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How can ESG impact the financial performance of the European Energy Sector?

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Master in Business Economics and Competition

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BUSINESS
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"Just when you think you know something,

you have to look at it in a different way."

Dead Poets Society (1989), dir. Peter Weir.

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Resumo

A integração dos fatores ESG (Ambiental, Social e Governança*)* tornou-se um elemento central na estratégia empresarial e na avaliação do desempenho das empresas. Compreender a relação entre as práticas de sustentabilidade e os resultados financeiros no setor energético, bem como os seus obstáculos e limitações, é essencial para avaliar a competitividade e o valor económico das empresas inseridas neste setor devido às fortes pressões regulatórias e ambientais às quais estão sujeitas.

Este estudo pretende avaliar o impacto destes fatores no desempenho financeiro das empresas do setor energético europeu, nomeadamente o impacto na Rentabilidade dos Ativos, Rentabilidade do Capital Próprio e Q de Tobin entre 2000 e 2024. Assim sendo, construiu-se um modelo econométrico de dados em painel para explicar a evolução do desempenho financeiro em função dos indicadores ESG. Como variáveis de controlo foram incluídos o tamanho da empresa, a alavancagem, a idade, assim como *dummies* de país e setor.

Os resultados obtidos indicam que, no setor energético europeu, existe uma relação positiva entre os fatores ESG e o desempenho financeiro das empresas, ainda que de forma diferente entre os três pilares. As iniciativas sociais e de governança são as mais valorizadas pelo mercado, estando relacionadas com um desempenho financeiro positivo, enquanto as iniciativas ambientais apresentam resultados mais fracos devido às características do setor. Conclui-se que a integração dos fatores ESG é cada vez mais valorizada pelos mercados e que pode, de facto, melhorar o desempenho financeiro das empresas que neles investem.

Palavras-Chaves: ESG, Desempenho financeiro, Sustentabilidade, Energia

Classificação JEL: P18, Q40

Abstract

The integration of Environmental, Social, and Governance (ESG) factors has become a central element in corporate strategy and in the assessment of firms' performance. Understanding the relationship between sustainability practices and financial outcomes in the energy sector, as well as their obstacles and limitations, is essential to evaluate the competitiveness and economic value of companies in this sector, given the strong regulatory and environmental pressures they are subject to.

This study aims to assess the impact of these factors on the financial performance of European energy sector firms, namely their effect on Return on Assets, Return on Equity, and Tobin's Q between 2000 and 2024. Accordingly, an econometric panel data model was constructed to explain the evolution of financial performance as a function of ESG indicators. Control variables included firm size, leverage, age, and country and sector dummies.

The results indicate that, in the European energy sector, there is a positive link between ESG factors and firms' financial performance, although differences exist across the three pillars. Social and governance initiatives are most valued by the market and are associated with positive financial results, while environmental initiatives show weaker outcomes due to the sector's characteristics. It is concluded that integrating ESG factors is recognized by capital markets and can improve the financial performance of companies that invest in them.

Keywords: ESG, Financial Performance, Sustainability, Energy

JEL Classification: P18, Q40

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List of Abbreviations

ESG - Environmental, Social, and Governance

CSR - Corporate Social Responsibility

GHG - Greenhouse Gas

ROA - Return on Assets

ROE - Return on Equity

CFP - Corporate Financial Performance

RES - Renewable Energy Sources

UNEP FI - United Nations Environment Programme Finance Initiative

ECGI - European Corporate Governance Institute

SFDR - Sustainable Finance Disclosure Regulation

GRI - Global Reporting Initiative

LSEG - London Stock Exchange Group

MSCI - Morgan Stanley Capital International

TRBC - Thomson Reuters Business Classification

WEF - World Economic Forum

IEA - International Energy Agency

1. Introduction

Environment, Social and Governance (ESG) factors were first introduced by the United Nations Global Compact in 2004 to address rising risks and opportunities linked to emerging environmental and social trends (United Nations Global Compact, 2004). Environmental concerns include resource efficiency, pollution reduction, and climate action. Social concerns cover human rights, product safety, and employee well-being, while governance issues involve board independence, corruption, and shareholder protection (Martiny et al., 2024). These concerns are especially vital for the energy industry, as it powers economies worldwide and contributes significantly to greenhouse gas (GHG) emissions. As the energy crisis continues and the demand for cleaner, more efficient systems grows, companies are making ESG factors a key part of their corporate strategies. Therefore, this study intends to examine how ESG factors affect the financial performance of companies in the European energy sector and how sustainability and profitability can be aligned in this important industry.

Stakeholder theory suggests that organizations should focus not only on creating value and profits for their stakeholders, but also on the interests and well-being of all those affected by their actions, including employees, customers, suppliers, communities, and the environment (Freeman, 1984). This approach promotes a more inclusive, sustainable model for long-term success. Investing in ESG initiatives not only aligns with stakeholder theory but also boosts a company's reputation, builds trust with consumers and investors, and drives better financial results by reducing risks and uncovering new opportunities for growth and innovation (Freeman, 1984).

According to the European Union, ESG ratings influence investor confidence in sustainable products, making sustainable finance a rapidly expanding concept. "In the EU's policy context, sustainable finance is understood as finance to support economic growth while reducing environmental pressures" (European Commission, 2024, n.p.).

Understanding the impact of sustainable finance and ESG strategies is important, particularly in the energy industry, given its unique position as one of the most environmentally

sensitive and economically vital sectors worldwide (Mubarak et al., 2024). The adoption of ESG practices aims to demonstrate that one of the highest-emitting industries can lead toward a sustainable future while maintaining competitiveness and revenue streams.

This analysis challenges the traditional view that sustainability and financial success are mutually exclusive, showing that environmentally friendly initiatives can coexist with strong financial results (Schaltegger, 2002).

This study addresses the research question of how ESG factors influence the financial performance of European energy companies. To investigate this, it uses a panel dataset of 306 firms from the European energy sector, covering the period 2000 to 2024 with data obtained from LSEG Workspace. Financial performance is measured through Return On Assets (ROA), Return On Equity (ROE), and Tobin's Q, while ESG performance is assessed using the overall ESG Score and its three pillars: Environmental, Social, and Governance.

This dissertation is composed of five chapters. Chapter 1 introduces the research problem, the objectives and the study's relevance. Chapter 2 reviews the literature on ESG and financial performance, focusing on the European energy sector. Chapter 3 describes the methodology and data, including the hypotheses, the sample, the variables and the econometric model. Chapter 4 presents the results and discussion. Chapter 5 concludes the dissertation with the main findings, implications and suggestions for future research.

2. Literature Review

2.1 The origin and concept of ESG

To understand the origin of the ESG factors, it is essential to understand the concept of Corporate Social Responsibility (CSR). According to Chaffee (2017), the social aspect of corporate behavior traces back to ancient Roman law, which recognized various groups as separate entities from individuals. These entities frequently played a social role by organizing efforts to support the poor, elderly, and orphaned while running hospitals and political clubs. This perception of corporations as social entities continued in English law during the Middle Ages, especially within religious and academic institutions.

According to Chaffee (2017), understanding why for-profit corporations must engage in socially responsible behavior requires examining their essential nature. He emphasizes that corporations are embedded within society rather than existing in isolation. Although primarily established to generate profits for shareholders, they also significantly influence a broader range of stakeholders, including individuals and organizations affected by their actions.

Howard Bowen (1953) formalized this concept in modern literature through the book "Social Responsibilities of the Businessman," defining CSR as the duties of businessmen to pursue policies, make decisions, or take actions that align with society's goals and values. Bowen believed that the largest businesses at the time employed significant power and decision-making influence, affecting society in many ways. Although he viewed CSR from a businessman's perspective, Keith Davis (1960), who expanded the term to include institutions and companies, emphasizes that firms should be concerned not only with profits but also with their social impacts. Davis argued that businessmen have a duty to society that includes economic and human values, and social responsibility can be connected to financial returns (Carroll, 1999; Davis, 1960).

Regarding CSR and firm value, Falck and Heblich (2007) suggest that engaging in CSR activities can be beneficial. They hypothesize that well-managed companies can achieve higher profits and improved social conditions, embodying the idea of "doing well by doing good."

Unlike the traditional focus on maximizing shareholder wealth, the stakeholder theory, first introduced by Freeman (1984), emphasizes the well-being of all stakeholders. Since the early 2000s, it has gained increasing attention, suggesting that companies should create value not just for shareholders, but also for customers, suppliers, employees, investors, and others involved in the organization. The concepts of ESG and CSR have gained momentum alongside the rise of stakeholder theory (Gillan et al., 2021).

Although many refer to ESG and CSR as interchangeably, there is a difference. While CSR focuses on a company's sustainability plans and responsible culture, ESG evaluates the actual results of a company's sustainability efforts (Kaźmierczak, 2022).

ESG first appeared in literature in 2004 but, since then, has become a well-established theme in the corporate world. The 2005 Freshfields Report, commissioned by the United Nations Environment Programme Finance Initiative (UNEP FI), was a landmark document that argued ESG issues as not only legitimate under fiduciary duty but often as necessary, since they can significantly influence long-term financial performance (UNEP FI).

