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How Responsible Are Energy and Utilities Companies in Terms of Sustainability and Economic Development?

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Abstract: The increasing importance of ESG (environmental, social, governance) scores in investment decisions has led to a growing interest in understanding their impact on corporate performance, particularly in the energy and utilities sector. This study's focus is to identify the research gap regarding the connection between corporate adherence to Sustainable Development Goals (SDGs) and the financial outcomes of these companies. The research objective is to examine the correlation between ESG scores and key financial metrics, such as return on assets (ROAs) and return on equity (ROE), using a quantitative approach to analyze a dataset of publicly traded companies in this sector. Using a panel data regression analysis, we identified a significant correlation suggesting that higher ESG scores are associated with improved financial performance for the entire sample and separately for the two sectors. These findings indicate that companies with robust ESG practices enhance their sustainability profile and achieve better operational efficiency and profitability. This research contributes to the existing literature by providing empirical evidence of the positive impact of ESG factors on corporate performance in a sector characterized by high environmental impact and regulatory scrutiny. Ultimately, this study underscores the necessity for energy and utilities companies to integrate ESG considerations into their strategic frameworks, thereby aligning financial objectives with sustainable practices to drive long-term success.

Keywords: responsibility; sustainability; economic development; energy; ESG; financial performance; risk; corporation

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1. Introduction

The energy and utilities sectors are significantly transforming as they move towards a sustainable business model aligned with environmental, social, and governance (ESG) principles [1]. Adopting these principles not only aids in reducing environmental impact and improving social and governance performance but also acts as a driving force for innovation and economic growth [2]. The shift to a green economy, supported by public policies and investor preferences, is critical for the long-term viability of companies in this sector [3].

Integrating ESG principles into the utilities and energy sector provides substantial economic and regulatory advantages, creating a robust foundation for sustained competitiveness. Beyond mitigating operational and financial risks associated with climate change, companies that align with ESG requirements benefit from enhanced access to capital. Global investors increasingly prioritize sustainability performance, and sustainable investment funds have experienced notable growth in recent years [4]. This trend highlights

how utilities companies with solid governance and social responsibility frameworks are well-positioned to attract capital from sustainability-oriented investors.

In addition to investor-driven pressures, energy and utilities companies are facing heightened regulatory scrutiny from public authorities. The European Non-Financial Reporting Directive (NFRD) and the Climate-Related Financial Disclosure Act have been implemented to impose more significant demands for transparency in environmental and governance practices [5]. In this regulatory context, ESG reporting becomes vital for strengthening stakeholder trust and ensuring compliance with existing regulations. Recent studies demonstrate that companies successfully integrate these requirements into their business strategies to achieve superior financial and reputational outcomes [6].

Technological innovation and evolving consumer preferences are critical drivers of ESG integration in the utilities and energy sector. Technological advancements, such as smart grids, energy storage solutions, and the digitalization of operational processes, enhance efficiency and reduce energy loss [7]. Additionally, consumers are increasingly focused on renewable energy sources and their environmental impact, providing opportunities for companies to develop new sustainable products and services [8].

ESG integration has significant implications for corporate risk management. The increasing frequency and severity of climate change-related events, such as extreme weather, heighten the vulnerability of critical infrastructure. As a result, utilities and energy companies must implement adaptive measures to safeguard their networks and physical assets [9]. Foreseeing and managing climate risks is crucial to ensuring operational continuity and maintaining long-term competitive advantages.

Adopting ESG principles has improved economic performance from a financial standpoint. Research indicates that companies with strong ESG scores benefit from lower capital costs, reduced stock volatility, and superior financial performance [10]. Furthermore, these companies enjoy a more favorable public perception, which contributes to increased customer loyalty and the ability to attract top talent [11].

Therefore, integrating ESG principles within the energy and utilities sector represents a critical strategy for companies adapting to the evolving economic, social, and environmental landscape. In a global context where sustainability has become a strategic imperative, companies in this sector must take concrete steps to reduce their environmental impact, enhance social responsibility, and strengthen corporate governance [12]. This approach meets the growing regulatory and market expectations and ensures long-term competitiveness and resilience.

In this context, the focus of this study is to identify the research gap regarding the connection between corporate adherence to (SDGs) and the financial outcomes of these companies. The research objective is to examine the correlation between ESG scores and key financial metrics, such as return on assets (ROAs) and return on equity (ROE), based on a quantitative approach, analyzing a dataset of publicly traded companies in these sectors extracted from the Refinitiv Eikon, a London Stock Exchange Group (LSEG) business platform for a period of five years, from 2019 to 2023, to capture medium-term evolution and trends. The selected sample comprised 91 distinct companies rated with an ESG (environmental, social, governance) score greater than 50 out of a maximum of 100.

The article follows the structure of an academic study. The Introduction contextualizes the research problem, highlighting the relevance of energy and utilities companies' responsibility concerning sustainability and economic development. The Literature Review section synthesizes existing contributions in the field, identifying gaps and directions for further research. The Materials and Methods section outlines the methodological approaches used for data collection and analysis. The Results section presents the research findings, followed by a critical discussion of their implications. Finally, the Conclusion summarizes the key ideas and provides suggestions for future research.

2. Literature Review

The energy and utilities sectors play a critical role in the global economy, and their practices have significant implications for sustainability and economic growth. These industries are under growing pressure to balance environmental, social, and governance (ESG) considerations with profitability and efficiency. This review examines the existing literature on the responsibilities of such companies regarding sustainability, highlighting key findings on their economic contributions, environmental impact, and adherence to global sustainability goals.

The companies from the analyzed sector are central to achieving the United Nations Sustainable Development Goals (SDGs), particularly goals related to affordable and clean energy (SDG 7) and climate action (SDG 13) [13]. As fossil fuel consumption contributes to climate change, transitioning to renewable energy sources has become a primary focus for this sector [14]. According to IRENA [15], energy companies have increasingly invested in renewable technologies, contributing to a shift in energy production methods, particularly in developed countries. However, this transition faces challenges, including the high costs of renewable infrastructure and the need for governmental incentives to accelerate adoption [16].

Sustainable investments are related to stakeholder theory; thus, investors' reactions to company reports are based on the degree of transparency of these reports and, lately, on the way companies engage in activities integrated with an ESG strategy [17]. Sustainability reporting has become a standard practice among large energy and utilities companies. According to García-Sánchez et al. [18], many firms in this sector have adopted the Global Reporting Initiative (GRI) standards to disclose their environmental and social impact. The literature reveals a positive correlation between companies' transparency in sustainability reporting and their performance in reducing carbon emissions [19]. However, critiques remain regarding the authenticity of such reports, as companies often engage in "greenwashing", where their sustainability initiatives are more about public relations than meaningful environmental action [20].

