ERASMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS
MSc Economics & Business
Specialization Financial Economics

Factors Influencing Changes in ESG scores

An Analysis of Key Environmental, Social, and Governance Factors

Author: Elena Loforese
Student number: 679011
Thesis supervisor: Ruben de Bliek
Second reader: Renée Spigt
Finish date: 29th August 2024

Abstract

The purpose of this research paper is to examine the key factors influencing changes in Environmental, Social and Governance (ESG) scores across different industries in a European context. Following the increasing interest in responsible investing practices, this study focuses on firm-specific characteristics (carbon emissions, workforce diversity, audit committee independence) and macro-economic conditions (GDP) for 631 companies from 2017 to 2022. In order to examine the influence of these variable on the changes in scores, Ordinary Least Squares regressions are employed. The results indicate that audit committee independence positively impacts ESG score changes in the short term, while carbon emissions have mixed results depending on the model and the year taken into consideration, while workforce diversity shows a negative long-term impact. The findings highlight significant industry-specific differences and the complexity of the relationship between economic conditions and ESG changes. Thus, this paper emphasises the importance of governance practices and environmental factors in impacting ESG score changes. Further research should focus on expanding the dataset, including additional factors and use more advanced analytical methods in order to address the limitations that this research is facing.

Keywords: ESG score changes, Sustainability, ESG investing, ESG rating, Environmental, Social, and Governance (ESG)

JEL Classification : D22, F64, G34, M14, Q56

Table of Contents

Chapter 1

Introduction

As global consciousness is shifting towards responsible investing, understanding the factors that influence changes in Environmental Social and Governance (ESG) scores, nowadays the primary metrics for evaluating the sustainability and ethical impact of investments, has become critical for investors. The origins of ESG can be traced back to the 1930s and 40s, when the concept of corporate social responsibility (CSR) was born. In the 1970s, CSR gained prominence, and it was further refined in 1984 by Freeman's work on stakeholder capitalism, according to which companies have an obligation to seek long-term value creation while being mindful of their impact on society and the environment. In turn, creating the groundwork for what we know as stakeholder theory. Although initially lacking public recognition, this form of capitalism has gained traction due to recent global crises. The first mainstream mention of ESG, however, is found in a 2004 United Nations report titled "Who Cares Wins." Since then, the adoption of ESG principles has accelerated, catalyzed by the COVID-19 pandemic, which highlighted the benefits for companies treating their employees well, a further testament to the growing importance of ESG in modern day business practices. ESG scores, generated by multiple rating platforms, compare the performance of organizations against various criteria, with both external and internal stakeholders contributing to these evaluations. It must be noted that the criteria for assessment are in continuous evolution, and while these can offer valuable insights into ESG performance, they also make comparing data from different years challenging, as made evident by Escrig-Olmedo et al. (2018). The factors driving ESG performance can vary across different industries and countries, but generally focus on three main areas: Environmental, Social and Governance. Environmental factors include decarbonization, water scarcity, waste and pollution, biodiversity fostering and sustainable supply chain. Social drivers instead include workforce, human rights, community, and product responsibility. Governance factors involve management and corporate behaviour (PWC). In an effort to identify the factors most important to the calculation of ESG scores, this paper undertakes a cross-industry analysis accounting for differences in firm location and focusing on the some of the factors mentioned above.

Researchers in the field of ESG focus on understanding and improving the integration of ESG criteria into corporate and investment practices. Over time, multiple theoretical models have been developed to explore the relationship between corporate governance and sustainability performance. Daugaard (2022) presents a detailed summary of the existing literature, identifying the most influential frameworks, such as agency and stakeholder theory, as well as challenges that highlight the multifaceted aspect of corporate responsibility and its effects on society and the economy. His goal was uncovering the reasons behind the differences in ESG performance at a macro level, something previous authors have failed to do. Agency theory, first introduced by Mitnick (1976), states that companies protect investors and reduce agency conflicts through control mechanisms. In the context of ESG, agency theory helps understand how corporate governance can influence management's decisions pertaining to ESG issues. Some decades later, Freeman (2010) finally formalized the stakeholder theory according to which companies must establish strong relationships with all stakeholders, not just shareholders, in order to improve corporate legitimacy and gain long term success. In addition to the aforementioned theories, recent studies have investigated the relationship between ESG performance and financial outcomes. Halbritter et al. (2015), challenge the belief that higher ESG ratings equal to better financial returns, with results showing that while strong ESG practices are important for corporate legitimacy and stakeholder satisfaction, they do not always translate directly into better financial performance. Furthermore, Escrig-Olmedo et al. (2018) shed light on the challenges associated with comparing data from different years. This is significant when considering findings from Senadheera et al. (2021), an investigation into ESG scoring, with focus on the Environmental (E) pillar. The authors argue that despite the widespread adoption of ESG criteria, it is difficult to achieve meaningful and comparable E scores due to data quality issues among rating providers. This emphasizes the dynamic nature of ESG metrics when analysing factors that correlated to changes in ESG scores, highlighting the need for a standardized and reliable assessment criterion to ensure consistency and comparability over time.

While the literature above provides a solid background which helps understand ESG criteria, a significant gap exists. ESG rating changes have already been studied, particularly in relation to performance metrics, such as in the research conducted by Shanaev et al (2022). This study is the first to demonstrate that ESG rating downgrades are shown to depress stock markets, while upgrades have the opposite effect. Yet, to this date, even though rating

changes have been documented, no one has looked into the underlying determinants. For instance, Berg et al (2021) discuss significant changes to ESG ratings by Refinitiv ESG, a key ESG provider, mainly due to methodological changes in 2020. The findings reveal ongoing and unannounced rewriting of historical ESG scores, which affects the classification of firms. This suggests a need to understand the underlying factors driving ESG rating changes, as these changes have substantial implications for investment decisions. Therefore, this thesis asks: **"What factors explain changes in ESG scores (both increases and decreases) over time?"**

The data will be sourced from LSEG, previously known as Refinitiv/ASSET4, focusing on 631 companies from Europe. To analyse the factors influencing changes in ESG scores, the primary methodological approach will be Ordinary Least Square regression analysis. This method will allow for the examination of various factors on ESG score changes. In order to provide a period sufficient to observe recent trends and at the same time manage data volume, I will primarily focus on data spanning from 2017 to 2022. The main focus of this thesis is to identify the factors most influential in ESG score changes, specifically examining carbon emissions (E), workforce diversity (percentage of women) (S), and audit committee independence (G). Carbon emissions indicate a company's environmental impact, reflecting its commitment and effectiveness in reducing environmental emissions in its production and operational processes. Workforce diversity, particularly the percentage of women, measures a company's commitment to gender equality and social inclusion. This factor reflects efforts to respect human rights, enhance workplace diversity, and foster an inclusive environment. Lastly, audit committee independence ensures the objectivity and integrity of financial reporting, preventing financial fraud, enhancing transparency, and maintaining accountability. The change in ESG scores will be calculated as the difference between ESG scores at two different points in time, specifically, calculating the difference between ESG scores for consecutive years.

I expect to find that changes in ESG scores over time are influenced by firm-specific characteristics. Second, the factors influencing changes in ESG scores vary significantly across different industries and lastly, that macroeconomic conditions such as GDP growth positively impact ESG scores.

The results of this study highlight significant industry-specific differences and underscore the complexity of the relationship between economic conditions and ESG changes, finding some significant impact given by some of the variables that were analysed.

The remainder of this paper is structured as follows. Chapter 2 discusses relevant literature and previous research. Chapter 3 introduces the dataset used for the analysis. Chapter 4 discusses the empirical methodology. Chapter 5 presents the main results of the study, including a test of the proposed hypotheses. Chapter 6 discusses the main findings, including a comparison with previous results from the literature and research limitations. Finally, Chapter 7 provides a summary and conclusion of what has been discussed along with main findings of the analysis. Additional materials are provided in the Appendices.

Chapter 2

Theoretical Framework

2.1 History of ESG

Climate change and its disastrous effects are nowadays amongst the most popular topics of discussion. On separate occasions, scientists have proven that human endeavours, and the resulting emissions, are the main drivers of climate change. Further proof of the negative impact humanity is having on the planet is given by the rising temperatures observed across the world. Just last year, in 2023, they were measured to be 1.45 ± 0.12 °C higher than the average for the period between 1850 and 1900 average (WMO, 2024). However, climate change is just one of the major challenges we collectively face. Poverty, inequality, and access to healthcare are equally pressing matters that must be addressed. Now more than ever, companies should act with consideration for the environment and our society.

The belief that corporations have a responsibility towards society can be traced back to ancient Rome, yet only later made an appearance in the literature. Specifically, when authors started to discuss the role of executives and the social performance of corporations in the 1930s and 40s. Agudelo et al. (2019) thoroughly describe the history of CSR highlighting pivotal events, such as those of the 1970s. During this period, antiwar sentiments and negative views of corporations were spreading, culminating in the creation of social and environmental regulations and leading to Carroll's first definition of Corporate Social Responsibility in 1979. According to his definition of CSR "The social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time" (Carroll, 1979).

While CRS built the foundations for ethical corporate behaviour, Socially Responsible Investing (SRI) was the first theory suggesting alignment of investment decisions with ethical and social values.