Today, ESG influences how companies are evaluated. It's no longer just about financial metrics (Pollman, 2022). As the European Corporate Governance Institute (ECGI) emphasizes in "The Making and Meaning of ESG" (2022), including ESG factors in investment analysis provides a broader view of a company's long-term health by highlighting risks and opportunities that traditional metrics might overlook. Being environmentally responsible, caring for people, and maintaining ethical business practices are essential for building resilient, long-term, successful companies (Pollman, 2022).

The ECGI report also highlights a growing demand for transparency and accountability. Investors closely examine how companies address issues like climate change, social inequality, and governance challenges, increasing pressure on businesses to meet new global standards. By prioritizing ESG, investors make more informed decisions and motivate companies to adopt sustainable practices that support growth and competitiveness in today's fast-changing market (Pollman, 2022).

ESG is now seen as a profitable investment approach. Bloomberg (2024) reports that ESG funds attracted net inflows of $10.4 billion in the third quarter of 2024, up from $6.3 billion in

the previous quarter. Most of this growth came from Europe, while the U.S. experienced outflows. Other regions, including parts of Asia, contributed modestly, while Japan and Canada continued to see redemptions (Schwartzkopff, 2024). Bloomberg Intelligence predicts that global ESG assets could exceed $40 trillion by 2030, with Europe expected to lead much of this growth. This increase reflects the growing incorporation of ESG factors into investment decisions, driven by rising awareness of environmental and social issues among investors (Bloomberg, 2024).

2.2 The Anti-ESG Movement and Critics

In 2024, Philip Morris International Inc. received a higher ESG score than Tesla Inc., making it a more ethical and sustainable investment. While Tesla is widely recognized as a leader in the transition to more efficient electric vehicles, especially since transportation is the largest source of greenhouse gas emissions in the North American economy, the company's internal processes and management have raised concerns among ESG rating agencies (Jamie Gordon, 2023).

ESG investing supporters argue that incomplete ratings make it difficult to establish a clear and reliable connection between ESG scores and stock performance. As a result, they advocate for companies to disclose more ESG-related information and stricter regulations on how that data is reported. The goal is to make comparing companies' scores easier and prevent misleading ESG claims, also known as greenwashing (Globerman, 2024).

The concept of ESG has faced criticism, with various individuals and organizations raising different concerns. Elon Musk (2022) has dismissed ESG as a scam, claiming that it is a tool protesters use to undermine traditional industries. Extensive research has been conducted on why ESG might not be the best strategy for companies to adopt (Henderson, 2001; Cornell and Damodaran, 2020; Reich, 2008). Indeed, according to Friedman (1970) and the Shareholder theory, requiring managers to pursue goals other than maximizing shareholder value would undermine the very foundations of a free society, as corporate officials should not take on social responsibilities at the expense of their principals. Friedman believed that shareholder value is the only value to be maximized. If managers wish to work toward social welfare improvement,

they should do so as private individuals at their own expense, not as agents of their principals and at their principals' expense.

Similarly, Cornell and Damodaran (2020) argue that ESG is not just a bad idea but a harmful one. It results in unclear corporate decisions and poor investment choices that fail to produce social benefits or better returns. They conclude that there is no positive connection between ESG investing and financial performance, as some firms can benefit from it, while an equal number can benefit from not implementing it. Therefore, according to these authors, claiming that being socially responsible will lead to higher growth, profits, and value is misleading.

Henderson (2001), in turn, criticizes CSR for being based on flawed economic principles, arguing that it pressures companies into acting against their interests and thus weakens competition. These critics contend that companies face pressure to be socially conscious and environmentally responsible, which can unfairly burden businesses (Reich, 2008).

However, critics often overlook the fact that not all social and environmental impacts are entirely external to business. When corporations concentrate on social effects essential to their operations, ESG can strongly predict financial returns. The controversy does not come from flawed investment theories but from inconsistent data. ESG-focused investors look for data that measures how ESG factors influence corporate financial performance. Instead, investors currently have a list of mechanical ESG statistics about management policies, operating principles, and codes of conduct (Saul and Constanza, 2023).

2.3 Contextualizing the Energy Sector

Renewable energy refers to energy sources that are continuously restored by natural environmental processes. These include energy harnessed directly from the sun, such as solar thermal, photochemical, and photovoltaic methods; energy indirectly driven by solar processes, such as wind, hydropower, and biomass; and energy derived from natural movements in the Earth's systems, like geothermal heat and tidal forces (Ellabban et al, 2014). Unlike fossil fuels or industrial waste, renewable energy is sustainable and comes from processes that do not

diminish finite resources (Ellabban et al., 2014). Figure 1. shows the various types of renewable energy sources.

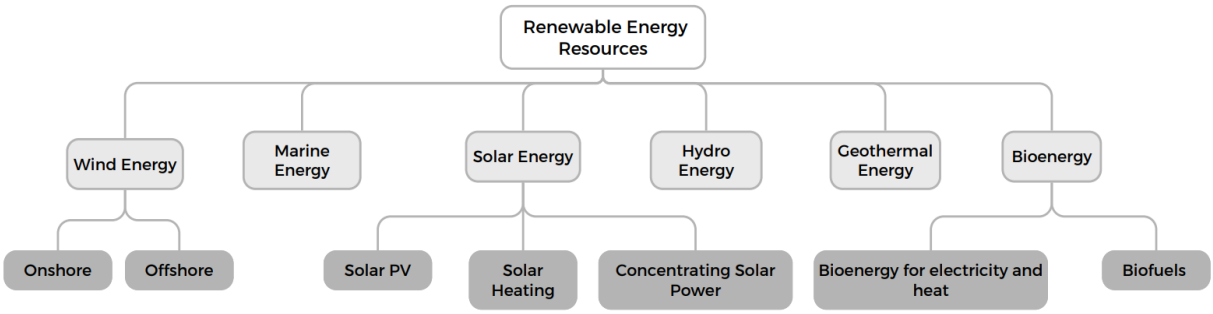


Figure 1. Overview of renewable energy sources

Source: adapted from Aslanturk and Kiprizli (2020)

Non-renewable energy generation is often called fossil fuel power generation. It includes technologies like coal-fired power plants, gas turbine facilities, integrated gasification combined cycle, and other syngas (synthesis gas) plants that use finite resources like solid coal, petroleum derivatives, or natural gas (Aslanturk and Kiprizli, 2020). Nuclear energy is also classified as non-renewable, since it depends on finite uranium resources rather than naturally replenished resources (Amir, 2024).

Besides reducing carbon dioxide emissions, governments have implemented renewable energy policies to achieve various goals, including environmental and health improvements, increasing energy access in rural areas, improving energy security by diversifying energy sources and technologies, and boosting social and economic development through job opportunities (Aslanturk and Kiprizli, 2020).

Europe is home to diverse energy producers and consumers, with strong connections to international markets. The European Union's historic reliance on renewables in 2023 marks a significant shift toward sustainable energy. Renewable energy became the leading source of electricity in the EU, accounting for 44.7% of electricity production, while electricity from fossil fuels fell to around 32.5% (Eurostat, 2023). Wind and solar alone made up 27% of the electricity

mix, with wind power surpassing gas for the first time. This progress represents a key step toward decarbonization and less dependence on coal and gas (Eurostat, 2023). Governments, businesses, and consumers are focusing on sustainability goals, driving demand for investment in renewable energy. Expanding energy sources with renewables improves energy security by decreasing reliance on imported fossil fuels and volatile global energy markets (Aslanturk and Kiprizli, 2020).

Driven by growing concerns about climate change and the rise of fossil fuel dependence, the EU launched the European Green Deal to respond to these challenges, aiming to become the world's first climate-neutral continent, with a 60% reduction in GHG emissions by 2050 (European Union, 2019).

In December 2019, the European Union advanced its sustainable finance framework through Regulation (EU) 2020/852 (EU Taxonomy), which establishes the classification criteria for environmentally sustainable economic activities. This regulation operates alongside Regulation (EU) 2019/2088 (SFDR). The SFDR introduces disclosure obligations for financial market participants, requiring transparency on the integration of sustainability characteristics in financial products (Article 5), while the EU Taxonomy provides the technical basis to determine sustainability. Under Article 3 of Regulation 2020/852, an activity is considered environmentally sustainable if it contributes to at least one environmental objective, causes no significant harm to the others, and complies with minimum social safeguards. The environmental objectives are identified in Article 9, and Article 10 sets the criteria under which activities related to climate change mitigation, including energy production, may qualify. Both regulations are aligned with the Paris Agreement, with the targets referenced in Articles 2 and 3 of the SFDR, which aim to limit global temperature increases to below 2°C, with efforts to reach 1.5°C above pre-industrial levels (European Union, 2019; 2020).

Ge et al. (2020) state that the energy sector is responsible for approximately 75.7% of global greenhouse gas emissions, making it by far the largest contributor worldwide. According to the World Economic Forum (2024), 2024 marked a turning point in energy emissions. Forecasts suggest that energy-related GHG emissions may have peaked and could now enter a long-term decline, a milestone portrayed as a historic shift towards a cleaner future.

In the second quarter of 2024, GHG emissions were estimated to have decreased in 19 EU countries compared to the same quarter in 2023. The largest reductions in GHG were estimated for the Netherlands (-9.1%), Bulgaria (-6.3%), Austria, and Hungary (each -5.9%) (Eurostat, 2024).

