	0.1888 (0.064)
COVID	-0.0149 (0.091)	0.0046 (0.855)	0.1049 (0.208)	0.0096 (0.735)
ACTIVITY	YES	YES	YES	YES
Constant	0.0460 (0.345)	0.0699 (0.587)	0.4882 (0.274)	0.522 (0.625)
Adjusted R-squared	0.3631	0.1611	0.3706	0.1683

Notes: Robust standard errors are clustered by firm, and the p-values are provided in parentheses.

In summary, the results obtained demonstrate the consistency of Tables 7, 8 and 9 for Models 1, 2, 3, 4, 5 and 6. A study of the first hypothesis revealed that the variables most likely to enhance the operational performance of companies are size in Models 1, 2 and 3 in Tables 7 and 8. However, it is evident that leverage variable has a negative impact on the operational performance of the companies. This phenomenon is evident in Models 1, 2 and 3, as well as Models 4, 5 and 6, as demonstrated in Tables 7 and 8, respectively. Therefore, regarding H1, our findings are consistent with those reported by Simon (1962) and Choi et al. (2024). In this study, the size of a company is identified as a significant factor in promoting positive outcomes from commitment in ESG scores, with a particular focus on emerging markets. In addition, the arguments advanced by Fan et al. (2017) and Clarkson et al. (2011) posit that larger companies possess greater environmental capacity in comparison to smaller companies, a factor which is conducive to enhanced profitability. As demonstrated by Ali et al. (2021), the country status of developing or developed country is found to be significant in relation to ROA. Conversely, the findings presented in Tables 7 and 8 of the "Leverage and Covariates" section align with the postulation proposed by Elsayed and Paton (2005), which asserts that the leverage variable does not offer significant insights into the relationship between ROA and ROS. The results obtained in Models 1, 2, 3, 4, 5 and 6 provide strong evidence in favour of Hypothesis 1. Hypothesis 1 (**H1**) is accepted.

Regarding the second hypothesis. The findings of this study imply that allocating financial resources to environmental initiatives does not exert a substantial influence on the return on assets (ROA) or return on equity (ROE). Furthermore, as demonstrated in models 1, 2,

3, 4, 5 and 6 in Tables 7 and 8, greater investment on environmental scoring does not have a significant effect on ROA and ROE. A similar result is obtained in the RES on ROA and ROE. These findings are consistent with those of Han et al. (2024), Amarna et al. (2024) and Sun et al. (2024), who have demonstrated that investing in environmental, social and governance (ESG) practices can result in increased costs and reduced profitability. Conversely, the findings contradict those reported by Amel-Zadeh and Serafeim (2018) and Wong et al. (2021), who proposed a positive correlation between ESG metric performance and organisational financial performance. Furthermore, Gupta et al. (2021) found that the adoption of enhanced sustainability measures was associated with higher returns on assets and equity. The results obtained in Models 1, 2, 3, 4, 5 and 6 show that the combined ESG indicator is non-significant. Furthermore, it can be demonstrated that the absence of a significant relationship in the ENV and RES variables results in the rejection of hypothesis 2 (**H2**).

Concerning, the results of the third hypothesis testing process indicate that the WATERINTEN.ESG, WATERINTEN.ENV and WATERINTEN.RES variables show a positive response and is statistically significant in Model 1,2,3,5 and 6 for ROA and ROE. It is evident that commitment ESG, ENV and RES initiatives has a directed towards enhancing water utilisation by the companies in the entire sample exert a favourable influence on the operational performance. Regarding the WATERINTEN.COUNTRY variable, no significant results were obtained in any of the models presented in Table 8. The findings for the entire sample demonstrate a favourable effect on ROA and ROE in Model 1,2,3, 5 and 6, specifically for the variable representing intensive water use in the ESG, ENV and RES Score. These results are consistent with those obtained by (Ali et al., 2021; Simionescu et al., 2020; Fu & Jacobs, 2022) and are in line with the recommendations of the UNESCO (2023) report. Consequently, **H3** is accepted.

The results obtained for Hypothesis 4 regarding the impact of the COVID-19 pandemic indicate a negative effect on the operational performance of the companies in the sample, with no distinction between industrialized and emerging countries. The COVID-19 variable shows a negative impact on ROA in Tables 7, 8 and 9. These results are consistent with the findings of Huayu et al. (2020), who demonstrate similar outcomes regarding the pandemic's impact. However, Table 9 presents the results of whether an increased commitment to ESG (water) initiatives enhances corporate resilience in the face of shocks. Our findings indicate that a heightened commitment to water sustainability improves corporate resilience during the COVID-19 pandemic. Specifically, in these models, an increased ESG score enhances operational performance during the crisis period. These results suggest that water sustainability initiatives act as a strategic buffer that strengthens organizational resilience against external disruptions. According to the results obtained by Ouchchikh et al. (2024), Janah and Sassi (2022), Kahcha et al. (2023), establish that ESG corporate practices improved the financial and environmental resilience of companies during the pandemic. Therefore, **H4** is accepted.