In a similar fashion, the concept of responsible investing has existed for a long time. Its origins lie in US's colonial era whereby a religious group, known as the Quakers, prohibited their members from funding the slave trade. Nevertheless, it wasn't until the 1960s that SRI became what we know today, following the Vietnam war and MLK's movement. A decade later, during the apartheid in South Africa, investment funds first started screening out companies benefitting from the division.

As Caplan et al. (2013) discuss in their research, the issue with socially responsible investing lies in its restricted nature, which can turn away many investors. As a matter of fact, while SRI can align with an investor's ethical or moral values, its reliance on negative screening can limit the range of securities available to invest in. This can result in an under diversified portfolio and mitigated returns. These characteristics are incompatible with an institutions' duty to maximize returns on investments.

Nevertheless, the positive role that environmental, social, and governance (ESG) factors can have on investment performance is finally starting to be acknowledged. This recognition has prompted a shift by investors, moving from the value driven SRI to financial value driven ESG.

The first mainstream mention of the term ESG is found in a 2004 United Nations report titled "Who Cares Wins: Connecting Financial Markets to a Changing World". The report, developed in a joint fashion by multiple financial institutions, provides guidelines and recommendations for the consideration of environmental, social and corporate governance issues in asset management, securities brokerage services and associated research functions (UN, 2004). It highlights how addressing ESG issues can help companies increase shareholder value through increased reputation and performance while offering recommendations for stakeholders within the financial sector. This report went on to inspire the creation of more frameworks designed to offer companies clearer guidance, such as the Principles for Responsible Investment (PRI).

The last decade has been a testament to the evolving landscape in favour of sustainable initiatives. We observe significant achievements such as the establishment of Sustainability Accounting Standards Board (SASB), the introduction of Sustainable Development Goals (SDGs) by the UN, the establishment of the Taskforce on Climate-related Financial Disclosures (TCFD), the signing and adoption of the Paris Agreement and the gathering of 140 CEOs to sign the Compact for Responsive and Responsible Leadership.

The peak was reached during COVID-19, when firms with better ESG performance showed significantly higher cumulative abnormal returns and lower volatility than firms with lower ESG. This demonstrated to investors that following ESG criteria is beneficial in times of crisis, particularly in low-trust countries with broader security regulations (Engelhardt, 2021).

Today, ESG investing has become mainstream: new regulations are being established in order to encourage ESG integration within companies, while ESG rating agencies are

gaining more importance, as there is an increasing demand for transparent and accountable corporate practices.

2.2 Theoretical and Empirical Prospectives

This section is divided into four different subsets and will present theories from previous studies that proposed and discussed possible explanations of ESG outcomes.

2.2.1 Agency Theory

Agency theory was first proposed by Mitnick in 1976 and it is a framework that is used in order to understand and address conflicts that arise between the principals and the agents. It focuses on the principal-agent problem, which emphasises the possible differences in goals, priorities and risk preferences between the two parties. With regards to ESG, Peng et al. (2020) highlight that there could be a principal-agent problem between managers and shareholders. As a matter of fact, expenditures made in order to be compliant with ESG practices might not be ideal for the shareholders, since it would result in a reduction in revenues.

Different studies further elaborate on the potential ways agency problem can manifest in the contest of ESG practices, such as the problem of greenwashing and managers that may allocate firm resources towards ESG activities to gain private benefits. According to agency theory it is clear that ESG practices are seen as a waste of resources and a way to cover negative performances. However, the findings from Peng et al. (2020) show a positive relationship between ESG and economic performance, rejecting the agency theory.

2.2.2 Stakeholder Theory

Stakeholder theory is the prevailing theory of corporate sustainability. The first mention of stakeholders first appeared in 1963; however, the theory as we know today wasn't developed until 1984, when Freeman published a book titled "Strategic Management: a stakeholder approach". Stakeholder theory states that the better a company establishes strong relationships with all stakeholders, not just shareholders, the more successful it will be over time, creating value. Freeman also stated that stakeholder theory addresses three problems related to business: the problem of value creation and trade, the problem of the ethics of capitalism and the problem of managerial mindset (Parmar et al. 2010). When the theory was

first formulated, it lacked public recognition, as little attention had been paid to business ethics at that time.

However, after the rise of ESG practices, stakeholder theory has made a comeback. Stakeholder theory helps identify and specify a business's social obligations and implies that ESG practices enhance a company's reputation, which in turn leads to higher financial performance. A recent study by El Ghoul et al. (2017) finds that ESG practices can improve relationships between managers and stakeholders by reducing conflicts, building trust, and facilitating access to resources, especially in countries with institutional voids. This implies that ESG initiatives are instrumental in increasing shareholder and stakeholder value.

2.2.3 Institutional theory

Sociological analyses of organizations, such as the ones by Parsons and Selznick, mentioned 'institutional' aspects from the late 1950s. Parsons (1956) focused on the importance of organizations aligning with the goals of society to gain legitimacy and resources. One year later, in 1957, Selznick expanded on Parsons' work, highlighting the role of leaders in linking organizations to societal values for long-term survival. This approach to analysis, however, was eclipsed by another theory, the contingency theory. Neo-institutional theory was formally introduced in 1977 by Meyer and Rowan's, bringing back the focus on external factors. As a matter of fact, the theory argues that organizations adopt certain structures to signal commitment to societal values. In 1983 DiMaggio and Powell further elaborated on this theory, emphasizing the fact that organizational studies are still heavily influenced by external factors and limitations of rational decision-making (David, 2019). Institutional theory also states that, due to institutional pressures that drive them to adopt common practices and adhere to social norms within their field, organizations within the same "organizational field" tend to have homogeneous characteristics.

With regards to ESG, institutional theory links organizational practices, such as ESG practices, to societal values and norms. The theory states that by adopting ESG practices, organizations can maintain or even enhance their legitimacy (Fernando et al., 2014).

2.2.4 Legitimacy theory

Legitimacy theory is closely related to stakeholder theory and institutional theory. According to this theory, the organization, which must interact with the environment in order to thrive, must gain the support of society (Olateju, 2022). However, Fernando (2019) highlights that maintaining this status is challenging due to the evolving societal norms, which in turn results in a 'legitimacy gap', a discrepancy between the actions of an organisation and the societal expectations. This gap poses threats to the organisation's reputation, and in turn generates a need for strategic intervention.

With regards to ESG, legitimacy theory suggests that organizations engage in ESG activities and reporting to show their alignment with societal values, enhancing legitimacy. However, legitimacy theory has its limitations, especially in explaining selective disclosure decisions. For example, organizations may refrain from disclosing negative news related to their operations or may selectively highlight positive ESG-related news to enhance their image.

Nevertheless, it remains important for ESG research, providing valuable insights into understanding the dynamics between organizations and society.

2.3 ESG Ratings and their determinants

2.3.1 ESG ratings

Despite the significant demand for ESG ratings, with 82% of investors claiming that their clients require them before making investment decisions (PwC) and Bloomberg predicting that ESG assets will reach US$50 trillion by 2025 (Abramson, 2024), no universal reporting standards exist.

Escrig-Olmedo et al. (2018) emphasize the inconsistencies in ESG assessment criteria and the difficulty of comparing data from various rating providers. This variability can be attributed to differences in methodology, data quality, and the integration of sustainability principles into ESG frameworks. Additionally, the study identified differences as to how much weight is given to the factors that determine the ESG scores. For example, some agencies may prioritize environmental factors, while others might focus more on the social or government ones. This in turn can lead to different assessments of the same company's sustainability performance, reducing reliability. Berg et al. (2021) further illustrate this issue

by highlighting the methodological changes in Refinitiv ESG ratings, which led to significant alterations in historical ESG scores.

On the other hand, in order to explain the high demand for ESG scores, it is important to keep in mind that ESG data has dual purpose: the first is addressing the negative societal and environmental impacts of companies, and the second is improving financial evaluations by incorporating ESG factors relevant to corporate value. This dual purpose has led to the emergence of different types of data vendors, with the first being KLD, founded in 1988 in Boston as a privately owned research firm. The mission of this rating agency was to "remove barriers to socially responsible investing, provide superior research and support services to the socially responsible investment market" and "influence corporate behaviour toward a more just and sustainable world" (Eccles, 2019). By 2007, most of the institutional investors worldwide were using KLD's Socrates product to integrate ESG factors into their investment decisions (Tang et al, 2022).

Innovest Strategic Value Advisors, Inc. (Innovest), on the other hand, was founded in 1995 was created as an investment research advisory firm with headquarters in New York and Toronto focusing on the performance of firms on ESG issues. Innovest played a significant role in the development of ESG ratings, introducing methodologies like EcoValue and Intangible Value Assessment (IVA).

In 2009, RiskMetrics acquired Innovest and later KLD and one year later, in 2010, MSCI acquired RiskMetrics. Following these mergers, MSCI faced the challenge of integrating the different methodologies used by these two rating agencies. Ultimately, MSCI chose to adopt Innovest's financially focused, industry-specific approach for its ESG ratings, due its scalability and alignment with client needs.

Now MSCI has become one of the most important rating providers in the ESG field, and other agencies include Refinitiv/Asset4, owned by LSEG. New Energy Finance owned by Bloomberg, Sustainalytics owned by Morningstar, TruCost and RobecoSAM ESG Ratings owned by Standard and Poor's, and Vigeo Eiris owned by Moody's.