It is also important to note that this sector has been greatly affected by the Russia-Ukraine conflict. According to the International Energy Agency (IEA), the war caused an energy crisis that pushed electricity and natural gas prices to record highs, as shown in Figure 2. European countries have since focused on energy security, significantly reducing fuel imports from Russia, which they used to depend on. Additionally, they have substantially increased their clean energy goals to diversify their energy sources even more, while working toward climate targets (IEA, 2022).

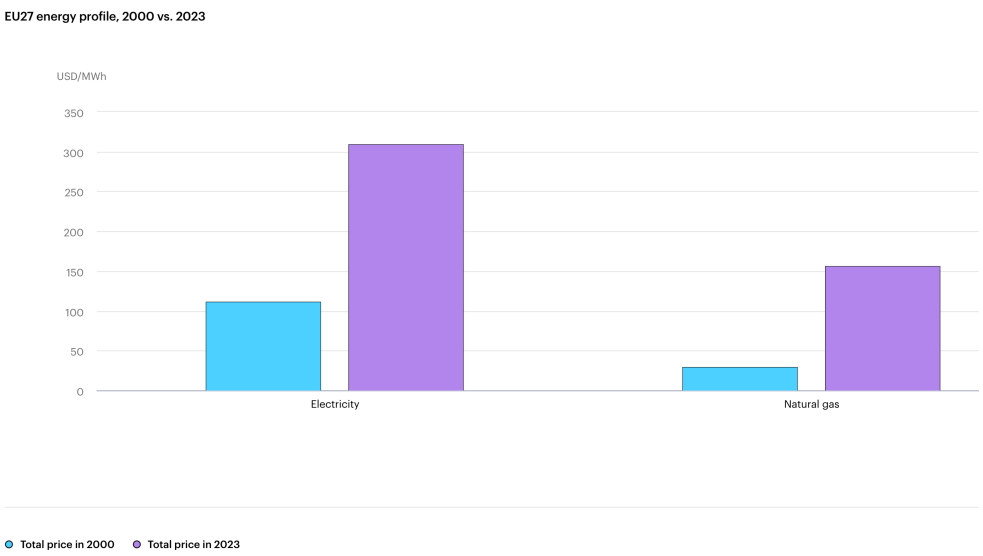


Figure 2. EU27 electricity and natural gas prices (2000 vs 2023)

Source: IEA (2024)

As electricity and natural gas are central to the EU energy mix, their price evolution is often used to illustrate structural changes in the sector. Natural gas plays a dual role as both a major

source for electricity generation and a transitional fuel in the energy shift, influencing price volatility, emissions, and energy security (IEA, 2022).

2.4 The Sector Characteristics

Clarkson et al. (2011) found that environmental disclosure improves corporate financial performance in polluting industries in the United States. Besides environmental disclosure, governance disclosure also benefits stakeholders. Larger firms that adopt more comprehensive disclosure practices tend to hire more capable managers, which leads to better financial performance (Hermalin and Weisbach, 2012). Similarly, Lokuwaduge and Heenetigala (2017) argue that ESG disclosure aims to gain social legitimacy for the environmental or social impacts caused by the firm's operations. This aligns with the Legitimacy Theory, which suggests that organizations try to earn or keep legitimacy from their stakeholders by aligning their activities with social values and expectations.

The nature of an industry determines its ESG concerns, which can vary widely. For example, the textile industry raises issues related to employment conditions. In contrast, fast food chains raise concerns about public health, and the tobacco industry raises worries about exposure to harmful chemicals (Frynas, 2009).

Due to the social and environmental costs associated with the activities of the energy industry, there is a high demand for ESG disclosure (Garcia et al., 2017). Being an environmentally sensitive sector, where firms are exposed to higher social pressures and public concern, sustainability reporting initiatives, such as the Global Reporting Initiative and non-profit organizations, have impacted corporate disclosure related to the energy sector for state-owned companies (Matisoff et al., 2012).

The ESG concept raises multiple concerns, from competitiveness and energy security to social equity and environmental externalities. According to Ligus (2017), these issues can be structured across three dimensions as shown in Table 1.

Table 1. ESG impacts of the energy sector

DIMENSIONS/ Impacts
ECONOMIC
GDP
Trade Balance
Competitiveness and Innovation of the Economy
Unemployment rate
Energy security of the enterprise and public sector (e.g., by developing local energy systems and auto-producing energy from RES (Renewable energy sources) for business purposes; diversification of energy sources; impact on the fossil fuels price fluctuations; unstable energy production with some RES technologies)
Balanced development of regions
Land requirement (e.g., due to low efficiency, the energy produced per unit of land occupied is low for most RES technologies)
SOCIAL
Eliminating social inequality (e.g., the deployment of distributed RES activates rural areas)
Shaping a new energy culture
Energy security of households (as in the case of companies and, e.g., by the development of prosumer energy[1])
ENVIRONMENTAL
Carbon emissions
SOx, NOx, PM10, PM2.5 [2] emissions (causing negative impacts on human health, flora and fauna, and materials)
Amount of waste generation
Resource efficiency of the economy
Interference in the landscape
Risk of failure/accident (e.g., major accident of nuclear reactor; environmental contamination during long-term storage of radioactive waste)

Source: Adapted from Ligus (2017)

[1] A prosumer is a combination of "producer" and "consumer." In the context of energy, prosumers are individuals or organizations that both produce and consume energy. They generate their energy, typically through renewable sources, and use it for their own needs. Any excess energy can be sold back to the grid or shared with others (Zafar, 2018).

[2] Sulfur Oxides, Nitrogen Oxides, Particulate Matter ≤ 10 micrometers, Particulate Matter ≤ 2.5 micrometers.

Frynas (2009) observed that, although energy companies have long faced criticism for their significant environmental impacts, many relied on CSR reporting, both as a reputation management tool and a long-term strategy, aligning with Freeman's stakeholder theory. Over a decade later, this trend remains clear. Recent studies show that oil and gas companies continue to position themselves as leaders in sustainability reporting to boost their public image and meet increasing stakeholder expectations and societal pressure (Aljanadi & Alazzani, 2023). This ongoing pattern indicates that sustainability disclosure in the energy sector has gradually evolved from a reactive response to criticism into a fundamental strategic practice driven by stakeholder interests.

2.5 Characteristics Influencing ESG Scores

ESG rating is a method used to measure a firm's sustainable practices and corporate efficiency. The scores are calculated using different methodologies, which vary depending on the rating agency or data provider. The approach used for these ratings is not standardized, allowing each rating agency to adopt its own methods, criteria, and evaluation techniques. The lack of standardization can cause differences in ratings for the same company across various agencies since the weight given to specific ESG factors and the data collection and scoring approaches may differ. ESG criteria evaluate a company's impact on the environment, society, and economy, as well as its management of internal operations and stakeholder relationships (PricewaterhouseCoopers, n.d.).

These ratings are just one of many tools used to assess corporate sustainability. While they offer useful insights into a company's ESG performance and help identify strengths and weaknesses, they are limited by their methodologies and data quality. Factors like regional differences, industry-specific challenges, and the changing nature of ESG issues can make these ratings more complex to compare and unreliable (Tayan et al., 2022).

Rating agencies are independent firms that concentrate on ESG scores. They collect data on factors such as GHG emissions, operational practices, diversity on company boards, and

community involvement to assess a company's overall ESG performance. (PricewaterhouseCoopers, n.d). These ratings are also used by investors, analysts, and other stakeholders to judge a company's long-term sustainability and risk management. Among the many agencies providing ESG scores, the best-known include Bloomberg ESG Data Services, Dow Jones Sustainability Index, MSCI ESG Research, Sustainalytics, LSEG Datastream (formerly Refinitiv Eikon), S&P Global, ISS ESG, Vigeo/EIRIS, Fitch Ratings, and Moody's Investors Service.

Examining rating agency roles and methodologies is essential for understanding how ESG performance is assessed and compared across companies. This section details leading agencies' practices, focusing on the ESG rating systems created by MSCI ESG Research and LSEG DataStream, among the most used in industry and academic studies.

The Ratings of the MSCI's ESG Research methodology evaluate companies based on their exposure to ESG risks and the ability to manage them effectively by identifying the most relevant issues for each industry. It focuses on factors that have a significant potential impact on financial performance. These issues are organized under the three primary pillars and divided into 10 themes and 33 key issues (MSCI, 2024). Each company is exposed to these key ESG issues, considering their specific business activities, location, and other relevant contextual factors. This analysis evaluates a company's vulnerability to certain ESG-related risks and opportunities.

The management of these exposures can be evaluated by reviewing the company's guidelines, agendas, performance data, governance structures, risk management frameworks, and any controversies or incidents related to ESG factors. Based on these details, a score is assigned to each key ESG issue. These scores are weighted according to the issue's relative importance within the company's industry. The weighted scores are then combined to produce scores for each ESG theme and pillar. The combined scores across all key issues create an overall ESG score, which aligns with a rating scale from AAA (indicating leadership in ESG performance) to CCC (signaling poor performance compared to industry peers) (MSCI, 2024).