From an economic perspective, energy and utilities companies significantly contribute to national GDPs and employment, particularly in regions rich in natural resources. Studies have shown that responsible business practices in these sectors can lead to long-term economic benefits, such as job creation in the renewable energy sector [21]. Furthermore, responsible companies tend to have better access to capital, as investors increasingly favor firms with strong ESG ratings [22]. Nevertheless, a tension exists between economic growth and environmental sustainability, with some companies prioritizing short-term profits over long-term environmental responsibility [23].

Despite advancements, energy, and utilities companies face several barriers to fully integrating sustainability into their business models. Regulatory inconsistencies, market volatility, and technological limitations are common challenges highlighted in the literature [24]. Moreover, the sector remains dominated by fossil fuel companies, which often have slower transitions toward sustainable practices due to existing infrastructure and vested interests [25].

The literature shows that while energy and utilities companies are making strides toward sustainable development, there is still significant room for improvement. The transition to more responsible business practices is slow [26], hindered by economic, regulatory, and technological challenges. However, firms that integrate sustainability into their core operations tend to perform better economically in the long run, and the shift toward renewable energy is expected to continue as global pressure mounts.

Corporate governance plays a critical role in how the analyzed companies address sustainability. Research has shown that companies with stronger governance structures are more likely to integrate sustainable practices into their business models [27]. Governance factors such as board diversity, executive compensation tied to sustainability goals, and shareholder engagement are key determinants of corporate sustainability efforts [28]. For instance, companies that link executive compensation to environmental performance in-

dicators tend to outperform those that do not in terms of reducing carbon footprints and improving energy efficiency [29].

Moreover, institutional investors are increasingly pushing for stronger governance mechanisms that prioritize sustainability [30,31]. Large asset managers such as BlackRock and Vanguard have issued public statements urging energy and utilities companies to focus on long-term value creation by incorporating ESG criteria into their operations [32]. These developments suggest that corporate governance reforms are crucial in driving sustainability in the energy sector.

Regulatory frameworks are another key driver of sustainability in the energy and utilities sector. Governments and international organizations have implemented various regulations aimed at reducing carbon emissions and encouraging the use of renewable energy sources. For example, the European Union's Green Deal and its associated policies are designed to make Europe the first climate-neutral continent by 2050 [33]. These regulations impose stringent requirements on companies to reduce their greenhouse gas emissions, promote energy efficiency, and increase their use of renewables.

Research by Andrews and Johnson [34] highlights that energy companies operating in regions with strong regulatory frameworks tend to perform better in terms of sustainability metrics compared to those in less regulated environments. However, these regulations also present challenges, as they often require significant financial investments to upgrade infrastructure and shift to cleaner energy sources [35]. Some companies argue that the costs associated with regulatory compliance may hinder their profitability in the short term despite the long-term benefits for sustainability and economic development.

Technological innovation is essential for the energy sector to transition to sustainable practices. Renewable energy technologies, such as solar and wind, as well as advancements in energy storage and grid management, are transforming the industry. According to Krivačić & Janković [36], companies that invest in innovative technologies are more likely to achieve their sustainability goals and gain a competitive advantage in the market.

However, the adoption of these technologies varies significantly across regions. In countries where the cost of renewable energy technologies remains high, companies are slower to integrate them into their operations [37]. Additionally, the literature points to the importance of government incentives, such as subsidies and tax credits, to support the adoption of these technologies [16]. Without such incentives, many energy companies may be reluctant to bear the high upfront costs of transitioning to renewable energy sources.

Energy and utilities companies are also evaluated on their social responsibility, particularly in terms of how they engage with the communities where they operate. Corporate social responsibility (CSR) initiatives that focus on local economic development, education, and healthcare are increasingly important in the energy sector [38]. For example, energy companies operating in rural areas often invest in infrastructure projects, such as building schools and hospitals, as part of their CSR efforts.

However, critics argue that some of these CSR activities are primarily motivated by a desire to improve public perception rather than create meaningful social impact [39]. In some cases, energy companies have been accused of contributing to social and environmental problems in the communities where they operate, particularly in regions where fossil fuel extraction causes environmental degradation and health risks [40].

This highlights the need for more genuine engagement between energy companies and local communities to ensure that CSR efforts contribute to long-term social and environmental well-being.

The literature indicates that while energy and utilities companies are making progress in integrating sustainability into their business models, challenges remain. Corporate governance, regulatory frameworks, technological innovation, and social responsibility are all crucial factors influencing the extent to which these companies can contribute to both sustainability and economic development. As the pressure from stakeholders—including governments, investors, and communities—increases, this sector will need to continue evolving to meet the demands of a low-carbon economy.

Measuring the performance of ESG activities is important but challenging to achieve due to the complexity of reporting and the activity carried out by companies. Thus, several rating agencies have different measurement systems that need to converge [41]. The methodologies used by rating agencies are not consistent in their evaluation, and they also have different measurement systems, such as Refinitiv's decimal measurement system, where the maximum score is 100. Sustainalytics is also based on the decimal score, where the best score is represented by the lowest score possible [42]. For the MSCI's letter measurement system, the AAA score represents the best score (leader). The confusion between valuation methodologies [43] and the measurement divergence can be mitigated when European companies are evaluated with the help of the EU Taxonomy [44].

Therefore, after analyzing the ESG rating methodologies and available data, we considered the Refinitiv Eikon methodology the most accessible for conducting research.

The environmental factor (environment) within the Refinitiv Eikon platform includes an in-depth evaluation of performance related to the use of natural resources, carbon emissions, and other forms of pollution, as well as strategies implemented to manage climate risks. For companies in the utilities and energy sector, which operate in an industry with a particularly significant environmental impact, the assessment of ESG risks based on these criteria is crucial. For example, companies that proactively report reductions in greenhouse gas emissions and improve energy efficiency are rewarded with higher scores [45]. These indicators are directly correlated with the objectives of international climate change, such as the Paris Agreement, which calls for a drastic reduction in carbon emissions.

The social factor (social) on the Refinitiv Eikon platform focuses on the impact that companies have on employees, customers, and communities. This includes evaluating workplace safety practices, diversity and inclusion, community engagement, and respect for human rights. Companies in the utilities and energy sector that have strong policies on employee health and safety, particularly in an industry characterized by high operational risks, receive higher social scores [45]. Additionally, the Eikon platform places significant emphasis on diversity at the management and board levels, which are elements that contribute to better corporate governance and an increased capacity for innovation.

The governance factor (governance) is essential for companies in the utilities and energy sector, given their frequent interactions with governments and the strict regulations regarding operational safety and legal compliance. Refinitiv Eikon assigns a governance score based on indicators such as board structure, anti-corruption policies, financial transparency, and non-financial reporting practices. For instance, companies that adhere to international reporting standards, such as those issued by the Global Reporting Initiative (GRI) or the Task Force on Climate-Related Financial Disclosures (TCFDs), receive higher scores in this area [45]. The platform also monitors governance scandals, executive compensation practices, and risk management policies, providing a comprehensive view of corporate governance quality.