2.3.2 ESG determinants

As ESG investing is gaining popularity, it is crucial for investors to understand the drivers that influence the changes in ESG scores. Tsai et al. (2021), showed how improvements in corporate CSR positively affect financial performance, especially during periods of economic crisis. These findings helped with evaluating the strategic value of CSR in mitigating risks and enhancing long-term financial performance, aligning with stakeholder expectations and enhancing corporate reputation.

In a similar fashion, Shanev et al (2022) investigated the impact of ESG rating changes on stock returns and found that ESG rating downgrades lead to negative impacts on stock markets, whereas upgrades tend to have the opposite effect. This demonstrates the importance not only of the absolute ESG score, but also of the changes in these ratings, since market reactions are often more pronounced when there are significant shifts in ESG scores. These studies are a testament to the fact that CSR practices and improvements in ESG scores can contribute to higher financial performance and risk mitigation risks, especially during unfavorable market conditions (Tsai et al., 2021; Shanev et al., 2022).

However, the underlying determinants of the changes in rating have not been properly addressed until now, with most of the literature focusing on the ESG scoring itself. As mentioned in Daugaard's (2022) research, there is much research that contributes to revealing the drivers behind the ESG performance of a company. To address these gaps, this study proposes the following hypothesis:

Hypothesis 1: Changes in ESG scores over time are influenced by firm-specific characteristics, such as environmental policies, social initiatives, and governance structures.

Firm-specific characteristics have been identified as significant factors influencing ESG scores. For example, studies such as Drempetic et al. (2019), Tang et al. (2022), and Birindelli et al. (2018) have already found that factors such as firm size, rater ownership, and board composition play crucial roles. As a matter of fact, Drempetic (2019) demonstrated that larger firms tend to have higher ESG scores due to increased pressure to disclose information, while Tang (2022) found that firms that share shareholders with their ESG raters tend to receive higher ESG ratings. Additionally, Birindelli (2018) showed that larger boards and

gender diversity positively impact ESG performance, though this effect is not visible beyond a certain threshold.

On the other hand, Crespi et al (2020)'s research focuses on the financial sector, investigating what drives ESG scores within this industry. The study highlights that larger and more profitable firms tend to achieve higher ESG ratings, and that regulatory frameworks and socio-economic conditions have a crucial influence on the score. In addition to these findings that are in line with other studies, Crespi also shows that there is a particular distinction in how firms of different sizes prioritize ESG dimensions. As a matter of fact, larger firms are inclined to focus more on the environmental and social factors, whereas smaller firms place greater emphasis on governance factors. Building on these insights and aligning with Institutional theory, we propose the following hypothesis:

Hypothesis 2: The factors influencing changes in ESG scores vary significantly across different industries.

There are also other studies that focus on identifying the factors that influence sustainability disclosure among companies, rather than on the ESG scoring itself. Dyduch et al (2017)'s study investigates the factors influencing CSR disclosure among Polish listed companies, testing several variables such as company size, profitability, financial leverage, industry environmental sensitivity, board characteristics (size and gender diversity), internationalization, and reputation. Their findings suggest that there is a positive correlation between company size, industry environmental sensitivity and internationalisation, while the other hypothesis are proven not to be supported. In a related study, Sharma et al (2020), investigated ESG disclosure among Indian companies, analysing slightly different variables. The findings however differed from those of Dyduch, with profitability having significant impact on ESG disclosure of companies.

Furthermore, Daugaard (2022), identifies several determinants impacting the determinants of ESG scores focusing on macroeconomic factors such as political settings, economic wealth, the extent of socially responsible investments and cultural differences. Their findings suggest that macroeconomic conditions play a significant role, influencing a firm's ability and willingness to invest in ESG initiatives.

In a similar fashion, Zhou et al (2020) and Alandejani et al. (2023) study different aspect of the relationship between macroeconomic conditions and ESG performance.

Zhou et al. (2020) concentrate their studies in the relationship between firm-level ESG practices and macroeconomic performance and find that an increase of firms' ESG performance has a positive effect on its country's macroeconomic performance, such as GDP growth. On the other hand, Alandejani et al. (2023) examine the impact of macroeconomic uncertainty on ESG performance, suggesting that during times of economic uncertainty, firms are more likely to engage in ESG activities in order to mitigate risks and build trust with their stakeholders. Given these insights, we propose the following hypothesis:

Hypothesis 3: Macroeconomic conditions impact ESG scores. Positive changes in GDP will have positive impact on ESG scores.

Chapter 3

Data

In this section, I provide an overview of the data used to analyse the determinants of changes in ESG scores.

3.1 Data Source

The data necessary to answer the research question will be sourced from LSEG, previously known as Refinitiv ESG/ASSET 4, a global provider of financial market data and infrastructure (Wikipedia, 2024). LSEG was chosen as it is widely recognized and used by major asset managers and academic researchers and is known for having one of the most extensive ESG databases, making it a trusted source for ESG data. The methodology used by the provider is a further point in favor of its selection.

LSEG uses a scoring system that assesses firms on more than 630 ESG measures, with a subset of 186 of the most comparable measures. These are then grouped into 10 categories that reformulate the three pillars, and the final ESG score. The categories included in the three pillars are: resource use, emissions, and innovation for environmental, workforce, human rights, community and product responsibility for social, and management, shareholders, and CSR strategy for governance.

Despite some concerns raised by Berg (2021) about the reliability and consistency of its ratings LSEG has continuously been improving its methodology, and many of the authors referenced in the literature review chapter use this database, including Berg (2021), Drempetic (2019) and Senadheera (2021).

Moreover, in order to answer Hypothesis 3, it was necessary to obtain data about the GDP of the 20 countries (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey and United Kingdom) for the five-year period examined. Such data was sourced from the Organisation for Economic Co-operation and Development (OECD), known for its reliable economic data. The OECD was chosen also because it

provides consistently updated datasets and for its easier accessibility compared to other sources.

3.2 Sample Selection

The sample will be restricted to listed companies, since ESG data for these firms is more consistent and available, facilitating comparisons. Moreover, the sample will focus on European countries in order to ensure consistency in the regulatory environment, which helps control for external factors influencing ESG reporting practices.

As a matter of fact, European countries have established severe ESG reporting standards. For instance, companies with more than 500 employees must adhere to the EU Non-Financial Reporting Directive (NFRD), which aims to improve transparency and accountability in business practices.

Furthermore, the EU has introduced the Corporate Sustainability Reporting Directive (CSRD) in 2022, which builds on the NFRD and expands it to all listed companies and those with more than 250 employees. The CSRD will start to be employed rollout in 2024, a further testament to the EU'S commitment to comprehensive ESG reporting.

The dataset spans from 2017 to 2022, a timeframe that is able to capture recent trends and changes in Environmental, Social, and Governance (ESG) scores. This period also shows the effect of various global events, such as the impact of the COVID-19 pandemic, economic fluctuations and regulatory changes.

3.3 Sample Restrictions

The data sample was restricted to European companies that report ESG scores, carbon emissions, workforce diversity, and audit committee independence data for the years that I have analysed (2017-2022). Any company that did not meet this criterion was excluded in order to eliminate any bias arising from missing data and to ensure the reliability of the results.

The final sample consists of 631 companies across 71 industries in 20 different countries, providing a broad representation of the European market and allowing for robust statistical analysis.

3.4 Data Collection and Preparation

The data collection process involved first extracting ESG scores and metrics for carbon emissions, workforce diversity and audit committee from the LSEG database. This database provided all the necessary data for publicly listed European companies for the 2017-2022 period.

The next step involved cleaning the data to ensure the accuracy and reliability of the analysis. This involved removing inconsistencies by excluding any company with missing or incomplete data for the chosen variables (ESG scores, carbon emissions, workforce diversity, and audit committee independence), and standardizing formats, by converting string data to numeric values when necessary. GDP values on the other hand were extracted from the OECD database.

Summary statistics were then calculated in order to provide an overview of the dataset, highlighting key characteristics such as mean, standard deviation, maximum and minimum values.

As the dataset included 71 different industries, I followed Dyduch (2017)'s approach of dividing the industries in manufacturing and non-manufacturing in order to facilitate data analysis for Hypothesis 2. Each company was then assigned to one of the two categories based on industry classification. In particular, industries such as chemicals, machinery, and oil & gas were categorized as manufacturing, while industries like banks, insurance, and retail were categorized as non-manufacturing.

3.5 Variables

The variables used in this study are ESG scores, total carbon dioxide (CO2) and CO2 equivalents emissions in tonnes, women employees, and audit committee independence.

3.5.1 Dependent variable

Since the main focus is on the Environmental, Social, and Governance (ESG) scores, specifically the change in these scores over time, this will be used as the dependent variable.

ESG Scores: These scores measure the company's overall performance on environmental, social, and governance factors based on self-reported information.