Regarding the LSEG database's ESG score, it has been widely used in academic publications (Reber et al., 2022; Shakil, 2021). Investors can evaluate a company's performance relative to its industry peers and businesses in other sectors by assigning an ESG score that ranges from 0 to 100.

Both LSEG and MSCI evaluate companies based on their exposure to risks and risk management. However, LSEG's methodology places greater emphasis on the use of a materiality matrix, assigning more weight to industry-specific metrics.

"To apply an objective, impartial, and trusted assessment of the importance of each ESG theme to different industries, the LSEG ESG magnitude matrix was developed as a proprietary model and is applied at the category level. Importantly, the magnitude values are automatically and dynamically adjusted as ESG corporate disclosure evolves and matures" (LSEG, 2023, p.12).

LSEG captures and calculates over 630 ESG measures at the company level, emphasizing 186 key metrics that are most relevant and comparable within each industry to support the overall assessment and scoring process, as shown in Figure 3. The scoring system also uses percentile ranks, assigning scores from 0 to 100.

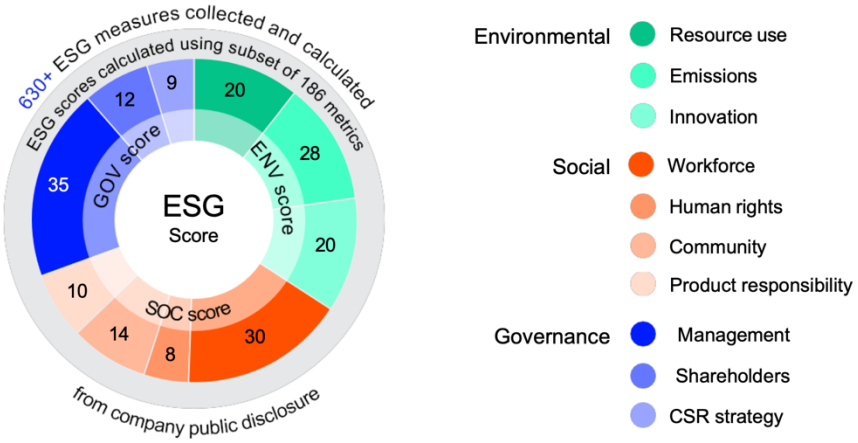


Figure 3. ESG Ratings

Source: LSEG (2025)

Since each agency has its own rating methodology, ratings should not be viewed in isolation. To gain a comprehensive understanding of a company's sustainability and long-term potential, investors and stakeholders should consider combining ESG ratings with other relevant sources of information. This well-rounded approach helps counterbalance the limitations of any single ESG rating, supporting more informed and responsible decision-making that aligns with broader sustainability goals (Tayan et al., 2022).

2.6 Financial Performance Variables in ESG

Several studies have explored the relationship between ESG and financial performance. According to Velte (2017), ESG practices positively influence on return on assets (ROA), indicating that firms with high ESG scores use their assets more efficiently to generate revenue. Velte also found a strong negative correlation between risk indicators, such as "debt," and ESG. However, these practices did not influence Tobin's Q, which measures a company's market value relative to its replacement costs. Xie et al. (2019) found that most ESG-related activities positively correlate with corporate efficiency, such as ROA, and market value. Environmental initiatives and cost-saving policies, like green building projects, sustainable packaging, an eco-friendly supply chain, or independent assessments, also contribute positively to a company's financial performance.

Fauzi et al. (2007) employed the slack resource theory, which suggests that additional resources, such as cash or time, allow organizations to invest in sustainability or social responsibility initiatives. However, they found no significant link between corporate social responsibility and financial performance. Modern, market-oriented metrics highlighting sustainability's contribution to corporate performance, such as Tobin's Q, the Price-to-Earnings ratio, enterprise value, and cash flow, often receive more attention because accounting measures have traditionally been more focused (Dalal, 2019).

Analyses of financial performance based on ESG measures often use stock returns, return on assets (ROA), and return on equity (ROE) as key metrics. A meta-analysis of 51 studies developed by Griffin and Mahon (1997) identified 80 unique performance metrics, the most

employed being firm size, ROE, and ROA. Lo and Sheu (2007) examined how corporate sustainability affects market value, and their findings supported the idea that sustainability increases a company's overall value, which in turn boosts its financial performance.

Folger-Laronde et al. (2020) examined the relationship between ESG and financial returns during the COVID-19 pandemic. Their research concluded that, during the pandemic, in contrast to previous literature, a negative relationship existed between ESG and economic returns. Their results also showed that investment funds with higher ESG ratings did not perform better or provide protection against financial losses in periods with sharp market declines. This study argued that even companies with strong ESG performance were not financially better off during the crisis, indicating that, in that case, ESG factors did not prevent the financial disruptions caused by the pandemic.

Gregory (2021), in turn, argues that ROE, ROA, and Tobin's Q are insufficient measures of corporate financial performance in terms of ESG criteria. As sustainability practices can affect debt levels, other components like profit margins and equity multipliers may not accurately reflect the impacts of sustainability activities when using ROE and ROA. Consequently, Tobin's Q may be screened out, as sustainable companies might enjoy greater pricing power in their markets and face lower capital costs, making Tobin's Q seem less appealing for these firms. Financial performance measures relevant to ESG factors should primarily consider pre-tax cash flows and cash flows tied to debt and equity to better understand these criteria's effects on a company (Gregory, 2021).

3. Methodology and Data

This section outlines the approach to address the proposed research question, presenting the overarching econometric framework and the data collection procedure. It also provides a detailed discussion of the variables used.

3.1 Research Hypothesis

This subchapter introduces the research hypotheses guiding the analysis. The aim is to test whether ESG performance influences the financial outcomes of firms in the European energy sector.

Hypothesis 1A: Improving ESG scores positively affects the energy sector's financial performance, showing that higher ESG scores benefit its economic results.

Hypothesis 1B: Companies that consistently improve their ESG scores over the years demonstrate increasing and sustainable financial performance.

Studies suggest that improving ESG scores can positively impact a firm's financial performance, as companies engaged in sustainable business practices often experience better risk management, operational efficiency, and investor confidence (Falck and Heblich, 2007). This reasoning aligns with Hypothesis 1A. Research has also shown that firms with higher ESG ratings tend to exhibit greater profitability metrics, such as ROA and ROE, since they benefit from lower capital costs, stronger stakeholder relationships, and an improved brand reputation (Velte, 2017; Xie et al., 2019).

Furthermore, companies that constantly invest in ESG initiatives over time build long-term financial resilience, as sustainability-focused strategies contribute to stable revenue and reduced exposure to environmental and reputational risks (Schaltegger and Synnestvedt, 2002), supporting Hypothesis 1B. This reasoning also follows the stakeholder theory, which suggests that firms prioritizing social and environmental concerns, rather than merely maximizing shareholder value, are more likely to achieve long-term financial success, as they create value for all stakeholders (Freeman, 1984). As regulatory frameworks, such as the European Green

Deal and the Paris Agreement, continue to promote corporate ESG adoption, companies that proactively align with these policies may gain a competitive advantage (European Commission, 2024).

3.2 Data

3.2.1 Data Source

The data was collected from LSEG DataStream, an add-in used to access historical financial and economic time-series data. This database was selected because it provides consistent and widely recognized ESG and financial indicators, which ensure comparability across different firms and are commonly employed in academic research. The analyzed variables were obtained through a segmented query; specifically, the screener application was employed to select all companies classified under the energy sector, particularly those listed in the "Energy" and “Europe” categories, which include publicly traded energy companies within the Eurozone and broader regions like Western and Central Europe, thus minimizing the impact of differences in laws, accounting standards, and culture.

Due to the complexities involved, the relationship between ESG and financial performance will be assessed using market-based performance and accounting-based measures (Naeem et al., 2022).

3.2.2 Data Analysis

This research uses a dataset of 7,650 observations covering 306 energy companies headquartered in European countries, including European Union and European Economic Area member states and other European nations and territories. The industry is classified according to the Thomson Reuters Business Classification (TRBC), as shown in Table 2. Data collection began in 2000, the year the Global Reporting Initiative (GRI) first issued its sustainability reporting guidelines (GRI, 2000) and continued through 2024

Table 2. Sample Composition

TRBC Industry name	N	# of obs.
Coal	15	375
Integrated Oil and Gas	10	250
Oil and Gas Drilling	12	300
Oil and Gas Exploration and Production	84	2 100
Oil and Gas Refining and Marketing	38	950
Oil and Gas Transportation Services	26	650
Oil Related Services and Equipment	40	1 000
Renewable Energy Equipment and Services	64	1 600
Renewable Fuels	14	350
Uranium	3	75
Final Sample	**306**	**7 650**

Geographical distribution of the companies					
Country	**N**	**%**	**Country**	**N**	**%**
Austria	2	0.65%	Jersey	8	2.61%
Belgium	5	1.63%	Latvia	1	0.33%
Bosnia and Herzegovina	9	2.94%	Lithuania	1	0.33%
Bulgaria	3	0.98%	Luxembourg	4	1.31%
Croatia	2	0.65%	Macedonia	2	0.65%
Cyprus	6	1.96%	Monaco	2	0.65%
Denmark	1	0.33%	Netherlands	6	1.96%
Estonia	2	0.65%	Norway	39	12.75%
Faroe Islands	1	0.33%	Poland	19	6.21%
Finland	3	0.98%	Portugal	2	0.65%
France	16	5.23%	Republic of Montenegro	2	0.65%
Germany	18	5.88%	Republic of Serbia	1	0.33%
Greece	9	2.94%	Romania	12	3.92%
Guernsey	3	0.98%	Slovenia	1	0.33%
Hungary	1	0.33%	Spain	6	1.96%
Iceland	2	0.65%	Sweden	17	5.56%
Ireland	8	2.61%	Switzerland	4	1.31%
Isle of Man	1	0.33%	Ukraine	3	0.98%
Italy	12	3.92%	United Kingdom	72	23.53%
Total				**306**	**100%**

Source: LSEG DataStream (via LSEG Workspace); own elaboration

3.3 Variables and Model

3.3.1 Explanatory Variables

According to previous literature, ESG Scores represent a company's level of engagement in environmental, social, and governance practices. However, it is important to note that these scores may not capture all relevant factors. Refinitiv calculates ESG scores by assessing a firm's performance, commitment, and effectiveness across ten core categories.