Another relevant aspect is the international comparability of ESG data provided by Refinitiv Eikon. This feature allows for the assessment of ESG performance across companies from different countries and regions, offering investors a global perspective on the utilities and energy industry. Thus, companies from countries with stricter ESG standards, such as those in the European Union, are evaluated comparatively with those in emerging economies, where ESG regulations are less developed [46]. This comparability provides a solid foundation for global investors seeking to identify the most sustainable companies in the energy sector.

An additional advantage of using the Refinitiv Eikon platform is its ability to customize ESG assessments according to the interests and preferences of investors. For example, an investor interested in a company's climate performance can adjust filters to prioritize environmental factors and, thus, evaluate the contributions of utilities companies to reduce carbon emissions. This flexibility makes the platform extremely useful for a wide range of investors, from those with purely financial interests to those concerned with the social and environmental impacts of their investments [45].

Therefore, utilizing the Refinitiv Eikon platform to assess the ESG scores of companies in the energy and utilities sector offers a comprehensive and well-structured approach to evaluating sustainability performance.

To fulfill the research gap regarding the connection between corporate adherence to (SDGs) and financial outcomes, we tested the following hypotheses:

H1. *There is a direct correlation between ESG scores and the return on assets (ROAs) of the companies from the energy and utilities sector.*

H2. *There is a direct correlation between ESG scores and the return on equity (ROE) of the companies from the energy and utilities sector.*

3. Materials and Methods

3.1. Data and Sample

Data were collected from secondary sources from Refinitiv Eikon over a period of five years, from 2019 to 2023, to capture medium-term evolution and trends. The selected sample comprised 91 distinct companies that were rated with an ESG (environmental, social, governance) score greater than 50. This approach allowed for a comprehensive and diverse assessment of the impact of ESG scores on company performance in the context of a significant economic and social period.

The study included a global sample, with companies from all six continents included in the database: Africa (code 1), North America (code 2), South America (code 3), Asia (code 4), Australia (code 5), and Europe (code 6). These companies belong to two industries, namely energy and utilities. From the synthesis of the information, it was found that no company from Africa was included in the sample, but in order to have a global picture, this continent remained coded with the value 1, and the other five continents had codes from 2 to 6.

Figure 1 presents the distribution of energy companies by continent.

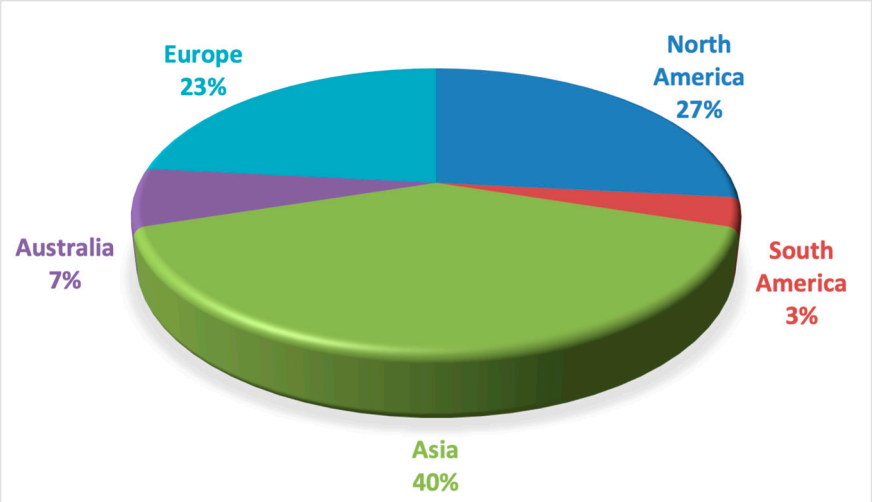

Figure 1. The structure of energy companies by continent. Source: own processing.

Figure 1 illustrates the structure of energy companies by continent. Asia accounts for the largest proportion, representing 40% of the total energy companies, indicating its dominant role in the global energy sector. Europe follows with 27%, reflecting its substantial but lesser presence compared to Asia. North America holds 23% of the energy companies, placing it in the mid-range, suggesting a notable yet more balanced participation in the industry.

In contrast, Australia, with 7%, represents a smaller share, while South America, with 3%, has the lowest representation among the continents. These figures suggest that

energy companies are predominantly concentrated in Asia and Europe, with relatively fewer companies in Australia and South America, highlighting regional disparities in the distribution of energy companies worldwide.

To highlight the companies with the best ESG scores, Figure 2 includes the energy companies that had an ESG score higher than 80 over a five-year period from 2019 to 2023.

Figure 2. Top energy companies with an ESG average greater than 80. Source: own processing.

From Figure 2, it follows that the top company is by Snam SpA, followed by Baker Hughes Co, Halliburton Co, Repsol SA, Koc Holding AS, and Indo Tambangraya Megah Tbk PT. For most companies, there is minimal variation in ESG scores over the years, indicating a stable commitment to sustainability and corporate governance.

Snam SpA shows the highest scores, consistently exceeding 85, with a slight increase from 2022 to 2023. This suggests a strong focus on improving environmental, social, and governance practices.

Baker Hughes Co and Halliburton Co display consistent scores above 80 but with less visible growth compared to other companies. This could suggest that while these companies are maintaining strong ESG performance, further improvements have been more incremental.

Repsol SA and Koc Holding AS exhibit similar stability, with scores also consistently above 80. Koc Holding AS shows a modest but steady upward trend, which may reflect progressive improvements in ESG initiatives. Repsol SA maintains relatively consistent scores throughout the period, indicating sustained efforts to maintain ESG performance.

Indo Tambangraya Megah Tbk PT shows a steady trajectory as well, with scores consistently exceeding 80, highlighting its commitment to ESG principles. The marginal variations across the years suggest efforts to maintain or slightly enhance sustainability practices.

In summary, all the companies depicted maintained high ESG scores throughout the observed period, signifying their robust performance across environmental, social, and governance criteria. These data reflect a sector-wide commitment to sustainability, with several companies demonstrating slight yet consistent improvements over time, indicative of their proactive approach to enhancing ESG practices.

Furthermore, Figure 3 presents the distribution of utilities companies by continent. This geographic representation underscores the varying presence of utilities in different regions, highlighting the concentration of companies in North America and Europe while also noting the emerging significance of utilities companies in South America and Asia. This distribution not only illustrates the current landscape of the utilities sector but also

points to potential areas for growth and investment, particularly in regions where economic development is driving increased demand for utilities services.