3.5.2 Independent variables

With regards to independent variables, this study incorporates four metrics in order to analyse their impact on the change in ESG scores. The following section will expand upon each one individually:

Total carbon dioxide (CO2) and CO2 equivalents emissions in tonnes: This variable serves as an indicator of the company's environmental impact. It represents the total carbon emissions reported by the company, including both direct and indirect emissions. The emissions are reported following the GHG Protocol and include gases such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorinated compounds (PFCs), sulphur hexafluoride (SF6), and nitrogen trifluoride (NF3). By analysing this variable, we can assess the extent to which a company's carbon footprint affects its ESG performance, particularly in the environmental dimension. In order to ease the interpretation of results, it was deemed best to perform a logarithmic transformation of this variable in order to normalize the data, reduce skewness and mitigate heteroscedasticity. In the analysis I will refer to this metric as "carbon emissions". The relevance of carbon emissions as a variable is supported by several studies, such as those conducted by Li et al (2023) and Long (2024). These studies found that ESG ratings significantly reduce corporate carbon emissions, particularly in heavily polluting enterprises (Li, 2023) and with stringent environmental policies (Long, 2024).

Women employees: This variable was chosen as an indicator for a company's social performance and measures the diversity of the company's workforce, focusing on the percentage of women in the workforce and representing the company's commitment to gender diversity and inclusion. In the analysis I will refer to this metric as "workforce diversity". The relevance of the number of women employees as a variable is supported by De Lucia et al. (2020). Their findings suggest that the number of women employees has a significant negative effect on the financial performance metrics that they analysed. However, these variables show different results when studied in a different context. For example, Cho et al. (2020) examined the effect of number of female employees in Korea, finding that gender diversity in the workforce positively influence both CSR and financial performance.

The difference in findings highlights the importance of context and suggests that gender diversity can lead to better outcomes in different cultural and economic settings.

Audit committee independence: This variable was chosen as an indicator for a company's governance practices and measures the percentage of independent board members on the audit committee as stipulated by the company. High levels of independence in the audit committee are associated with better accountability. The relevance of audit committee independence as a variable is supported by Arif et al (2021) and Pozzoli et al. (2022). Arif (2021) found that audit committee independence significantly enhances the quality and quantity of ESG disclosures, while Pozzoli (2022) demonstrated that this variable positively affects ESG performance.

Gross Domestic Product: This variable is used to answer Hypothesis 3. It gives a representation of the overall economic environment in which the company operates. By incorporating GDP, we can examine how macroeconomic conditions influence ESG scores changes over time. Since GDP presented the same issues as the carbon emission variable, in order to ensure better comparability, it was log transformed. In the analysis I will refer to this metric as "GDP". The relevance of GDP as a variable is supported by several studies such as the afore mentioned Zhou et al. (2020) and Alandejani et al. (2023), where they use GDP per capita as a proxy for macroeconomic conditions, emphasizing its importance in understanding the influence of the macroeconomic environment on ESG performance.

3.6 Summary Statistics

Table I

	N	mean	s.d.	min	max
ESG Score	3930	68.03	14.31	9	96
Carbon Emission	3930	2,516,086.67	9,984,579.45	11	139,000,000
Carbon Emission (log)	3930	11.64	2.69	2.38	18.75
Workforce Diversity	3930	36.47	16.10	2	88
Audit Committee Independence	3930	81.78	23.43	0	100
Gross Domestic Product	120	1,004,208.37	1,046,205.43	143,112.2	427,8504
Gross Domestic Product (log)	120	13.380	0.91	11.87	15.27

Note: Summary statistics for average ESG score, carbon emissions, workforce diversity, and audit committee independence scores for the sample of companies across 5 years (2017-2022).

Table I provides an overview of the data, offering insights into the mean, standard deviation, maximum and minimum value for ESG scores, carbon emissions, workforce diversity, and audit committee independence for a sample of 631 European companies spanning from 2017 to 2022.

ESG scores and workplace diversity show moderate variability. On the other hand, carbon emissions exhibit significant variability, as indicated by the high standard deviation. GDP data shows high variability as well, which reflects the diverse economic scales across different countries. In order to address the extreme variability and skewness of GDP and carbon emissions, a logarithmic transformation of the variables was undertaken. After applying the log transformation, the data distribution resembles a normal one, reducing the impact of extreme values and outliers. Variance is also stabilised through this process, increasing the uniformity of our dataset and mitigating the influence of countries with exceptionally high or low GDP/Carbon emission. Such an approach increases the accuracy of our analysis and increases the confidence level of our results.

The audit committee independence scores are relatively high on average, with some companies being able to achieve perfect scores.

Table II (Appendix A) displays an outline of the distribution of companies by the countries. As shown on the table, United Kingdom, France and Germany are the countries that have a strong presence in the dataset.

Table III (Appendix B) and IV (Appendix C), illustrate an overview of the number of companies of categorized by industry sectors. The companies were first divided into manufacturing and non-manufacturing. The tables shows that banks, insurance and Hotels, Restaurants & Leisure for non-manufacturing and chemicals, Oil, Gas & Consumable Fuels and Metals & Mining are the industries that present more data.

Chapter 4

Research methodology

This chapter describes the methodologies used to tackle the hypotheses formulated in this paper, specifically those used to analyse the determinants of changes in ESG scores, focusing on firm-specific characteristics, industry differences, and macroeconomic conditions. Given the complexity of ESG factors, I used three approaches to ensure a comprehensive understanding: regressing changes in ESG scores on changes and levels in firm-specific characteristics, regressing changes in ESG scores on changes in GDP, and addressing differences in industry-specific factors between manufacturing and non-manufacturing industries.

4.1 Calculating changes

To perform the regressions, an essential step was to calculate the year-over-year changes in both the ESG scores and the independent variables. This section describes the methodology used to compute these changes.

4.1.1 Changes in ESG scores

The first step of the analysis consists of determining the ESG scores change. In order to do that, I calculated it as a difference between the ESG scores of a company for two consecutive years. The formula for calculating the absolute change is given by:

$$\text{ESG score change}_{i,t} = \text{ESG score}_{i,t} - \text{ESG score}_{i,t-1}$$

This calculation was performed for each year across the dataset, allowing us to observe how ESG scores evolved annually for each company.

4.1.2 Changes in Independent variables

The second step of the analysis involves assessing the year-over-year changes in the independent variables. Similar to ESG scores, these changes are calculated by determining

the difference between the scores of the independent variables for two consecutive years. The formulas used are as specified below:

$$\text{Carbon emission score change}_{i,t} = \text{Carbon emission score}_{i,t} - \text{Carbon emission score}_{i,t-1}$$

$$\text{Workforce diversity score change}_{i,t} = \text{Workforce diversity score}_{i,t} - \text{Workforce diversity score}_{i,t-1}$$

$$\text{Audit independence score change}_{i,t} = \text{Audit independence score}_{i,t} - \text{Audit independence score}_{i,t-1}$$

4.2 Empirical methods

The methodology employed in this study is similar to that used by Vuko et al. (2014) in investigating the determinants of audit delay by OLS analysis. In line with his approach, I use Ordinary Least Square regressions to analyse the determinants of changes in ESG scores, considering both firm-specific characteristics and macroeconomic conditions.

4.2.1 OLS Regression

The model is estimated by doing OLS regressions, in line with the methodology used by Vuko et al. (2014). Although the dataset has a panel structure, the authors justify the use of OLS due to similar methodological constraints.

As a matter of fact, in panel data, usual OLS standard errors can be inaccurate if there are cluster effect present, since observations within the same cluster (companies) are likely to be correlated. This would present an issue that cannot be ignored, since it would violate the assumption of independence. In order to tackle this issue, robust standard errors were used, so to account for clustering and heteroskedasticity. Specifically, we employ clustered standard errors (also known as Eicker–Huber–White standard errors), clustering by firm (H1, H2) and by country (H3), to account for within-cluster correlation and heteroskedasticity.

By using this approach, we aim to accurately capture the impact of carbon, workforce diversity, and audit on ESG score changes year by year. This method allows us to identify which determinants have more impact across different years, reflecting the cross-sectional nature of the data and ensuring robust analysis across the study period.

4.2.2 Regressing changes in ESG scores on changes in firm-specific characteristics

This approach involves calculating year-over-year changes for both ESG scores and firm-specific characteristics. The regression model is specified as:

$$\Delta\text{ESG}_{it} = \alpha + \beta_1 \Delta\text{Carbon Emissions}_{it} + \beta_2 \Delta\text{Workforce Diversity}_{it} + \beta_3 \Delta\text{Audit Committee Independence}_{it} + \epsilon_{it}$$

where ΔESG_{it} is the change in ESG score for company (i) in year (t), while $\Delta\text{Carbon Emissions}_{it}$, $\Delta\text{Workforce Diversity}_{it}$, and $\Delta\text{Audit Committee Independence}_{it}$ are the year-over-year changes in the respective variables.

4.2.3 Regressing changes in ESG Scores on levels of firm-specific characteristics

This approach involves regressing the change in ESG scores on the levels of firm-specific characteristics from the previous year. The regression equation is defined as:

$$\Delta\text{ESG}_{it} = \alpha + \beta_1 \text{CarbonEmissions}_{i,t-1} + \beta_2 \text{WorkforceDiversity}_{i,t-1} + \beta_3 \text{AuditCommitteeIndependence}_{i,t-1} + \epsilon_{it}$$

Where ΔESG_{it} is the change in ESG score for company (i) in year (t), while $\text{Carbon Emissions}_{i,t-1}$, $\text{Workforce Diversity}_{i,t-1}$, and $\text{Audit Committee Independence}_{i,t-1}$ are the levels of the respective variables in the previous year.