These categories are selected based on comparability, data availability, and industry relevance, and they may vary across sectors. As shown in Table 3, the categories correspond to the different components of the ESG score.

Table 3. ESG Rating system

Score range	Grade	Description
0.916666 < score <= 1	A+	'A' score indicates excellent relative ESG performance and a high degree of transparency in publicly reporting material ESG data.
0.833333 < score <= 0.916666	A	
0.750000 < score <= 0.833333	A-	
0.666666 < score <= 0.750000	B+	'B' score indicates good relative ESG performance and above-average degree of transparency in reporting material ESG data publicly.
0.583333 < score <= 0.666666	B	
0.500000 < score <= 0.583333	B-	
0.416666 < score <= 0.500000	C+	'C' score indicates satisfactory relative ESG performance and a moderate degree of transparency in reporting material ESG data publicly.
0.333333 < score <= 0.416666	C	
0.250000 < score <= 0.333333	C-	
0.166666 < score <= 0.250000	D+	'D' score indicates poor relative ESG performance and an insufficient degree of transparency in reporting material ESG data publicly.
0.083333 < score <= 0.166666	D	
0.0 <= score <= 0.083333	D-	

Source: LSEG (2025)

Environmental score (w_EnvironmentalScore): Provides measures of commitment toward environmental and ecological stability and sustainability. LSEG divides environmental scores into three major themes: resource use, emissions, and innovation. An environmental score of 0 corresponds to a D- grade, indicating inferior environmental performance and a lack of

transparency in the disclosure of environmental data. In contrast, a score of 1 corresponds to an A+ grade, reflecting excellent environmental performance and complete transparency in reporting material environmental information.

Social score (w_SocialScore): Provides measures and describes a company's success in maintaining good relations and earning loyalty and trust from its employees, suppliers, consumers, and the broader local community. LSEG divides the social score into four main groups: workforce, human rights, community, and product responsibility. It utilizes 62 different measures to gather and calculate the social score of corporations based on their publicly available reports (LSEG, 2022). Like as the environment, a social score of 0 aligns with a D- grade, signifying very weak social responsibility practices and the absence of public disclosure on key social metrics, whereas a score of 1 corresponds to an A+ grade, indicating outstanding performance in social factors and comprehensive transparency in reporting.

Governance score (w_GovernanceScore): Aims to ensure that corporations act in the best interests of their owners while promoting transparency in reporting. For data collection and scoring, Refinitiv Eikon categorizes governance performance into three sub-themes: management, shareholders, and CSR strategy. It calculates governance scores by gathering and combining scores from 56 metrics derived from corporations' public disclosures (LSEG, 2022). A Governance Score of 0 reflects a D- grade, indicating inadequate governance structures and minimal or no public information on governance practices. A perfect score of 1 earns an A+ grade, signifying robust governance performance and complete transparency in disclosing relevant governance data.

ESG Score (w_ESGScore): Is calculated using a weighted average of 34%, 42%, and 24% for environmental, social, and governance performance, respectively. These weights correspond to both the number and significance of indicators within each category. The social pillar receives the highest weight due to its broader scope, encompassing human rights, community impact, employee well-being, and product responsibility. In contrast, governance is assigned a lower weight because it includes fewer indicators, primarily board structure, shareholder rights, and anti-corruption measures. This weighting methodology ensures that the final Score accurately reflects the quantity and relevance of data in each pillar. (LSEG, 2022). A combined ESG Score

of 0, graded as D-, represents inferior performance across all ESG dimensions with negligible transparency. A score of 1, graded as A+, signifies overall excellence in ESG practices, with strong performance and full public disclosure across environmental, social, and governance areas.

3.3.2 Control Variables

This subchapter describes the control variables included in the analysis, outlining their definition and the rationale for their selection.

Firm size (ln_w_TotalAssets): proxied by the natural logarithm of total assets, winsorized at the 1st and 99th percentiles. Total assets are included as a control variable because prior research recognizes firm size as a firm-level attribute influencing ESG performance and financial outcomes, given that larger firms typically have more resources and greater visibility (Velte, 2017; Martiny et al., 2024). Information on alternative measures of firm size, such as the number of employees or market capitalization, was not available for the full sample; therefore, total assets were used as a proxy for firm size, in line with previous studies that commonly adopt this measure (Buallay, 2019).

Leverage (ln_w_Leverage): measured as the natural logarithm of the firm's leverage ratio, also winsorized. Leverage is included as a control variable because prior literature identifies capital structure as an important firm-level characteristic, potentially influencing financial performance and risk (Frank & Goyal, 2009).

Firm age (ln_Age): calculated as the difference between the observation year and the year of incorporation reported in LSEG. To address skewness, the natural logarithm of firm age was utilized. Including firm age as a control variable is common in ESG studies, as prior research recognizes that company maturity may influence disclosure practices and financial outcomes (Velte, 2017; Zhou et al., 2022).

Country and Sector dummies: To account for unobservable heterogeneity related to institutional environments and industry characteristics, country and sector dummy variables were included, using LSEG's classifications for country and TRBC industry sectors. This

ensures that regulatory differences, institutional settings, or sector-specific dynamics within the European energy industry do not affect the results. According to Hsiao (2014), including country and sector dummies is a standard approach in panel data analysis, as it allows the model to capture group-specific characteristics that remain constant over time and would otherwise bias the estimates.

To address skewness, the natural logarithm was applied to several continuous variables, including ROA, ROE, Tobin's Q, leverage, total assets and firm age, to normalize their distribution and reduce the influence of extreme values (Martiny et al., 2024). In addition, total assets and leverage were winsorized at the 1st and 99th percentiles to mitigate the effect of outliers (Buallay, 2019).

3.3.3 Dependent Variables

This subchapter presents the dependent variables employed to capture firm financial performance, outlining their definition and measurement.

Return on assets (ln_w_ROA): an accounting-based financial performance metric that evaluates a company's ability to generate profit relative to its total assets. It measures how efficiently a company uses its assets to create value, providing insight into overall operational effectiveness and profitability.

Return on equity (ln_w_ROE): an accounting-based financial performance metric that measures a company's ability to generate profit from stockholders' investments. It reflects how efficiently a company utilizes its equity to create value, making it a key indicator of profitability and financial health.

Tobin's Q (ln_w_TobinsQ): a market-based metric used to assess a firm's financial performance and valuation. It is calculated by comparing the firm's market value to the book value or replacement cost of its total assets. This ratio reflects the company's current market performance and the long-term cost of replacing its assets. A Tobin's Q larger than 1 suggests

that the market values the company more than the cost of its assets, showing growth potential. In contrast, a Tobin's Q below 1 may suggest undervaluation or inefficiencies.

3.4 Econometric Model

To analyze the relationship between firms' financial performance and ESG, a panel data model was chosen because it can capture the dataset cross-sectional and time-series dimensions. According to Hsiao (1986), panel data containing a large amount of information can increase the degrees of freedom and reduce the collinearity among explanatory variables, contributing to more robust estimated parameters. Additionally, this method allows for the use of unbalanced datasets, where information may be missing for specific periods under analysis.

Nevertheless, some limitations remain, such as the assumption in specific models that correlations and coefficients are homogeneous across individuals, which may oversimplify heterogeneity.

Within this framework, hypotheses formulated in Chapter 2 are tested by examining whether ESG performance is associated with firms' financial outcomes (Hypothesis 1A) and whether constant improvements in ESG scores over time contribute to financial performance (Hypothesis 1B).

In this study, the panel regression model (1) is specified as:

$$Y_{it} = \alpha + \beta_1 ESG_{it} + \beta_2 ln(TotalAssets_{it}) + \beta_3 \ln(Leverage_{it}) + \beta_4 ln(Age_{it}) + \gamma Country_i + \delta Industry_i + \mu_{it} \quad (1)$$

- Y_{it} = financial performance indicator (ln (ROA), ln (ROE), and ln (Tobin's Q) for firm *i* in year *t*).
- ESG_{it} = ESG variable (ESG Combined Score, Environmental Score, Social Score, and Governance Score).
- $ln(TotalAssets_{it})$ = proxy for firm size, measured as the natural logarithm of total assets.