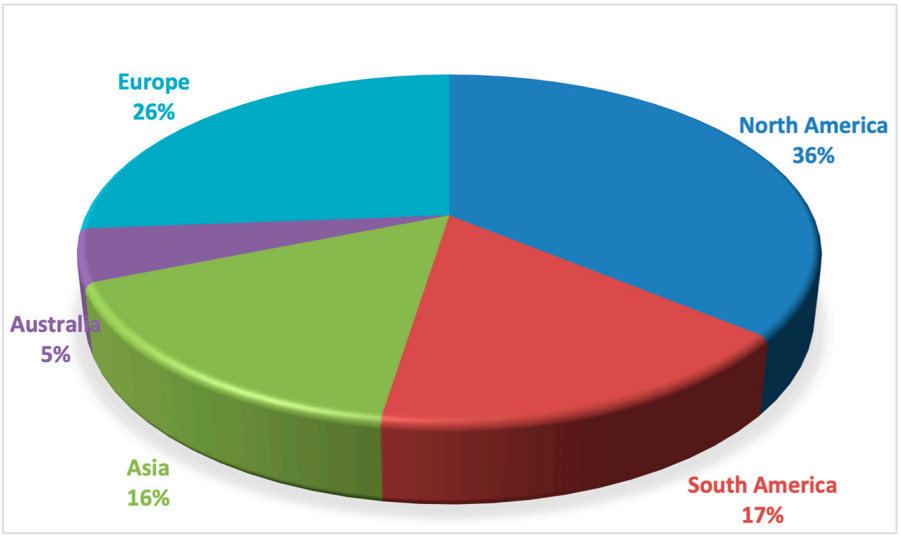

Figure 3. The structure of utilities companies by continent. Source: own processing.

Figure 3 illustrates the geographical distribution of utilities companies across various continents. North America accounts for the largest share, representing 36% of the total number of utilities companies, followed by Europe at 26%. South America contributes 17% to the overall distribution, while Asia constitutes 16% of the market. Australia has the smallest representation, making up just 5% of the total.

This distribution underscores a notable concentration of utilities companies in North America and Europe. The predominance of these regions can be attributed to several factors, including their advanced infrastructure, well-established regulatory environments, and a historical legacy of large-scale utilities operations. These elements create a conducive environment for utilities companies to thrive, facilitating investments in energy generation, transmission, and distribution. Additionally, the regulatory frameworks in these regions often prioritize sustainability and innovation, further enhancing the operational capabilities of utilities firms.

The significant presence of utilities companies in South America and Asia reflects the growing economic landscape and increasing demand for utilities services in these regions. Factors such as rapid population growth, urbanization, and industrialization contribute to this trend, leading to heightened energy needs and a corresponding demand for utilities infrastructure. In South America, emerging economies are investing in modernizing and expanding their utilities sector to accommodate urban growth and improve service delivery. Similarly, in Asia, countries are experiencing substantial urban migration, necessitating investments in energy and utilities services to support expanding metropolitan areas.

Conversely, Australia's relatively small share of the utilities market may be attributed to its lower population density and smaller overall market size compared to other regions. The vast geographical area of Australia, coupled with a dispersed population, presents unique challenges for utilities companies, potentially limiting the scalability of operations and investments in infrastructure.

This geographic distribution suggests that the development of the utilities sector is heavily influenced by factors such as economic maturity, demographic needs, and regional infrastructure capacities. It also highlights potential growth areas in emerging markets, particularly in Asia and South America, where economic expansion is likely to drive increased investments in utilities services. As these regions continue to develop, utilities companies may find new opportunities to expand their operations and enhance their service offerings, thereby contributing to overall economic growth and sustainability.

Moreover, this analysis prompts the consideration of the strategic implications for utilities companies operating in diverse geographical contexts. Firms may need to adopt tailored approaches that consider local market conditions, regulatory frameworks, and consumer demands to effectively navigate the challenges and opportunities presented by their respective regions.

As in the case of energy companies, Figure 4 includes the utilities companies that had an ESG score higher than 80 during the period from 2019 to 2023.

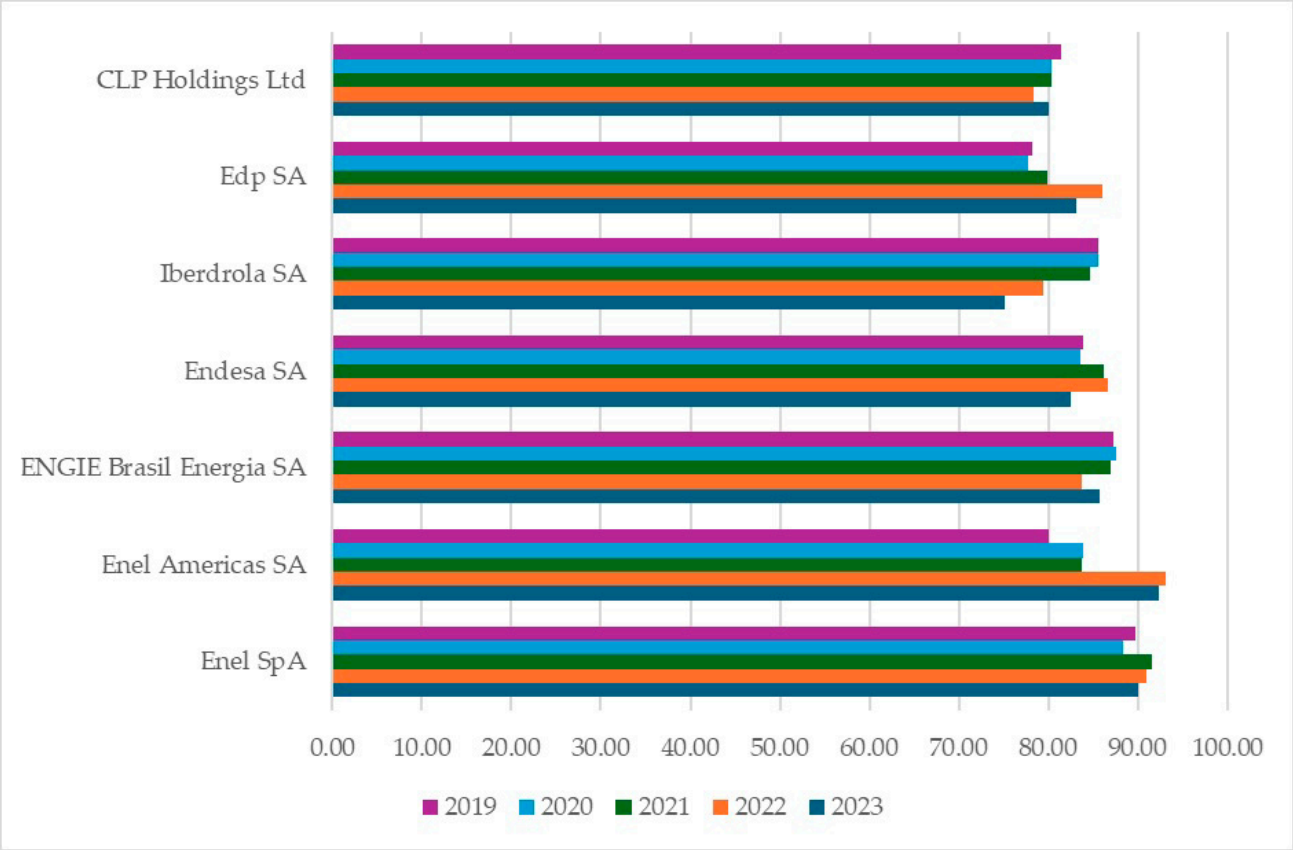

Figure 4. Top utilities companies with an ESG average greater than 80. Source: own processing.