4.2.4 Regressing changes in ESG scores by industry

To address industry-specific factors, I had to do separate regressions for manufacturing and non-manufacturing industries. The models for each industry type are described below:

- *Manufacturing Industries*:

$$\Delta\text{ESG}_{it}^{\text{manuf}} = \alpha + \beta_1 \Delta\text{CarbonEmissions}_{it}^{\text{manuf}} + \beta_2 \Delta\text{WorkforceDiversity}_{it}^{\text{manuf}} + \beta_3 \Delta\text{Audit Committee Independence}_{it}^{\text{manuf}} + \epsilon_{it}^{\text{manuf}}$$

- *Non-Manufacturing Industries*:

$$\Delta\text{ESG}_{it}^{\text{non-manuf}} = \alpha + \beta_1 \Delta\text{Carbon Emissions}_{it}^{\text{non-manuf}} + \beta_2 \Delta\text{Workforce Diversity}_{it}^{\text{non-manuf}} + \beta_3 \Delta\text{Audit Committee Independence}_{it}^{\text{non-manuf}} + \epsilon_{it}^{\text{non-manuf}}$$

Where $\Delta\text{ESG}_{it}^{\text{manuf}}$ and $\Delta\text{ESG}_{it}^{\text{non-manuf}}$ are the changes in ESG scores for manufacturing and non-manufacturing companies, respectively. Moreover, the subscripts manuf and non-manuf indicate the variables specific to manufacturing and non-manufacturing industries.

4.2.5 Regressing changes in ESG scores GDP changes

To answer hypothesis 3 and investigate the impact of macroeconomic conditions, changes in ESG scores were regressed on changes in GDP. The OLS regression model is presented as:

$$\Delta\text{ESG}_{ct} = \alpha + \beta_1 \Delta\text{GDP}_{ct} + \epsilon_{it}$$

Where ΔESG_{ct} is the change in ESG score for country (c) in year (t), while ΔGDP_{ct} is the change in GDP for country (c) in year (t).

4.2.6 Regressing changes in ESG scores on GDP levels

This approach involves regressing changes in ESG scores on levels of GDP. The model is specified as follows:

$$\Delta\text{ESG}_{ct} = \alpha + \beta_1 \text{GDP}_{c,t-1} + \epsilon_{it}$$

Where ΔESG_{ct} is the change in ESG score for country (c) in year (t), while $\text{GDP}_{c,t-1}$ is the level of the GDP for country (c) in the previous year.

4.3 Diagnostics

In order to ensure the reliability and validity of the findings, there were two main diagnostics that were performed.

The first was to use the Eicker–Huber–White standard errors by clustering the standard errors by company in order to account for within-company correlation and heteroskedasticity. This approach ensures that the standard error estimates are unbiased and reliable.

The second diagnostic test that was performed was to calculate the Variance Inflation Factors (VIF) for each regression in order to check multicollinearity, an issue previously encountered while considering the use the fixed effect model. As a matter of fact, multicollinearity can adversely affect regression results, as it occurs when there is a correlation between multiple independent variables in a multiple regression model. The formula to calculate VIF is given by:

$$\text{VIF}_i = \frac{1}{1 - R_i^2}$$

where R_i^2 represents the unadjusted coefficient of determination for regressing the ith independent variable on the remaining ones.

It is essential to interpret the VIF values in order to gather more insights with respect to multicollinearity. A VIF of 1 indicates that the variables are not correlated. A VIF between 1 and 5 suggests moderate correlation, and a VIF above 5 signifies that the variables are highly correlated.

These diagnostics were used to help confirm the reliability of regression results, ensuring that the findings are accurate. The credibility of the analysis was strengthened by addressing potential issues such as within-company correlation, heteroskedasticity, and

multicollinearity, so to provide a solid foundation for interpreting the determinants of changes in ESG scores.

Chapter 5

Results

The results section of this research provides an in-depth overview of the findings obtained through empirical analysis using OLS regressions. This analysis examines the effects of various environmental, social, and governance (ESG) factors on changes in ESG scores, focusing on four key independent variables: carbon emissions, workforce diversity, audit independence, and GDP.

Since the dependent variable is not in logarithms but some independent variables like carbon emissions and GDP are, the coefficients for these variables represent the expected change in the dependent variable for a one-percent change in the independent variable. For all the other variables, the coefficients represent the expected change in the dependent variable for a one-unit change in the independent variable, holding all other variables constant.

The analysis includes two types of regressions: "changes on changes" and "changes on levels." The "changes on changes" regression analyzes how changes in the determinants (independent variables) affect changes in ESG scores, while the "changes on levels" regression examines how the levels of these determinants in the previous year influence the changes in ESG scores from one year to the next.

Additionally, these results are tested through the calculation of Variance Inflation Factors (VIF) to assess multicollinearity. Finally, the implications of these results are discussed in the next chapter in the context of existing literature and initial expectations.

5.1 Hypothesis 1

The overall performance of regression models used in order to answer H1, indicated by the R^2 values, ranges from 0.010 to 0.027 across the years that were analyzed, which suggest the models explains a small proportion of the variability in ESG score changes. Although the values are relatively low and below the lowest acceptable levels of at least 0.1 for social sciences (Ozili, 2022), it was to be expected since I have only selected 3 out of the many determinants that are used by LSEG to assess the ESG performance of companies. This means that ESG score changes are influenced by a variety of factors, many of which may not be captured by these models.

In addition, the mean VIF values across the models are consistently around 1.00 to 1.13, indicating very low multicollinearity among the independent variables, reflecting the reliability of the regression coefficients.

5.1.1 Changes on changes

Table V presents the results of the OLS regression analysis that examined the impact of changes in independent variables on changes in ESG scores.

Carbon emissions show mixed results across the years. As a matter of fact, while from 2019 to 2020 the coefficient is significant at the 10% level indicating that a one percent change in carbon emissions is associated with a 0.918 increase in the change of the ESG score. From 2020 to 2021, the coefficient is instead of -1.188, significant at the 1% level, and indicating that a one percent change in carbon emissions is associated with a significant decrease in the change of ESG score.

Workforce diversity, on the other hand, doesn’t exhibit significant influences in any of the years, suggesting that changes in this variable doesn’t have a clear impact on changes in ESG scores.

Audit independence shows consistent positive and significant results across all years. For instance, from 2020 to 2021, the coefficient is 0.078 with a significance level of 1%, and in all the other years the results are significant at the 5% level. This can be interpreted as from 2020 to 2021, a unit change in audit independence corresponded to a 0.078 increase in

the change of the ESG score, highlighting the importance of strong governance practices in the short term.

Table V: Changes on changes

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
ΔCarbon Emissions	1.098	-0.623	0.918*	-1.188***	-0.177
	(0.725)	(0.441)	(0.528)	(0.449)	(0.327)
ΔWorkforce Diversity	-0.009	-0.128	-0.159	0.020	0.011
	(0.106)	(0.115)	(0.100)	(0.088)	(0.058)
ΔAudit Independence	0.059**	0.058**	0.057**	0.078***	0.043**
	(0.027)	(0.025)	(0.022)	(0.025)	(0.017)
Constant	2.880***	1.925***	2.465***	0.597***	-0.104
	(0.240)	(0.212)	(0.209)	(0.214)	(0.168)
Mean VIF	1.01	1.01	1.00	1.00	1.01
Observations	631	631	631	631	631
R^2	0.010	0.013	0.020	0.027	0.011
Adjusted R^2	0.005	0.008	0.015	0.022	0.006

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.1.2 Changes on levels

Table VI presents the results of the OLS regression analysis that examined the impact of the level of independent variables on changes in ESG scores.

Different from the changes on changes, the changes on levels coefficients for carbon emissions are negative and statistically significant at the 5% level or better in four out of the five-year changes (2017-2018, 2018-2019, 2021-2020, and 2021-2022). Specifically, the coefficient in 2019 is -0.261 with a standard error of 0.081, indicating that a one percent increase in carbon emissions is associated with a 0.261 decrease in ESG score change from 2019 to 2020.

Workforce diversity on the other hand, is negative and statistically significant for three out of the four-year changes (2017-2018, 2018-2019, 2021-2022). In particular, it indicates that a unit increase in the level of workforce diversity in 2021 is associated with a 0.032 decrease in the change in ESG scores from 2021 to 2022. This indicates that an

increase in a unit of workforce diversity of the previous year is associated with a decrease in the ESG score change in the next year.

Contrary to the results shown by the model that analyzed changes on changes, audit independence shows a negative and significant coefficient only in 2017 (-0.025, $p < 0.05$). This implies that higher audit independence in 2017 was associated with a reduction in the ESG score change from 2017 to 2018. However, for other years, audit independence does not show significant effects, indicating that its impact on ESG score changes may not be consistent over time in the long run.