- $ln(Leverage_{it})$ = leverage, expressed as the natural logarithm of the debt-to-equity ratio.
- $ln(Age_{it})$ = firm age, measured as the logarithm of the number of years since incorporation.
- $Country_i$ = country dummy variables controlling for institutional and regulatory differences.
- $Industry_i$ = industry dummy variables capturing sector-specific heterogeneity.
- μ_{it} = error term.

The coefficients of interest are interpreted as follows:

- β_1 = measures the marginal effect of ESG performance on firm financial outcomes (positive values suggest that higher ESG engagement enhances performance, while negative values indicate the opposite).
- β_2 = denotes how firm size influences performance, reflecting whether larger firms perform better or worse than smaller peers.
- β_3 = captures the role of leverage, indicating whether higher indebtedness constrains or enhances firm outcomes.
- β_4 = assesses the effect of firm maturity on performance.
- γ,δ = captures structural differences across countries and industries that are not explained by firm-level variables.

4. Results and Discussion

This chapter presents the study's empirical results. The analysis begins with descriptive statistics and correlations, followed by the panel regression models used to test the research hypotheses regarding the relationship between ESG performance and firm financial outcomes. All statistical analyses were conducted using STATA/BE 18.0 for Mac, provided through the ISCTE-IUL academic license.

4.1 Descriptive Analysis

Table 4 shows the descriptive statistical results of each variable.

Table 4. Descriptive Statistics

Variable	Minimum	Maximum	Mean	Standard Deviation
ln_w_ROA	-4.637578	4.020146	3.222398	1.344218
ln_w_ROE	-2.030986	3.504788	3.111103	0.855674
ln_w_TobinsQ	-2.769188	4.598608	2.451061	1.997616
ln_w_TotalAssets	5.886104	26.54967	21.97983	4.128011
ln_w_Leverage	-0.26621	3.301117	1.742566	1.323907
ln_Age	0	5.278115	3.259091	1.096479
w_ESGScore	1.952466	94.62133	51.6580	22.11423
w_EnvironmentalScore	0	95.7536	44.8066	20.2827
w_SocialScore	0	96.2133	51.4125	21.3231
w_GovernanceScore	0	96.3632	64.1864	20.2037

Source: Own elaboration

To mitigate the influence of extreme values in economic variables and ensure robust results, the variables were winsorized at the 1st and 99th percentiles. Winsorization reduces the impact of outliers without deleting observations, therefore preserving the structure of the panel dataset, while improving the stability of the estimates (Jennifer et al., 2005).

After the winsorization process, logarithms were applied to the dependent and control variables. The logarithmic transformation is commonly used to stabilize the variance in time series and to linearize relationships in economic data, making the data easier to model and interpret (Lütkepohl and Xu, 2010). The natural logarithm of values between 0 and 1 produces negative numbers, which explains the minimum values observed in the economic variables. This is expected and aligns with the mathematical properties of the logarithmic transformation.

Between 2000 and 2024, the companies in the sample had an average market value, measured by the natural logarithm of the winsorized Tobin's Q ratio, of 2.45, with the lowest value being -2.77 and the highest being 4.59. In line with prior ESG research, Tobin's Q shows a wide dispersion. Aydogmus (2022) finds a mean of 2.567, while Wu (2022) reports a mean of 1.931; this variation aligns with the sensitivity of Tobin's Q to market expectations and sector differences.

Regarding profitability, the distribution of ROA and ROE shows that the firms in the sample are, on average, profitable, yet display considerable heterogeneity. The natural logarithm of the winsorized ROA (ln_w_ROA) ranges from -4.64 to 4.02, with a mean of 3.22. Negative values do not indicate negative profitability; instead, they may represent minimal positive returns on assets. For return on equity (ln_w_ROE), values span from -2.30 to 3.50, with an average of 3.11. Compared to ROA, the narrower spread in ROE suggests that shareholder returns are more stable across firms in the sample. Literature often finds weaker links between ESG and ROE than ROA (Velte, 2017). The descriptive statistics support this, as ROA varies widely among firms, while ROE appears more concentrated around the mean, highlighting the moderating effects of equity financing and leverage on profitability.

Regarding the control variables, firm size, measured as the natural logarithm of total assets (ln_w_TotalAssets), ranges from 5.89 to 26.55, with a mean of 21.98 and a standard deviation of 4.13. Firm leverage (ln_w_Leverage) ranges from -0.27 to 3.30, with a mean of 1.74, showing significant variation in the capital structures, from conservatively financed firms to those heavily reliant on debt. Firm age, measured as the natural logarithm of years since their founding (ln_Age), ranges from 0 to 5.28, reflecting different maturity levels among firms. Previous studies (Velte, 2017; Zhou et al., 2022) suggest that firm size, age, and leverage significantly

influence ESG performance. Typically, larger and more established firms have well-developed governance frameworks and greater visibility among stakeholders. On the contrary, high leverage may constrain a firm's ability to invest in sustainability initiatives.

Finally, the ESG performance variables show, generally, balanced distributions, but with notable differences across the pillars. The ESG combined score ranges from 1.95 to 94.62, with a mean of 51.66 and a standard deviation of 22.11. Among the pillars, governance is the highest, averaging 64.19, followed by social at 51.41, and environmental, which is the lowest, averaging 44.81. This hierarchy, where governance takes precedence over social and environmental scores, aligns with global ESG reporting patterns, as governance mechanisms tend to be more institutionalized due to regulation and investor demand. In contrast, environmental practices remain less developed and more variable across firms (Gillan et al., 2021).

4.2 Bivariate Analysis

This section reports the bivariate analysis to examine pairwise correlations among the study variables. This step is important as it highlights preliminary associations, potential multicollinearity issues, and insights into the expected direction of relationships to be further tested in the regression models.

Table 5 reveals strong correlations between the ESG dimensions and the aggregate ESG Score, with coefficients ranging from 0.69 to 0.88, which is significant at the 1% level. Strong associations like these indicate potential risks of multicollinearity if the ESG Score and its subcomponents were to be included simultaneously in the same regression model (Gujarati and Porter, 2009). To address this concern, separate specifications were estimated for the ESG aggregate and for each dimension, thus avoiding collinearity problems and ensuring robust inference.

Financial performance variables also exhibit a positive correlation with ESG variables, with coefficients ranging from 0.10 to 0.26, all significant at the 1% level. This result suggests that, for this sample, higher ESG scores can be associated with better financial results.

Regarding control variables, firm size is strongly and significantly associated with leverage ($r = 0.802$, $p < 0.001$), indicating that, for the sample analyzed, larger firms tend to rely more heavily on debt financing. Leverage also shows a strong correlation with Tobin's Q ($r = 0.759$, $p < 0.001$), suggesting possible collinearity; however, leverage was retained as a control variable, given its established role in corporate finance (Frank and Goyal, 2009). Firm age is negatively and significantly related to ESG scores and financial performance (ranging from -0.13 to -0.35, $p < 0.001$), indicating that, in this sample, younger firms tend to display higher ESG engagement and better financial outcomes than older firms.

Table 5. Pearson Correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) E	1.000									
(2) S	0.750***	1.000								
(3) G	0.702***	0.691***	1.000							
(4) ESG	0.876***	0.885***	0.861***	1.000						
(5) ROA	0.195***	0.201***	0.221***	0.205***	1.000					
(6) ROE	0.104***	0.111***	0.131***	0.114***	0.879***	1.000				
(7) Tobin's Q	0.252***	0.249***	0.260***	0.256***	0.393***	0.331***	1.000			
(8) Size	0.012	0.007	-0.005	0.011	0.178***	0.158***	0.568***	1.000		
(9) Leverage	0.219***	0.220***	0.219***	0.224***	0.388***	0.358***	0.759***	0.802***	1.000	
(10) Age	-0.153***	-0.163***	-0.186***	-0.166***	-0.307***	-0.258***	-0.351***	-0.131***	-0.320***	1.000

The correlation is significant at the ***1%, **5%, and 10% levels
All variables were winsorized at the 1 and 99 percentiles.
Definition of variables: E = Environmental Score, S = Social Score, G = Governance Score, ESG = ESG Combined Score, ROA = Natural logarithm of Return on Assets, ROE = Natural logarithm of Return on Equity, Tobin's Q= Natural logarithm of Tobin's Q, Size = Natural logarithm of total assets, Leverage = Natural logarithm of the firm's leverage ratio, Age = Natural logarithm of the difference between the observation year and the year of constitution

Source: Own elaboration

Overall, the correlation structure for the sample indicates minimal issues with multicollinearity, as most coefficients remain below the critical levels. While strong correlations between ESG dimensions and the ESG combined score point to possible collinearity, this was mitigated by running separate regressions for the overall ESG scores and each subcomponent, a standard approach in ESG studies (Gujarati and Porter, 2009).

4.3 Regression Analysis

Since the primary regression analysis was a panel data, the Hausman test was applied to determine the best estimator, fixed-effects or random-effects, for the three dependent variables: ln_w_ROE, ln_w_ROA, and ln_w_TobinsQ. As shown in Table 6, the best estimator is the fixed effects model, with a 1% significance level. When variables are omitted and potentially correlated with the model's variables, fixed effects estimation offers a way to control for this bias (Ebenezer Bugri Anarfo, 2015).