Figure 4 shows that the top company for the entire analyzed period is Enel SpA, followed by Enel Americas SA, ENGIE Brasil Energia SA, Endesa SA, Iberdrola SA, and CLP Holdings Ltd., EDP SA.

A general upward trend in ESG performance is apparent across the observed years, although specific fluctuations can be noted for certain companies in individual years. Notably, Enel SpA and Enel America SA exhibit a consistent trajectory of improvement, reflecting their robust commitment to enhancing ESG practices over time. In contrast, ENGIE Brasil Energia SA, Endesa SA, EDP SA, and CLP Holdings Ltd. demonstrate a degree of stability, maintaining elevated ESG scores with minimal year-to-year fluctuations. Meanwhile, Iberdrola SA also shows high ESG ratings, although with decreasing rates compared to other companies.

These findings underscore the proactive efforts of major utilities companies to uphold stringent ESG standards, which is an endeavor that is increasingly critical in light of the growing investor and regulatory emphasis on sustainability. Given the substantial environmental footprint of utilities companies, they are under considerable pressure to transition towards more sustainable and environmentally friendly operations. The consistent performance of these firms suggests that the utilities sector is positively responding to

these expectations, particularly as ESG scores assume greater significance in determining long-term corporate viability and influencing investor decisions.

Moreover, the results may indicate that companies prioritizing strong ESG practices could reap benefits in terms of their enhanced reputation, increased stakeholder trust, and improved financial performance. This aligns with broader trends within the energy sector, which increasingly favors sustainability and responsible governance. Thus, the commitment to ESG principles not only serves to meet regulatory and societal expectations but may also translate into tangible competitive advantages in the market.

3.2. Methodology

The empirical analysis consists of a panel data econometric model in which we chose as dependent variables the financial indicators, ROA and ROE, which were also validated in previous research [22,47] and tested for their correlation with the environment, social, and governance index (ESG). We also included in the model continents of exchange (COA), total assets (TAs), and the industry classification benchmark (ICB) as control variables for a better and more robust analysis, COE (presented in Table 1).

Table 1. Description of indicators.

Indicator	Code	Description
Return on Assets	ROA	Expressed as a percentage based on information from the annual financial statements.
Return on Equity	ROE	Expressed as a percentage based on the information from the annual financial statements.
Environmental, Social, and Governance	ESG	ESG scores are based on the Refinitiv Eikon database.
Continent of Exchange	COE	COE refers to the continent where the stock exchange on which a company is listed is located. This is a geographic variable used to identify the location of stock exchanges (e.g., Europe, Asia, North America, etc.), expressed by numbers from 1 to 6.
Industry Classification Benchmark	ICB	Energy companies—code 1. Utilities companies—code 2.
Total Assets	TA	TA represents the total sum of all assets owned by a company, including fixed assets (equipment, real estate) and current assets (cash, receivables). It is a key indicator for assessing the size and financial stability of a company.

Source: own processing.

The variables included in the econometric model are described in Table 1.

The econometric model takes the following form:

$$X_{it} = \alpha it + \beta_i Y_{it} + \beta_i C_{it} + \varepsilon_{it} \quad (1)$$

X—dependent variables: ROA, ROE;

Y—independent variable: ESG;

C—control variables: COE, TA, ICB.

To decide on the proper regression type, we started the testing with an ordinary least squared (OLS) regression to validate the chosen model, and the multicollinearity was checked using the Variance Inflation Factor. The VIF was 1.08 and, in both cases, smaller than the threshold of 7, so we did not have multicollinearity problems. We performed the Hausman test to determine if the regression with fixed effect or the one with random effects was more suitable for our data and obtained a chi2(2) of 33.42 for the model with ROA as the dependent variable and a chi2(2) of 36.92 for the model with ROE as the dependent variable, with a *p*-value of 0.0000 in both cases; thus, we rejected the null hypothesis and utilized a regression with

fixed effects. We also tested for heteroskedasticity using the Breusch–Pagan/Cook–Weisberg test and obtained a chi2(1) of 576.72 and 42.79, respectively, with a *p*-value, in both cases, of 0.0000, so we rejected the null hypothesis of homoskedasticity. Pesaran's test for cross-sectional independence revealed a coefficient of 8.639 and 6.028, respectively, with $p = 0.0000$, from which the cross-sectional dependence of the residuals resulted.

Considering the results obtained from all the tests, we decided to use the Prais–Winsten regression, correlated panels with corrected standard errors (PCSEs) and panel-level heteroskedastic and correlated scores across panels and the autocorrelation of residuals based on the Durbin–Watson statistic. All the testing and estimations were performed using Stata 17 software.

4. Results

The descriptive statistics of the variables studied are presented in Table 2.

Table 2. Descriptive statistics for all data.

Code	Obs.	Mean	Stand Dev	Min	Max
ROA	455	0.0479	0.0422	0.0004	0.5573
ROE	455	0.1426	0.1008	0.0008	0.7584
ESG	455	70.6865	9.7058	50.1127	94.5429
COE	455	3.7802	1.5692	2	6
TA	455	41,720.1	60,175.96	568.579	393,969.4
ICB	455	1.6703	0.4706	1	2

Source: own processing using Stata 17 software.

Table 2 shows that the financial indicator ROA (return on asset) had a mean value of 4.79% for all companies, varying from 0.04% to 55.73%, which indicates a high difference in the utilization of assets and ROE (return on equity) had a mean value of 14.26%, registered a minimum value of 0.08% and a maximum value of 75.82% meaning that there were considerable differences in the returns offered to shareholders. The mean value of the environmental, social, and governance score (ESG) for all energy companies was 70.68. TAs (total assets) registered a very high standard deviation of 60,175.96 from the mean, highlighting that our sample consists of small and medium companies, as well as very big companies.

Considering that we performed a robustness analysis on the type of company, the descriptive statistic for each type is presented in Tables 3 and 4.

Table 3. Descriptive statistics for energy companies.