6. Discussion and conclusions

Previous studies have shown that a greater effort on environmental, social and governance (ESG) activities are likely to negatively impact financial performance. This study examines whether companies with a high volume of ESG initiatives may be perceived as

counterproductive regarding return on assets (ROA) and return on equity (ROE), which is consistent with compensation theory. Although, a priori, one might think that trade-off theory would have the same effect in different geographical areas, the regression results indicate that a negative impact is not a usual result of an ESG activities. The practical implications of this for companies are significant, particularly in relation to decision in increase their focus in ESG scores.

Companies are starting to understand how their businesses affect the environment. So, more companies are thinking about how their ESG decisions can help the environment and reduce climate change. Some authors argue that there is a positive correlation between investment in ESG scores and operating performance as Amel-Zadeh and Serafeim (2018), Wong et al. (2021). In contrast, investment decisions in ESG have probably negative effect on operating performance (Amarna et al., 2024; Sun et al., 2024).

In the context of the prevailing controversy and considering extant empirical evidence, this research endeavours to analyse the impact of a greater effort in ESG initiatives, with a particular focus on the operating performance of listed companies in the Ibero-Maghrebi context. The central question guiding this study is whether a heightened commitment to Environmental, Social and Governance (ESG) initiatives results in a decline in the operational performance of listed companies in these countries. The present study has identified a significant implication for companies, focusing on the effect of their decisions to increase their ESG scores on operational performance. Therefore, the results of this study offer an interesting practical proposal for companies. From this practical perspective, our results shows that leverage variable has a more substantial negative influence on return on assets (ROA) and return on equity (ROE) compared to size, which shows a positive, although less pronounced, effect. The positive effects on corporate behaviour regarding greater ESG efforts would be significantly influenced by the debt structure of the listed companies in the entire sample. Contrary to the findings of previous studies, this research suggests that companies in the Ibero-American region do not typically demonstrate a correlation between increased ESG efforts and a likely decline in operating performance. This evidence suggests that the relationship between operational performance and the trade-off theory is more complex than previously theorized.

In addition, a relevant question that we study in this research is whether a greater commitment from companies in the construction and food sectors will lead to a reduction in intensive water use to combat climate change. The results indicate that the WATERINTEN.ESG, WATERINTEN.ENV and WATERINTEN.RES variable demonstrates a positive response and is statistically significant in relation to ROA and ROE. Evidence suggests that a greater commitment is directed towards enhancing water utilisation by companies in the entire sample result in favourable operational performance. In this way, these results ensure that there is no deterioration in ROA and ROE. Consequently, this research demonstrates that a greater effort to reduce the intensive use of water by companies in the construction and food sectors in an Ibero-Maghrebi context means reducing the impact of their water footprint by the optimization of processes through water reuse, as well as the integration of more efficient technologies that decrease their intensive use by these sectors. Regarding year 2020 pandemic, our results show that an increased commitment to ESG (water) initiatives enhances corporate resilience in the face of shocks like the COVID-19 pandemic.

The present study has concluded that there is insufficient correlation between operating performance and the compensatory theory for companies within the Ibero-Maghrebi region. However, our results suggest that a greater focus in ESG initiatives could enhance operational effectiveness and address climate change when the approach is predicated on ESG (Water) metrics.

This research is subject to certain limitations, including the relatively small sample size of 92 companies and the exclusive focus on ESG scores in relation to operating performance over a specific period. This may potentially impact the generalisability of the study's findings. The present sample is limited to two countries and could be extended to include other Mediterranean countries. Consequently, it's interesting in future studies may utilise alternative models; however, the measurements developed by the authors have been employed extensively in relevant previous literature. In subsequent research, we propose a more extensive sample be investigated. Furthermore, the study's findings could be replicated in a range of countries, including those classified as industrialised, emerging, and less-emerging economies, where perceptions of ESG commitments could vary, consequently yielding distinct implications. It is further proposed that future research should be conducted to investigate the various factors that may influence the relationship between ESG, ROA and ROE.

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Author contributions

Author 1: conceptualization, data curation, investigation, writing – original draft, writing – review & editing, formal analysis, methodology, software, visualization.

Author 2: conceptualization, data curation, investigation, writing – original draft, formal analysis, methodology, software.

Disclosure statement

The authors declare that they have no conflict of interest.

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