Table 6. Results from the Hausman Test

Dependent variable	Explanatory variable	Chi² (df=4)	Prob > Chi²	Conclusion
ln_w_ROE	ESG Score	17.38	0.0016	FE
	Environmental Score	19.98	0.0005	FE
	Social Score	17.16	0.0018	FE
	Governance Score	17.19	0.0018	FE
ln_w_ROA	ESG Score	38.80	0.0000	FE
	Environmental Score	42.51	0.0000	FE
	Social Score	36.41	0.0000	FE
	Governance Score	37.17	0.0000	FE
ln_w_Tobin's Q	ESG Score	137.66	0.0000	FE
	Environmental Score	138.33	0.0000	FE
	Social Score	139.34	0.0000	FE
	Governance Score	135.22	0.0000	FE

Source: Own elaboration

The fixed-effects model's robustness was assessed using the Modified Wald test for groupwise heteroskedasticity. In all cases, the null hypothesis of homoskedasticity was rejected, indicating heteroskedasticity was present across panels. If not addressed, heteroskedasticity leads to biased standard errors and unreliable significance tests. Therefore, to have robust standard errors, all models were estimated clustered at the firm level. This corrects for heteroskedasticity and potential correlation errors within each firm over time, ensuring reliable results.

Table 7. Modified Wald test for groupwise heteroskedasticity in the fixed effect regression model

Dependent variable	Explanatory variable	Chi ² (df=305)	Prob > Chi ²	Conclusion
ln_w_ROE	ESG Score	**4.55e+10**	0.0000	Heteroskedasticity present
	Environmental Score	**6.67e+10**	0.0000	Heteroskedasticity present
	Social Score	**4.35e+10**	0.0000	Heteroskedasticity present
	Governance Score	**2.56e+10**	0.0000	Heteroskedasticity present
ln_w_ROA	ESG Score	**9.64e+11**	0.0000	Heteroskedasticity present
	Environmental Score	**1.73e+10**	0.0000	Heteroskedasticity present
	Social Score	**9.21e+11**	0.0000	Heteroskedasticity present
	Governance Score	**5.16e+11**	0.0000	Heteroskedasticity present
ln_w_TobinsQ	ESG Score	**2 898 037.16**	0.0000	Heteroskedasticity present
	Environmental Score	**2 855 400.63**	0.0000	Heteroskedasticity present
	Social Score	**2 831 685.06**	0.0000	Heteroskedasticity present
	Governance Score	**3 055 114.30**	0.0000	Heteroskedasticity present

Source: Own elaboration

The model fit was assessed through the F-test, which evaluates the joint significance of the explanatory variables. The results indicated a *p*-value of 0.000, far below the 0.05 threshold, meaning that the null hypothesis that all coefficients are zero can be rejected. As a result, the model shows statistical significance at the global level and exhibits a good overall fit, providing a robust foundation for interpreting the results.

4.4 Results

As mentioned in the previous subchapter, the estimator selected for generating the estimates was the fixed-effects model. Tables 8, 9, and 10 present the fixed-effects regressions of ln_w_ROE, ln_w_ROA, and ln_w_TobinsQ on the ESG indicators, respectively.

Table 8. FE regressions of ROE on ESG indicators

Variables	(1) ESG Score	(2) Environmental Score	(3) Social Score	(4) Governance Score
ESG Score	-0.0007 (0.0010)	-	-	-
Environmental Score	-	-0.0015** (0.0007)	-	-
Social Score	-	-	-0.0006 (0.0009)	-
Governance Score	-	-	-	0.0007 (0.0010)
ln_w_Total Assets	-0.0246*** (0.0079)	-0.0257*** (0.0070)	-0.0246*** (0.0080)	-0.0228*** (0.0078)
ln_w_Leverage	0.2893*** (0.0270)	0.2925*** (0.0201	0.2890*** (0.0271)	0.2835*** (0.0267)
Age	0.0478* (0.0249)	0.0434* (0.0252)	0.0483* (0.0248)	0.0552** (0.0251)
Country Dummies	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000
Groups	305	305	305	305
R² (Within)	0.071	0.072	0.071	0.071
R² (Between)	0.130	0.133	0.130	0.123
R² (Overall)	0.088	0.089	0.088	0.085
F-test (model)	108.56	109.54	108.58	108.60
Prob>F	0.0000	0.0000	0.0000	0.0000

*All models include a constant term, firm fixed effects, country dummies, and sector dummies. Robust standard errors (clustered at the firm level) in parentheses. Significance levels: ***p < 0.01; **p < 0.05; p *< 0.10,*

Source: Own elaboration

Regarding the ROE model, presented in Table 8, the fixed-effects estimates, with cluster-robust standard errors, show no significant relationship. The within R^2 values, around 7%, reveal that much of the variation in ROE is not explained, despite the models being statistically significant. This aligns with Gregory (2021), who argued that ESG performance indicators are often modest and heavily dependent on the context.

The estimation results show that the ESG Score is not statistically significant in explaining ROE, suggesting that the combined score does not provide explanatory power for financial outcomes when considered as a whole. When disaggregated, however, the Environmental Score emerges at the 5% level, with a negative effect (-0.0015). This result can indicate that a stronger environmental performance is associated with a small reduction in financial performance, in line with studies that highlight the short-term costs of ESG initiatives (Velte, 2017). In contrast, the Social Score and Governance Score show no statistically significant impact, indicating that, in this sample, improvements in these areas do not translate into measurable short-term financial benefits.

Among the control variables, firm size shows a negative and significant effect across all models. This indicates that larger firms tend to have lower financial performance, as measured by ROE. This result aligns with previous research suggesting that as firms grow, increased operational complexity and capital intensity may decrease profitability (Aydogmus et al., 2022; Naeem et al., 2022). Leverage, in contrast, is strongly positive at the 1% level, indicating that higher debt levels are associated with improved financial performance. Modigliani and Miller (1963) also reflect this conclusion in their findings, proposing that using debt can add value for firms through tax shields and higher returns on equity. Firm age also shows a modest positive effect at the 1 % level, suggesting that more established firms might benefit from experience.

Table 9. FE regressions of ROA on ESG indicators

Variables	(1) ESG Score	(2) Environmental Score	(3) Social Score	(4) Governance Score
ESG Score	0.0025** (0.0012)	-	-	-
Environmental Score	-	0.0012 (0.0015)	-	-
Social Score	-	-	0.0025* (0.0015)	-
Governance Score	-	-	-	0.0028*** (0.0010)
ln_w_Total Assets	0.0273* (0.0153)	0.0258* (0.0153)	0.0275* (0.0153)	0.0283* (0.0096)
ln_w_Leverage	0.2858*** (0.0443)	0.2905*** (0.0444)	0.2849*** (0.0444)	0.2827*** (0.0287)
Age	0.0304 (0.0422)	0.0252 (0.0421)	0.0307 (0.0421)	0.0355 (0.0362)
Country Dummies	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes
Observations	5980	5980	5980	5980
Groups	305	305	305	305
R^2 (Within)	0.088	0.087	0.088	0.088
R^2 (Between)	0.047	0.046	0.047	0.048
R^2 (Overall)	0.071	0.070	0.071	0.072
F-test (model)	136.59	109.54	146.87	137.44
Prob>F	0.0000	0.0000	0.0000	0.0000

*All models include a constant term, firm fixed effects, country dummies, and sector dummies. Robust standard errors (clustered at the firm level) in parentheses. Significance levels: ***p < 0.01; **p < 0.05; *p < 0.10.*

Source: Own elaboration

Table 9 reports the fixed-effects estimation results for the ROA model. The relatively low within R^2 value, around 9%, indicates that part of the variation is not explained by the model, which is also in line with Gregory (2021), who highlights the limitations of ROA as a standalone measure of corporate financial performance.

The ESG Score is statistically significant at the 5% level, with a positive effect (0.0025). This indicates that, in this sample, the companies with a stronger overall ESG performance tend to achieve higher operational profitability. This aligns with findings from Atan et al. (2018),

who found that ESG practices improve ROA and overall firm efficiency. Dalal (2019) also reported the positive association between ESG disclosure and ROA. When examining each pillar individually, the Social Score is significant at the 10% level, with a positive effect (0.0025). This result can indicate that stronger social practices among firms can be associated with higher profitability. Also, the Governance Score is highly significant at the 1% level, with a positive effect (0.0028). This highlights the role of corporate governance in improving financial performance, which is in line with Velte (2017) and Gillan et al. (2021). The Environmental Score is not statistically significant, despite having a positive coefficient (0.0012), which suggests that environmental practices from the firms in the sample do not lead to measurable short-term improvements, likely because of the costs associated with environmental investments (Frynas, 2009).

Firm size is significant at a 10% level, with a positive effect (0.0273). This result can suggest that larger firms tend to achieve a higher ROA, which is in line with prior research that highlights economies of scale and better access to resources in larger firms (Frank and Goyal, 2009). Age is not significant, indicating that maturity and accumulated experience do not have a measurable impact on ROA in this context, which reflects the evidence reported by Naeem et al. (2022).