Code	Obs.	Mean	Stand Dev	Min	Max
ROA	150	0.0658	0.0636	0.0004	0.5573
ROE	150	0.1677	0.1165	0.0008	0.7584
ESG	150	73.3287	10.1195	50.1127	94.5429
COE	150	3.9666	1.4536	2	6
TA	150	50,221.73	82,108.81	568.579	393,969.4

Source: own processing using Stata 17 software.

Table 4. Descriptive statistics for utilities companies.

Code	Obs.	Mean	Stand Dev	Min	Max
ROA	305	0.0391	0.0210	0.0028	0.1497
ROE	305	0.1302	0.0898	0.01324	0.6732
ESG	305	69.8788	9.4079	50.1127	93.1470
COE	305	3.6885	1.6175	2	6
TA	305	37,538.9	45,280.2	1250.8	235,310.4

Source: own processing using Stata 17 software.

For energy companies, there were 150 observations, with an average ROA of 6.58%, a minimum of 0.04%, and a maximum of 55.73%. ROE also had an average value of 16.77%, from a minimum of 0.08% to a maximum of 75.84%. The average ESG score was 73.32, from a minimum of 50.11% and a maximum of 94.54% (e.g., Snam SpA).

Companies from the utilities domain registered lower percentages than the ones from the energy sector for ROA, max 14.97%, and for ROE, max 67.32%. The average ESG score for these companies was 69.87. But, in both domains, there are different sizes of companies.

A graphical representation of the main analysis indicators, ROA, ROE, and ESG, is presented in Figure 5 for each sector: energy and utilities. Companies from the utilities sector registered lower and more stable levels of ROA than the ones from the energy sector, but the levels of ROE fluctuated in both sectors.

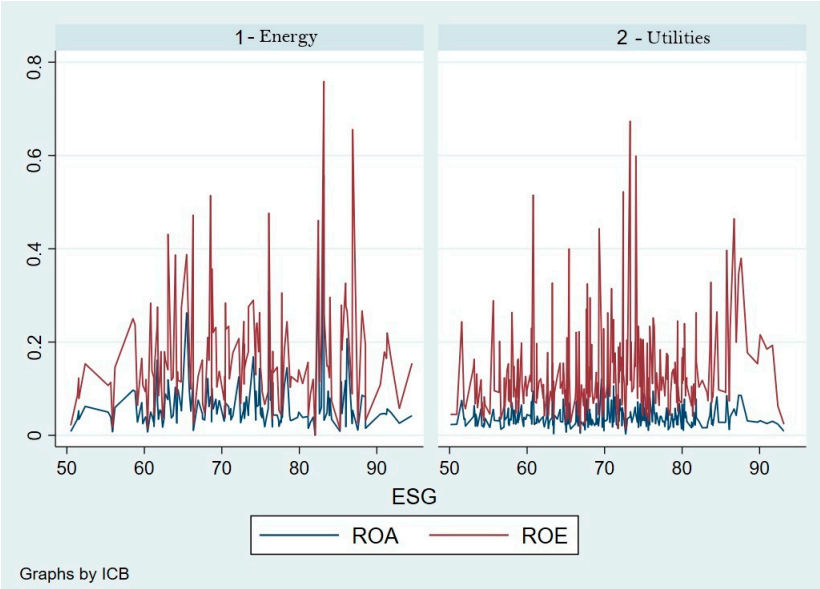

Figure 5. Graphical representation of ROA, ROE, and ESG by sector. Source: own processing using Stata 17 software.

In order to deepen the analysis, statistics of the indicators of the companies on the five continents were also considered, as presented in Table 5.

As can be seen from Figures 1 and 3, based on selection criteria, the companies from Africa were not included in the sample. Combined with the two industries, most companies were from North America, followed by those from Europe and Asia. The highest average ESG scores were obtained by companies from Europe, followed by those from South America. The lowest average ESG score was recorded by companies from Australia, which is the continent where the company with the lowest ESG score in the sample is also located.

Regarding the financial performance indicators, the highest average value of ROA was recorded by companies from Asia (where the energy company with the highest value is included) and the lowest by companies from North America (where the energy company

with the lowest value is included). Also, the highest average value of ROE was recorded by companies from South America, and it was found that the lowest average value belongs to a company from Australia.

The analysis of company indicators on continents and sectors shows that there are significant differences from one continent to another, both in terms of performance indicators and ESG scores, which shows that the regulations regarding sustainability and corporate governance are essential in the evaluation of the financial and non-financial performances of companies.

We also performed a graphical representation of the main indicators, ROA, ROE, and ESG, for each continent (presented in Figure 6): North America, South America, Asia, Australia, and Europe. The same pattern can be observed, with lower and more stable levels of ROA and fluctuating levels of ROE in all continents, except for Asia, where ROA registered higher fluctuations in value.

Table 5. Statistics of company indicators by continent.

COE		ROA	ROE	ESG	ICB	TA
2. North America Obs.150 (40E+110U)	Mean	0.0370	0.1320	69.2929	1.73	45,374.33
	Min	0.0004	0.0008	50.5072	1	568.57
	Max	0.1497	0.6732	92.9017	2	178,086.00
3. South America Obs. 55 (5E+50U)	Mean	0.0549	0.1654	70.6952	1.90	11,251.87
	Min	0.007	0.0179	54.0609	1	1449.46
	Max	0.1060	0.5149	93.1473	2	36,854.68
4. Asia Obs. 110 (60E+50U)	Mean	0.0630	0.1400	69.1447	1.45	54,343.55
	Min	0.0032	0.0132	51.3638	1	1158.62
	Max	0.5573	0.7584	86.8771	2	393,969.40
5. Australia Obs. 25 (2E+3U)	Mean	0.0398	0.0855	62.8715	1.6	14,399.67
	Min	0.0137	0.0283	50.1127	1	3158.89
	Max	0.1218	0.2275	77.7932	2	59,321.00
6. Europe Obs.115 (35E+80U)	Mean	0.0463	0.1604	75.6735	1.69	45,390.11
	Min	0.0028	0.0143	51.5701	1	1250.83
	Max	0.1708	0.5143	94.5439	2	235,310.40

Source: own processing using Stata 17 software.

The correlation matrix of the variables is presented in Table 6.

The correlation matrix, presented in Table 6, shows a direct significant correlation of ROA with ROE and ESG and an indirect significative correlation with TA and ICB, at a 1% level of significance. ROE has a significant direct correlation with ESG and an indirect statistically significant correlation with TA and ICB. The independent variable ESG has a positive significant correlation with control variables COE and TA and a negative correlation, at a 5% level of significance, with ICB.

Table 7 shows the results obtained from the econometric model, the coefficients of correlation, and the significance levels and t-values from Student's test are in parentheses. The variables of the ESG score and TA were converted into natural logarithms to ensure more unified data and obtain more reliable results.

Table 6. Correlation matrix.