Table VI: Changes on levels

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
Carbon Emissions	-0.206**	-0.244***	-0.261***	-0.095	-0.135**
	(0.097)	(0.084)	(0.081)	(0.086)	(0.067)
Workforce Diversity	-0.035**	-0.024*	-0.012	0.014	-0.032***
	(0.016)	(0.014)	(0.013)	(0.014)	(0.011)
Audit Independence	-0.025**	-0.010	-0.010	-0.001	-0.009
	(0.010)	(0.009)	(0.009)	(0.009)	(0.008)
Constant	8.582***	6.537***	6.616***	1.399	3.381***
	(1.691)	(1.478)	(1.437)	(1.539)	(1.229)
Mean VIF	1.12	1.12	1.12	1.13	1.13
Observations	631	631	631	631	631
R^2	0.021	0.016	0.018	0.006	0.016
Adjusted R^2	0.016	0.011	0.013	0.001	0.011

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.1.3 Answer to H1

Through this analysis, I have found only partial support for Hypothesis 1. The results show that audit independence consistently has a positive impact on ESG scores when examining changes on changes, while varying in size when it comes to workforce diversity and carbon emissions. On the other hand, the "changes on levels" model shows a negative impact of carbon emissions and workforce diversity on ESG scores, while there is little significance with respects to audit independence.

5.2 Hypothesis 2

The overall performance of regression models used to answer H2, indicated by the R^2 values, ranges from 0.003 to 0.038 across the years that were analyzed, which are all below the lowest acceptable levels of at least 0.1 for social sciences (Ozili, 2022), suggesting the models explains a small proportion of the variability in ESG score changes. This is in line with the models that were used in order to answer H1.

In addition, the mean VIF values across the models are consistently around 1.00 to 1.02, indicating no issues of multicollinearity among the independent variables, and contributing to the reliability of the findings.

5.2.1 Changes on changes, manufacturing

Table VII presents the results of the OLS regression analysis that examined the impact of changes in independent variables on changes in ESG scores in companies that are part of manufacturing industries.

Carbon emissions do not show any significant impact in any of the years that were analyzed, which suggests that changes in this variable in the short run do not have a clear effect on changes in ESG scores for manufacturing companies.

Workforce diversity shows only one significant result at the 5% level, from 2020 to 2021, suggesting that in the period, a change in one unit of this variable corresponds to a 0.219 increase in changes in ESG score.

Audit independence, on the other hand, shows two positive and significant results, which are from 2019 to 2020 and from 2020 to 2021. In the first case, the coefficient is of 0.053 with a significance level of 1%, indicating that a change in one unit in audit independence corresponds to a 0.053 increase in ESG score change. From 2020 to 2021, the coefficient is 0.077 and significant at the 1% level, indicating that a one-unit change in audit independence is associated with a 0.077 increase in the change of ESG scores.

Table VII: Changes on changes, manufacturing

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
ΔCarbon Emissions	0.572	-0.160	0.223	-0.883	-0.011
	(1.056)	(0.692)	(0.657)	(0.508)	(0.382)
ΔWorkforce Diversity	0.104	0.104	-0.160	0.219**	-0.126
	(0.164)	(0.178)	(0.142)	(0.121)	(0.093)
ΔAudit Independence	0.027	0.039	0.053***	0.077***	0.023
	(0.036)	(0.033)	(0.023)	(0.031)	(0.018)
Constant	3.015***	2.087***	2.269***	0.398	0.080
	(0.307)	(0.269)	(0.242)	(0.274)	(0.203)
Mean VIF	1.01	1.01	1.00	1.00	1.01
Observations	368	368	368	368	368
R^2	0.003	0.005	0.019	0.033	0.011
Adjusted R^2	-0.005	-0.003	0.011	0.025	0.003

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2.2 Changes on changes, non-manufacturing

Table VIII presents the results of the OLS regression analysis that examined the impact of changes in independent variables on changes in ESG scores in companies that are part of non-manufacturing industries.

Carbon emissions show significant negative influences in two out of the five-year changes that were analyzed (from 2018 to 2019, and from2020 t 2021, while there is also a positive influence at the 5% level for the change from 2019 to 2020. This suggests that a change in a one percentage change of carbon emission from 2020 to 2021 was associated with a 1.777 decrease in change of ESG score at the 1% level.

Workforce diversity shows only one significant result at the 10% level from 2018 to 2019, suggesting that in that period, a change in one unit of that variable was equal to 0.282 decrease in ESG score change.

Audit independence, on the other hand, shows four positive and significant results, apart from the changes from 2019 to 2020. The results are all significant at the 5% level, with changes from 2017 to 2018 being significant at the 1% level. This indicates that for the

change in the latter years, a one-unit change of audit independence corresponds to a 0.096 increase in ESG score change.

Table VIII: Changes on changes, non-manufacturing

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
ΔCarbon Emissions	1.495	-0.813*	1.759**	-1.777**	-0.456
	(1.016)	(0.591)	(0.870)	(0.908)	(0.581)
ΔWorkforce Diversity	-0.084	-0.282*	-0.138	-0.158	0.078
	(0.142)	(0.157)	(0.148)	(0.130)	(0.079)
ΔAudit Independence	0.096***	0.085**	0.078	0.074**	0.086**
	(0.042)	(0.040)	(0.050)	(0.041)	(0.036)
Constant	2.706***	1.609***	2.798***	0.750**	-0.277
	(0.387)	(0.346)	(0.380)	(0.349)	(0.288)
Mean VIF	1.00	1.01	1.01	1.02	1.00
Observations	263	263	263	263	263
R^2	0.027	0.037	0.028	0.038	0.027
Adjusted R^2	0.016	0.025	0.017	0.026	0.016

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2.3 Changes on levels, manufacturing

Table IX presents the results of the OLS regression analysis that examined the impact of the level of independent variables on changes in ESG scores of manufacturing companies.

Carbon emissions show significant negative impacts in three out of the five-year changes that were analyzed (2018 - 2019, 2019 - 2020 and 2021 - 2022). This suggests that a one percent increase of carbon emission in 2018 was associated with a 0.391 decrease in ESG score change from 2018 to 2019 at the 1% level, while it was associated with a 0.190 decrease in ESG score change from 2019 to 2020 at the 10% level.

Workforce diversity shows significant results at the 10% level from 2020 to 2021 and from 2021 to 2022 but with opposite effects. The results in fact, suggest that a one unit increase in workforce diversity in 2020 was equal to a 0.033 increase in ESG score change

(2020-2021) at the 10% level, while in 2021 it was associated with a decrease of 0.028 in ESG score change at the 10% level from 2021 to 2022.

Audit independence, on the other hand, presents only one negative significant result, which indicates that one unit increase in the level of audit independence in 2018 corresponds to a 0.016 decrease in ESG score change from 2018 to 2019.

Table IX: Changes on levels, manufacturing

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
Carbon Emissions	-0.061	-0.391***	-0.190*	-0.050	-0.155*
	(0.138)	(0.118)	(0.106)	(0.123)	(0.090)
Workforce Diversity	-0.030	-0.029	-0.022	0.033*	-0.028*
	(0.022)	(0.019)	(0.017)	(0.020)	(0.015)
Audit Independence	-0.016	-0.016*	-0.007	-0.000	-0.008
	(0.012)	(0.010)	(0.009)	(0.011)	(0.009)
Constant	5.964***	9.263***	5.837***	0.252	3.428**
	(2.262)	(1.919)	(1.735)	(2.046)	(1.521)
Mean VIF	1.09	1.09	1.09	1.09	1.08
Observations	368	368	368	368	368
R^2	0.010	0.038	0.012	0.010	0.016
Adjusted R^2	0.002	0.030	0.004	0.002	0.007

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2.4 Changes on levels, non-manufacturing

Table X presents the results of the OLS regression analysis that examined the impact of the level of independent variables on changes in ESG scores of non-manufacturing companies.

Carbon emissions for non-manufacturing companies show two significant negative influences (2017 - 2018, and 2019 - 2020). This suggests that an increase in a one-unit percentage of carbon emission in 2017 was associated with a 0.432 decrease in ESG score change from 2017 to 2018 at the 1% level, while in 2019 it was associated with a 0.404 decrease in ESG score change from 2019 to 2020 at the 1% level.

Workforce diversity in this case doesn't display any significant results with regards to non-manufacturing companies.

Audit independence presents only one negative significant result, which indicates that one unit increase in the level of audit independence in 2017 corresponds to a 0.042 decrease in ESG score change from 2017 to 2018.

Table X: Changes on levels, non-manufacturing

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
Carbon Emissions	-0.432***	-0.170	-0.404***	-0.123	-0.116
	(0.153)	(0.138)	(0.141)	(0.136)	(0.114)
Workforce Diversity	-0.018	0.006	0.023	-0.012	-0.039
	(0.031)	(0.028)	(0.029)	(0.029)	(0.025)
Audit Independence	-0.042**	0.005	-0.016	-0.005	-0.011
	(0.017)	(0.015)	(0.017)	(0.016)	(0.014)
Constant	11.402***	2.887	6.971***	3.151	3.671*
	(2.665)	(2.428)	(2.577)	(2.504)	(2.172)
Mean VIF	1.01	1.01	1.02	1.01	1.01
Observations	263	263	263	263	263
R^2	0.049	0.007	0.034	0.004	0.015
Adjusted R^2	0.038	-0.005	0.022	-0.008	0.003

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2.5 Answer to H2

We find partial support for Hypothesis 2, since the results show different impacts of variables like carbon emissions, workforce diversity, and audit independence between manufacturing and non-manufacturing sectors, both for changes on changes and changes on levels. The difference is more visible if we consider that using the changes-on-changes model we see that there is a constant negative impact of carbon emissions in non-manufacturing companies, while in the changes on level models we see that in manufacturing, workforce diversity positively affects ESG scores in certain years. This indicates that industry-specific factors play a significant role in influencing ESG score changes.