Table 10. FE regressions of Tobin's Q on ESG indicators

Variables	(1) ESG Score	(2) Environmental Score	(3) Social Score	(4) Governance Score
ESG Score	0.0089*** (0.0014)	-	-	-
Environmental Score	-	0.0072 (0.0012)	-	-
Social Score	-	-	0.0075*** (0.0013)	-
Governance Score	-	-	-	0.0093*** (0.0012)
ln_w_Total Assets	0.0578*** (0.0116)	0.0562*** (0.0116)	0.0568*** (0.0116)	0.0604*** (0.0116)
ln_w_Leverage	0.9373*** (0.0346)	0.9432*** (0.0345)	0.9407*** (0.0346)	0.9306*** (0.0346)
Age	-0.9254*** (0.0435)	-0.9294*** (0.0435)	-0.9316*** (0.0435)	-0.9125*** (0.0436)
Country Dummies	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000
Groups	305	305	305	305
R^2 (Within)	0.491	0.491	0.491	0.493
R^2 (Between)	0.301	0.301	0.299	0.305
R^2 (Overall)	0.410	0.410	0.409	0.413
F-test (model)	1372.95	1369.82	1369.65	1380.66
Prob>F	0.0000	0.0000	0.0000	0.0000

*All models include a constant term, firm fixed effects, country dummies, and sector dummies. Robust standard errors (clustered at the firm level) in parentheses. Significance levels: ***p < 0.01; **p < 0.05; *p < 0.10.*

Source: Own elaboration

Table 10 reports the fixed-effects estimation results for Tobin's Q model. The R^2 values (about 49%) show that the models explain a large part of the variation in Tobin's Q, which is much higher than in the ROE and ROA models.

The ESG Score is significant at the 1% level with a positive effect (0.0089), indicating that firms with higher ESG scores are valued more by the market. This result supports the argument that capital markets are starting to include sustainability in valuation (Bloomberg, 2024). Velte

(2017) also provides evidence that ESG scores are positively linked to firm value in European markets, emphasizing the robustness of this relationship across different contexts. This aligns with the broader literature (Falck and Heblich, 2007; Gillan et al, 2021), which views ESG as a compliance requirement and a strategic factor driving long-term market valuation.

All three ESG scores show positive, significant results at the 1% level. The Environmental Score (0.0072) suggests that environmental practices reduce risk and signal resilience, affecting valuation (Schaltegger, 2002). The Social Score (0.0075) indicates firms with a stronger social responsibility are valued more, aligning with the Stakeholder Theory (Freeman, 1984). Naeem et al. (2022) note that in environmentally sensitive industries, social performance can enhance valuation by reducing reputational and operational risks, suggesting that social investments can increase market value through Tobin's Q. The Governance Score (0.0093) has the strongest impact, in line with evidence that strong governance reduces agency costs and is highly valued by investors (Velte, 2017; Gillan et al, 2021)

Firm size and Leverage are significant at the 1% level with a positive effect, indicating that, in the sample, larger firms tend to achieve higher market valuations and that debt financing can be associated with higher firm value. Age is significant at the 1% level, with a negative effect (-0.9254), indicating that the market places a lower value on older firms. This result suggests that, as a market-based indicator, Tobin's Q can reflect investor concerns about the structural challenges that established firms face (Gregory, 2021).

Furthermore, in the energy sector, older companies are more likely to hold carbon-intensive legacy assets and face higher adjustment costs in the sustainability transition, which can negatively affect market value (Frynas, 2009; Oreggioni et al., 2021).

5. Conclusion

This study explored the complex relationship between ESG Scores and their association with financial performance in European energy sector firms. The data was obtained from the LSEG DataStream database, resulting in a final sample of 306 companies and 7,650 observations from 2000 to 2024.

Regarding Hypothesis 1A, which proposes that improvements in ESG scores positively influence financial performance, the results suggest a positive relationship, although the evidence is not consistently strong across all indicators. Tobin's Q presents the most consistent association, indicating that market-based measures appear to reflect ESG developments more clearly than accounting-based indicators, where the effects are weaker and less uniform.

This tendency is also visible in Appendix A - ESG Score evolution over time which illustrates the progression of average ESG scores throughout the sample period. The graph shows a gradual increase rather than a sharp change, suggesting that ESG improvements have occurred over time, but at a moderate pace. This development supports the idea that ESG performance may be recognized by the market, even if the financial impact is not immediate or equally reflected across all firms. Overall, the results support H1A in a cautious manner, with a positive direction that should be interpreted as indicative rather than conclusive.

Due to the sector's highly regulated nature, governance has the strongest association with financial performance. Investing in corporate governance helps to reduce agency costs and builds trust with stakeholders and investors, which can, in consequence, lead to better economic results. Social initiatives also show a positive effect; therefore, efforts to support employee well-being, diversity, inclusion, and community involvement add value and can be seen as a positive strategy by investors, enhancing confidence and, consequently, improving financial results. On the other hand, environmental initiatives have a weaker and less significant effect, due to the sector's characteristics; the transition to sustainable energy requires substantial investment and takes more time to execute. The financial outcomes of environmental projects depend heavily on outside factors, such as energy price volatility and geopolitical events, which can reduce their direct influence.

The results also support Hypothesis 1B. which states that companies that consistently improve their ESG scores over the years demonstrate increasing and sustainable financial performance. To develop this hypothesis, the variable Firm Age was created. The estimations indicate that older firms, known for their greater reputational pressure and established systems, tend to benefit more from continued improvements in ESG performance. Even though they can be seen as more adaptable, young firms do not present the same long-term financial gains. Therefore, it can be concluded that older firms that yearly increase their ESG score have a more direct positive economic impact than younger and more flexible firms that are still very volatile to these changes.

Nevertheless, this study has some limitations. First, it focuses on the European countries only, so the results may only be relevant within this context and cannot be applied to other regions. Second, the ESG data may significantly influence the results. Relying solely on the LSEG workspace can lead to reporting inconsistencies and methodological changes. Thirdly, the period covered in this study, during which significant events have occurred, such as the European Green Deal, the COVID-19 Pandemic, and the Russia-Ukraine conflict, may have influenced both financial and ESG results in the European countries in ways that cannot be fully isolated in this study.

Regarding future research prospects and building on the limitations of this study, it could be valuable to perform the same analysis using individual samples from different countries simultaneously. This kind of research can help uncover the fundamental differences between countries and cultures and identify which mechanisms and characteristics positively influence the implementation of ESG initiatives across various nations. The role of sector-specific dynamics, such as transitioning from fossil fuels to renewable energy sources, and the effects of energy price volatility, should be considered. Broadening this scope could provide insights into how companies adapt their ESG strategies to stay profitable while advancing the energy transition.

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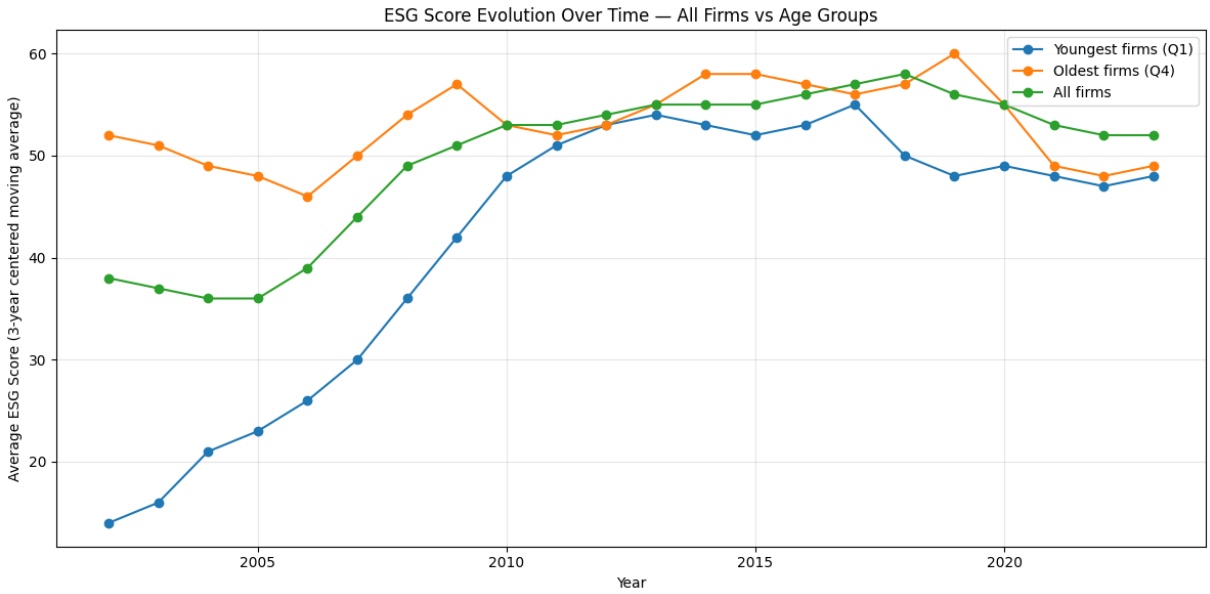
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Appendix

Appendix A – Additional Figure



Appendix A - ESG Score evolution over time.

Source: Own elaboration