Code	ROA	ROE	ESG	COE	TA	ICB
ROA	1					
ROE	0.6329 ***	1				
ESG	0.0926 **	0.1722 ***	1			
COE	0.0772	0.0640	0.1980 ***	1		
TA	−0.1704 ***	−0.0787 *	0.1026 **	0.0173	1	
ICB	−0.2974 ***	−0.1748 ***	−0.1140 **	−0.0834 *	−0.0232	1

Note: ***—significance level at 1%; **—significance level at 5%; *—significance level at 10%. Source: own processing using Stata 17 software.

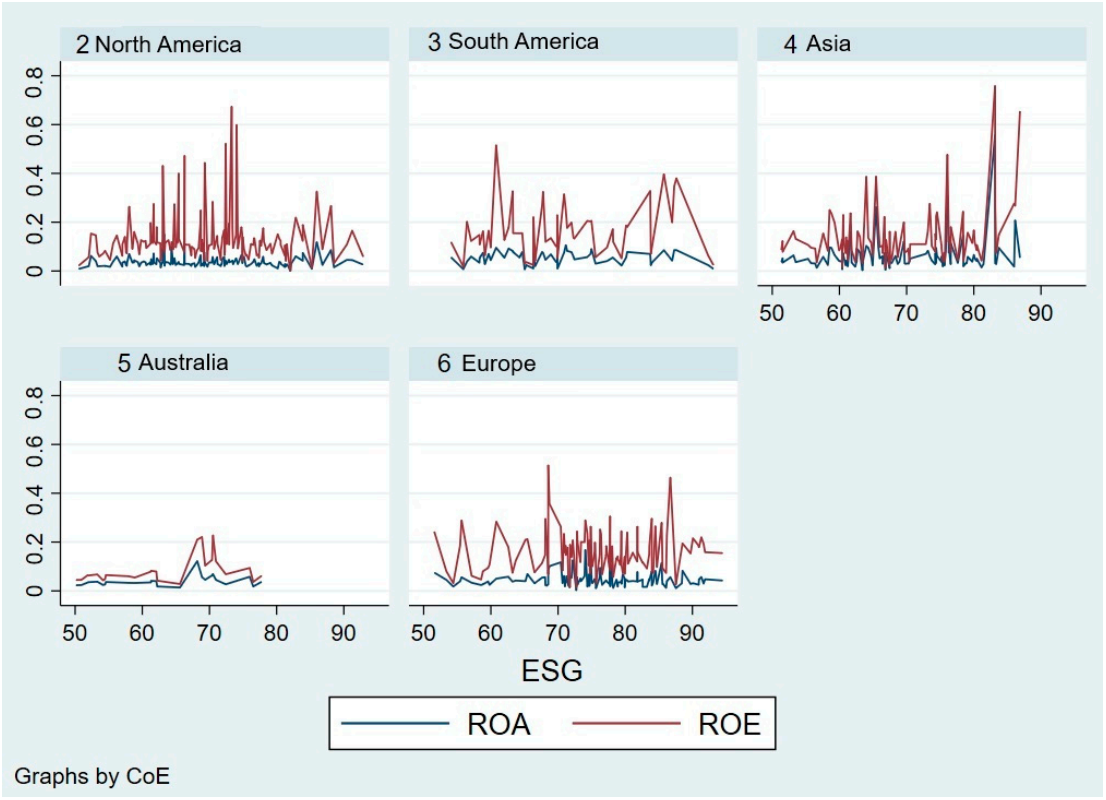

Figure 6. Graphical representation of ROA, ROE, and ESG by continent. Source: own processing using Stata 17 software.

Table 7. Regression results.

ROA—Dependent variable							
Sample	**Obs**	**R-squared**	**Wald chi2**	**ln_ESG**	**COE**	**ln_TA**	**ICB**
All	455	0.64	6442.47 ***	0.0440 (5.71) ***	0.0005 (1.59) *	−0.0101 (−6.05) ***	−0.02443 (−2.73) ***
Energy	150	0.58	84.71 ***	0.0449 (4.57) ***	0.0041 (3.57) ***	−0.0144 (−3.97) ***	
Utilities	305	0.80	4161.87 ***	0.0245 (13.28) ***	−0.0002 (−1.22)	−0.0064 (−8.86) ***	
ROE—Dependent variable							
Sample	**Obs**	**R-squared**	**Wald chi2**	**ln_ESG**	**COE**	**ln_TA**	**ICB**
All	455	0.68	32011.68 ***	0.0723 (7.31) ***	0.0013 (0.97)	−0.1009 (−4.05) ***	−0.0362 (−1.69) *
Energy	150	0.70	62.13 ***	0.0774 (6.24) ***	0.0068 (2.19) ***	−0.0192 (−4.50) ***	
Utilities	305	0.68	2015.12 ***	0.0394 (4.94) ***	0.0004 (0.30)	−0.0038 (−1.26)	

Note *t*-values are reported in parentheses: ***—significance level at 1%; *—significance level at 10%. Source: own processing using Stata 17 software.

The model that had an ROA and dependent variable had an R-square of 0.64, which means that 64% of the variation in ROA might be influenced by the variation in the independent and control variables. Similar results were obtained for ROE, where R-square was 0.68, which means that 68% of its variation might be explained by changes in the independent and control variables. Wald chi2 registered high values, bigger than the threshold, and was also statistically significant for all models. For the companies from the energy sector, 58% of ROA can be influenced by the variation in all variables while 70% of the variation in ROE can be explained by the changes in the indicators. For the utilities sector, the situation was reversed, with a higher level of variation in ROA; 80% could be explained by the changes in the independent and control variables, whereas only 68% of the variation in ROE could be explained this way.

The analysis of the dataset revealed significant correlations between ESG scores and financial performance indicators among firms in the energy and utilities sector. Specifically, higher ESG scores were positively associated with return on assets (ROAs) and return on equity (ROE). Regression analysis indicated that for each unit increase in the ESG score, firms experienced an average increase of 4.16% in ROA and 6.85% in ROE, suggesting that strong ESG practices are linked to enhanced operational efficiency and profitability.

A deeper analysis of the two domains showed that the correlation between ESG scores and financial indicators was higher for the energy sector than the utilities sector. For each unit increase in the ESG score, energy companies had an average increase of 4.49% in ROA and 7.74% in ROE compared to 2.45% in ROA and 3.94% in ROE for utilities companies.

The size of the companies, expressed by total assets, registered a negative correlation with the financial indicators, meaning that smaller companies had a higher efficiency for their assets and a higher return on equity.

5. Discussion

The growing emphasis on sustainability and economic development in the energy and utilities sector highlights the dual responsibility of companies to act in environmentally and socially responsible ways while contributing to economic growth. This discussion focuses on three key dimensions: environmental stewardship, social impact, and governance practices.