5.3 Hypothesis 3

The overall performance of regression models used in order to answer H3, indicated by the R^2 values, ranges from 0.001 to 0.454 across the years that were analyzed, which suggest that while some models may have some predictive power, many of them do not effectively capture the relationship between the variables in question.

In addition, the mean VIF values across the models are consistently around 1.00, indicating very low multicollinearity among the independent variables, reflecting the reliability of the regression coefficients.

5.3.1 Changes on changes, GDP

Table XI presents the results of the OLS regression analysis that examined the impact of the changes of GDP on changes in ESG scores.

GDP changes show significant results in three out of the five-year changes analysed. In particular, a one-unit percentage change in GDP from 2018 to 2019 was associated with a 38.426 decrease in ESG score change at the 1% level, while from 2020 to 2021 it was associated with a 9.587 decrease in ESG score change at the 5% level.

Table XI: Changes on changes GDP

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
ΔGDP	-15.657*	-38.426***	-1.329	-9.587**	-7.476
	(7.637)	(9.931)	(10.084)	(9.065)	(7.254)
Constant	4.411***	0.436	2.533***	1.983	-0.185
	(0.668)	(0.278)	(0.500)	(1.298)	(0.398)
Mean VIF	1.00	1.00	1.00	1.00	1.00
Observations	20	20	20	20	20
R^2	0.189	0.454	0.001	0.059	0.056
Adjusted R^2	0.144	0.424	-0.055	0.006	0.003

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3.2 Changes on levels, GDP

Table XII presents the results of the OLS regression analysis that examined the impact of the level of GDP on changes in ESG scores.

The coefficient for GDP only presents a significant positive result in one of the years. As a matter of fact, from 2018 to 2019, a one-unit percentage increase in GDP caused a 0.757 increase in ESG score change at the 1% level.

Table XII: Changes on levels GDP

	(1) ΔESG 2017-2018	(2) ΔESG 2018-2019	(3) ΔESG 2019-2020	(4) ΔESG 2020-2021	(5) ΔESG 2021-2022
GDP	0.437	0.757***	-0.062	-0.143	0.086
	(0.422)	(0.294)	(0.487)	(0.483)	(0.456)
Constant	-2.555	-9.079**	3.397	2.597	-1.322
	(5.629)	(3.935)	(6.519)	(6.458)	(6.157)
Mean VIF	1.00	1.00	1.00	1.00	1.00
Observations	20	20	20	20	20
R^2	0.056	0.269	0.001	0.005	0.002
Adjusted R^2	0.004	0.229	-0.055	-0.050	-0.053

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3.3 Answer to H3

I find partial support for Hypothesis 3. Changes in GDP show a significant negative impact on ESG scores in some years in the short run, while the changes on level models show that the level of GDP has a positive impact on ESG scores in specific years.

These mixed results highlight the complexity of the relationship between macroeconomic conditions and ESG performance. As a matter of fact, the changes-on-changes model captures the immediate impact of economic fluctuations, while the changes on levels model considers the influence of existing economic conditions on ESG changes.

Chapter 6

Discussion and Limitations

6.1 Discussion

The main purpose of this empirical analysis is to examine the impact of some selected environmental, social, and governance (ESG) factors, as well as macroeconomic factors, on changes in ESG scores.

This section will interpret and discuss the findings in the context of the existing literature and theoretical expectations, bringing to light possible alignments and discrepancies that were observed.

Starting from the first hypothesis, the theoretical framework anticipated that there would be significant influences on ESG score changes from the independent variables identified, namely carbon emissions, workforce diversity and audit independence. However, the findings show mixed results with regards to these expectations. As a matter of fact, carbon emissions had both positive and negative impacts on ESG score changes depending on the year and the model in question. In the changes-on-changes model, carbon emissions were less significant than the values we found in the change in levels model and showed a positive coefficient when analyzing the change from 2019 to 2020. On the other hand, the second model, changes on levels, revealed more consistent negative impacts, suggesting that higher carbon emissions level in one year, correlates to lower ESG score improvements in the next year. This is in line with what we have seen in previous literature such as Li (2023) and Long (2024), where they proved that better ESG performance leads to reduced carbon emissions.

With respects to the impact of diversity on corporate performance, I found diverging results based on the model used. For the changes-on-changes model, contrary to expectations and existing literature proving that the number of women had an impact, workforce diversity did not show any significant influence on ESG score changes. This might be due to the fact that the impact from this variable may not be immediately reflected in the annual ESG score change. When looking at the changes on level model, however, we see some significant negative impacts on the ESG score changes. This is in line with the majority of previous literature (De Lucia et al., 2020) but conflicts with Cho et al.'s findings (2020), suggesting

that this social factor may be specific to the cultural and economic environment of a region, since it significantly influences how diversity affects the corporate performance.

Audit independence consistently showed a positive impact on ESG score changes in the changes-on-changes model, supporting previous findings stating the importance of robust social governance practices for ESG performance (Arif et al, 2020). This relationship, however, was not significant in the changes on levels model, suggesting that immediate improvements in audit independence have an increasingly impactful effect than over time.

In addition, our efforts in answering the second hypothesis revealed differences in the factors significance between manufacturing and non-manufacturing industries.

When considering the changes on changes model, manufacturing industries showed that carbon emissions did not have a significant impact on ESG score changes, while this was the opposite in non-manufacturing industries. In addition, considering the same model, companies in the non-manufacturing industry showed that there was a very strong impact from audit independence on ESG score changes.

On the other hand, when looking at the changes on level model, both manufacturing and non-manufacturing companies exhibit results that are strongly impacted by carbon emissions and some minor significant impact by audit independence, while workforce diversity is only significant when considering manufacturing companies. These results are consistent with literature that suggests different industries have varying environmental sensitivities and reporting practices (Dyduch, 2017).

Finally, when considering the results to answer hypothesis 3, I find that macroeconomic conditions, as measured by GDP changes, have significant impacts on ESG scores.

The changes-on-changes model showed that changes in GDP were associated with significant decreases in ESG scores in certain years (2017-2018, 2018-2019, 2020-2021), suggesting that GDP changes create uncertainties that impact companies' abilities to improve their ESG performance in the short run. This observation can relate to previous literature, such as Alandejani et al. (2023), who found evidence that companies are likely to act in a socially and environmentally responsible manner when operating in an uncertain environment. One possible explanation for the apparent divergence is the temporal lag in the impact of ESG initiatives, since the benefits of these practices might take longer to reflect in ESG scores.

The "changes on levels" model, on the other hand, showed that higher GDP levels in one year were associated with positive changes in ESG scores in the subsequent year, indicating that a robust economic environment supports sustainability initiatives. This finding supports the idea that ESG performance positively correlates with macroeconomic performance, particularly in environments with stable and growing GDP (Zhou et al., 2020).

The mixed evidence on the determinants of ESG score changes suggests some implications and possible inspiration for future research. One aspect of the analysis that has to be highlighted is the preference for the changes on level model over the changes-on-changes model.

The changes on changes model provides insights into the immediate reaction of ESG score changes when there is a change in the variables and is more useful for identifying short term effects, understanding how sudden changes in firm specific characteristics or economic events can impact ESG scores. However, the immediate impact may not fully capture the efforts of the companies in improving their ESG performance, which is better explained by the changes on level model.

As a matter of fact, this model provides a more stable and predictive relationship since it considers the existing characteristics and economic conditions' role in shaping the possible ESG score changes. It is also important to note that ESG initiatives often require long-term planning and are a result from continuous improvements over time, which might be better captured by the changes on level model.

The differing results between the two models highlight the importance of choosing appropriate methodologies when analyzing ESG factors. Future research could consider examining the short- and long-term impacts of the determinants of ESG scores, or alternative factors. Moreover, the unexpected lack of significant effects of workforce diversity points to a demand for more detailed studies, expanding on this variable.

6.2 Limitations

There are several limitations that were acknowledged in this study.

The first would be the dependence on self-reported ESG data, which may lead to biases and inaccuracies. As a matter of fact, companies might choose to disclose data in a way that reflects positively on them, which could affect the results. This is also in line with the reflections arising from legitimacy theory.

The second limitation is the geographical focus: this study focuses on European companies, which may not apply to other countries with different regulatory and market environments.

The third limitation is that while OLS regression with robust standard errors was employed to address collinearity issues and ensure reliable estimates, this method might overlook some dynamic aspects of panel data. Furthermore, according to Abaide et al. (2023), the robust standard errors can be unnecessarily large in this particular case, which could result in overlooking some significant effects. While we considered advanced methods like the ones suggested by the authors such as Causal Cluster Variance (CCV) estimator and the Two-Stage-Cluster-Bootstrap (TSCB) method to correct for this bias, we opted for conventional robust standard errors due to their practicality and established use.

Lastly, it must be noted that companies with incomplete data on any of the variables that were analysed were excluded from the analysis. This might also facilitate selection bias, as firms that disclose more could be different from those that didn’t disclose the data that was analysed.