Energy and utilities companies are significant contributors to greenhouse gas emissions, making their sustainability strategies crucial. Many firms are investing in renewable

energy sources—such as solar, wind, and hydroelectric power—to reduce their carbon footprints and align with global decarbonization trends [48]. These proactive measures not only mitigate climate change but also enhance reputational capital, fostering trust among stakeholders who prioritize environmental responsibility [6].

In addition to environmental considerations, these companies have a profound social impact on their communities. By ensuring reliable access to energy and engaging in corporate social responsibility (CSR) initiatives—such as community outreach, job training, and educational programs—utilities companies can foster local economic development and improve living standards [49]. Such investments benefit communities and align with companies' long-term interests, increasing customer loyalty and market stability [50].

Effective governance is vital for adhering to sustainability commitments. Strong frameworks that prioritize transparency and accountability foster stakeholder trust [51]. Many companies are integrating sustainability into their governance structures by establishing dedicated sustainability committees, reinforcing their commitment to responsible practices [52].

Energy and utilities companies significantly influence local and national economies through investments in infrastructure and human capital. These investments can drive economic growth and stimulate job creation in the renewable energy sector [53]. However, companies that fail to adapt to sustainable practices risk facing regulatory penalties and reputational damage, threatening their economic viability [54].

Previous research on financial performance confirmed that ROA and ROE are good measurement indicators [55]. In other studies, ROA is considered the best predictor of firm performance [56].

Based on the results obtained in the models with dependent variables, ROA and ROE, both models registered close R-squared values and were validated. In contrast, in some studies, correlations with ESG metrics are validated with only one of these dependent variables [22].

Most studies [57] have identified a positive relationship between sustainability activities, measured according to various criteria and methodologies, and financial performance. Similar findings to this research have been reported in previous research [10,12], thus highlighting the complexity of the interaction between ESG criteria and financial performance, suggesting the need for additional investigations to comprehensively understand these developments.

Regarding the correlation between the dependent variables, ROA and ROE, and the control variable, COE, a direct correlation resulted with only one exception. However, this correlation was only validated for the energy sector at a high significance level. Therefore, the continent where the company operates is relatively independent of its performance. As noted, due to the selection criteria, companies from Africa were not included in the sample, representing a research limitation.

Furthermore, the analysis revealed a negative relationship between the dependent variables (ROA and ROE) and the control variables (TA and ICB) incorporated in the study. This phenomenon can be attributed to the fact that control variables reflect economic or structural factors that can negatively affect firms' financial performance, consequently diminishing their profitability.

Similar findings were reported by Puente De La Vega Caceres [58], who identified both positive associations between ESG performance and financial metrics and negative impacts related to specific control variables. These results highlight the complexity of the interaction between ESG criteria and financial performance, suggesting the need for further investigations to comprehensively understand these dynamics.

In summary, the responsibility of energy and utilities companies encompasses environmental stewardship, social impact, governance practices, and contributions to economic development. As they navigate the evolving landscape of sustainability, their commitment to responsible practices will be pivotal in shaping their long-term success and relevance in a sustainability-focused world.

6. Conclusions

The energy and utilities sector holds strategic importance in the transition towards a sustainable economy governed by ESG (Environment, Social, Governance) principles. Historically, this sector has been characterized by massive infrastructure investments and significant environmental impact, particularly due to the use of natural resources and greenhouse gas emissions [7]. Currently, companies in this field face pressure from investors, authorities, and society to reconfigure their business models by integrating sustainable practices that address the need to reduce environmental impact and improve governance.

From an environmental (E) perspective, companies in the energy sector significantly contribute to carbon emissions and, consequently, to climate change [59]. In this context, the transition to renewable energy sources, such as wind and solar power, is essential for achieving climate neutrality goals and complying with international regulations, such as the Paris Agreement, according to the UN Agenda [60].

For the social (S) dimension, utilities companies have the responsibility to provide energy safely, affordably, and consistently, including in vulnerable areas [61]. Additionally, protecting employees' rights, ensuring safe working conditions, and promoting diversity and inclusion are central elements for ESG performance in this sector [62]. The impact on local communities and the commitment to sustainable development are increasingly important in investors' assessments of corporate social responsibility.

The assessment of energy and utilities companies regarding their responsibility in terms of sustainability and economic development reveals a complex interplay between regulatory compliance, market demands, and corporate practices. The integration of environmental, social, and governance (ESG) principles is not merely a trend but a necessary evolution for companies aiming to thrive in a sustainability-oriented landscape.

Firstly, companies in this sector that effectively implement ESG strategies are better equipped to mitigate operational and financial risks associated with climate change. This proactive approach enables them to secure enhanced access to capital and build stronger relationships with stakeholders, thereby fostering investor confidence.

Secondly, regulatory frameworks such as the Corporate Sustainability Reporting Directive (CSRD) [63] and the European Sustainability Reporting Standards (ESRSs) [64] emphasize the importance of transparency in corporate governance and environmental stewardship. Adherence to these regulations not only meets compliance requirements but also serves as a vital tool for companies to demonstrate their commitment to sustainability, thus enhancing their reputational capital.

Furthermore, technological advancements play a crucial role in enabling energy and utilities companies to meet the increasing demand for renewable energy and more efficient operational processes. Companies that invest in innovative technologies, such as smart grids and energy storage systems, are well-positioned to adapt to evolving consumer preferences and contribute positively to sustainable economic development.

In summary, energy and utilities companies have a significant responsibility to align their operations with sustainability principles and contribute to economic development. By embracing ESG frameworks, enhancing transparency, and leveraging technology, these companies can achieve long-term success while addressing the pressing challenges of climate change and resource management. As the global emphasis on sustainability intensifies, the commitment of the energy and utilities sector to these principles will be critical for fostering a sustainable future.

These findings underscore the importance of integrating ESG considerations into corporate strategies. Firms that prioritize ESG factors are likely to achieve competitive advantages, translating sustainability efforts into improved financial metrics. This research reinforces the notion that sustainability and profitability are not mutually exclusive but rather complementary objectives that can enhance long-term corporate success. This confirms the concerns of the authors Wheeler and Elkington [65], expressed more than twenty years ago, regarding the need to improve effective communication with stakeholders through corporate reporting. Their thesis is valid even today.

This research's practical implications are connected with the stakeholder theory, so investors, as an essential category of users of companies' reports, can primarily consider their financial and non-financial performance when deciding to invest. This study's results are helpful for managers and other decision-makers within companies to establish strategies that will improve their financial performance. Also, the findings are essential for researchers and academics because we have confirmed that ROA and ROE are suitable proxies for measuring company performance.

The research results should be interpreted considering several limitations, one being related to the sample size and the fact that the ESG scores established by a single evaluation agency, namely Refinitiv Eikon, were used. Furthermore, the proposed model may not capture all potential influencing factors. These limitations can be addressed in future research by performing comparative analysis, extending the period of study, and including new variables in the econometric model.

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