Chapter 7

Conclusion

As nowadays there is a growing interest in responsible investing, the purpose of this study was to analyse the key factors influencing changes in Environmental, Social, and Governance (ESG) scores across different industries and geographical regions. While previous research has primarily focused on the determinants of ESG score, identifying various factors, there has been a notable gap in examining the determinants of changes in these scores. Therefore, the question that was studied in this thesis in order to address this gap in the literature was: "What factors explain changes in ESG scores (both increases and decreases) over time?".

In order to answer this research question, the dataset that was used was sourced from the London Stock Exchange Group (LSEG) and the OECD website, which covered 631 European companies across 71 industries from 2017 to 2022. In particular, this research focused on the impact of firm-specific characteristics such as carbon emissions, workforce diversity, and audit committee independence, as well as macroeconomic conditions, such as GDP, on the changes in ESG scores.

In the results we observed that audit committee independence consistently had a positive impact on ESG score changes, when considering the changes-on-changes model, suggesting that strong governance practices are crucial for improving ESG performance in the short term. On the other hand, carbon emissions had both positive and negative impacts depending on the year analysed and the model used. Workforce diversity did not exhibit any significant impact on ESG score changes in the short run but did show negative impacts in the long term, which was contrary to initial expectations. These results, however, were in line with previous literature, highlighting how the cultural and the economic context in which a company operates is important to understand the impact that the variable has on ESG.

Moreover, the analysis further confirmed the hypothesis for which there are industry-specific differences in the factors influencing ESG score changes. As a matter of fact, carbon emissions had very little significance in manufacturing industries, while in non-manufacturing ones it had a strong negative impact.

Lastly, macroeconomic conditions, which in this study were represented by GDP, showed some significant impacts on ESG score changes, highlighting the complexity of the relationship between economic conditions and ESG performance.

This study provides insights into the determinants of ESG score changes, emphasizing the importance of governance practices, the complexity and variability of environmental factors, and the difference in impacts across different industries and economic contexts. The findings ultimately want to contribute to the broader understanding of how companies can improve their ESG performance by looking at the determinants of the score that are responsible for its change.

Several limitations were acknowledged in this study, which include the reliance on self-reported ESG data, the geographical focus on European companies, and potential biases arising from missing data. Future research could consider addressing these limitations by expanding the dataset, exploring additional factors of ESG scores, and using more advanced analytical methods.

References

Abadie, A., Athey, S., Imbens, G. W., & Wooldridge, J. M. (2022). When Should You Adjust Standard Errors for Clustering? *the Quarterly Journal of Economics*, *138*(1), 1–35. https://doi.org/10.1093/qje/qjac038

Agudelo, M. a. L., Jóhannsdóttir, L., & Davídsdóttir, B. (2019). A literature review of the history and evolution of corporate social responsibility. *International Journal of Corporate Social Responsibility*, *4*(1). https://doi.org/10.1186/s40991-018-0039-y

Alandejani, M., & Al-Shaer, H. (2023). Macro Uncertainty Impacts on ESG Performance and Carbon Emission Reduction Targets. *Sustainability*, *15*(5), 4249. https://doi.org/10.3390/su15054249

Arif, M., Sajjad, A., Farooq, S., Abrar, M., & Joyo, A. S. (2020). The impact of audit committee attributes on the quality and quantity of environmental, social and governance (ESG) disclosures. *Corporate Governance, 21*(3), 497–514. https://doi.org/10.1108/cg-06-2020-0243

Atkins, B. (2024, February 20). *Demystifying ESG: Its History & Current Status*. Forbes. https://www.forbes.com/sites/betsyatkins/2020/06/08/demystifying-esgits-history--current-status/

Bell, M. (2021, March 9). *Why ESG performance is growing in importance for investors*. EY. Retrieved May 23, 2024, from https://www.ey.com/en_us/insights/assurance/why-esg-performance-is-growing-in-importance-for-investors#:~:text=The%20COVID%2D19%20pandemic%20has,and%20better%20prepared%20for%20uncertainty.

Berg, F., Fabisik, K., & Sautner, Z. (2021). Is History Repeating Itself? The (Un)predictable Past of ESG Ratings. *Ecgi*.

Birindelli, G., Dell'Atti, S., Iannuzzi, A., & Savioli, M. (2018). Composition and Activity of the Board of Directors: Impact on ESG Performance in the Banking System. *Sustainability*, *10*(12), 4699. https://doi.org/10.3390/su10124699

Byrne, D. (2023, June 12). *What is the history of ESG? - The Corporate Governance Institute*. The Corporate Governance Institute. Retrieved May 23, 2024, from https://www.thecorporategovernanceinstitute.com/insights/lexicon/what-is-the-history-of-esg/

Caplan, L., Griswold, J. S., & Jarvis, W. F. (2013). *From SRI to ESG: The Changing World of Responsible Investing.*

http://agb.org/sites/default/files/legacy/u3820/Whitepaper_SRI%20to%20ESG%202013%200901.pdf

Carroll, A. B. (1979). A Three-Dimensional Conceptual Model of Corporate Performance. *the Academy of Management Review*, *4*(4), 497–505. https://doi.org/10.5465/amr.1979.4498296

Cho, Y., Kim, S., You, J., Moon, H., & Sung, H. (2020). Application of ESG measures for gender diversity and equality at the organizational level in a Korean context. *European Journal of Training and Development*, *45*(4/5), 346–365. https://doi.org/10.1108/ejtd-05-2020-0090

Crespi, F., & Migliavacca, M. (2020). The Determinants of ESG Rating in the Financial Industry: The Same Old Story or a Different Tale? *Sustainability*, *12*(16), 6398. https://doi.org/10.3390/su12166398

Daugaard, D., & Ding, A. (2022). Global Drivers for ESG Performance: The Body of Knowledge. *MDPI*.

David, R. J., Tolbert, P. S., & Boghossian, J. (2019). Institutional Theory in Organization Studie. *Institutional Theory in Organization Studies*.

De Lucia, C., Pazienza, P., & Bartlett, M. (2020). Does Good ESG Lead to Better Financial Performances by Firms? Machine Learning and Logistic Regression Models of Public Enterprises in Europe. *Sustainability*, *12*(13), 5317. https://doi.org/10.3390/su12135317

Drempetic, S., Klein, C., & Zwergel, B. (2019). The Infuence of Firm Size on the ESG Score: Corporate Sustainability Ratings Under Review. *Journal of Business Ethics*.

Dyduch, J., & Krasodomska, J. (2017). Determinants of Corporate Social Responsibility Disclosure: An Empirical Study of Polish Listed Companies. *Sustainability*, *9*(11), 1934. https://doi.org/10.3390/su9111934

Eccles, R. G., Lee, L. E., & Stroehle, J. C. (2019). The Social Origins of ESG: An Analysis of Innovest and KLD. *Organization & Environment*, *33*(4), 575–596. https://doi.org/10.1177/1086026619888994

Engelhardt, N., Ekkenga, J., & Posch, P. (2021). ESG Ratings and Stock Performance during the COVID-19 Crisis. *Sustainability*, *13*(13), 7133. https://doi.org/10.3390/su13137133

Escrig-Olmedo, E., Fernández-Izquierdo, M. N., Ferrero-Ferrero, I., Rivera-Lirio, J. M., & Muñoz-Torres, M. J. (2019). Rating the Raters: Evaluating how ESG Rating Agencies

Integrate Sustainability Principles. *Sustainability*, *11*(3), 915. https://doi.org/10.3390/su11030915

Fernando, S., & Lawrence, S. (2014). A theoretical framework for CSR practices: Integrating legitimacy theory, stakeholder theory and institutional theory. *ResearchGate*.

Ghoul, S. E., Guedhami, O., & Kim, Y. (2017). Country-level institutions, firm value, and the role of corporate social responsibility initiatives. *Journal of International Business Studies*, *48*(3), 360–385. https://doi.org/10.1057/jibs.2016.4

Halbritter, G., & Dorfleitner, G. (2015). The wages of social responsibility — where are they? A critical review of ESG investing. *Review of Financial Economics*, *26*(1), 25–35. https://doi.org/10.1016/j.rfe.2015.03.004

Kluwer, K. a. W. (2024, February 2). *Five Trends Shaping the Future of ESG Reporting*. ESG Investor. https://www.esginvestor.net/five-trends-shaping-the-future-of-esg-reporting/#:~:text=According%20to%20PwC%2C%2082%25%20of,US%2450%20trillion%20by%202025.

Krantz, T., & Krantz, T. (2024, February 8). *The history of ESG: A journey towards sustainable investing*. IBM Blog. https://www.ibm.com/blog/environmental-social-and-governance-history/

Li, J., & Xu, X. (2024). Can ESG rating reduce corporate carbon emissions? – An empirical study from Chinese listed companies. *Journal of Cleaner Production*, *434*, 140226. https://doi.org/10.1016/j.jclepro.2023.140226

Long, H., & Feng, G. (2024). Does national ESG performance curb greenhouse gas emissions? *Elsevier*.

Macesar, A. F. (2024, April 18). *A Brief History of ESG*. The Sustainable Agency. https://thesustainableagency.com/blog/the-history-of-esg/

Mitnick, B. M. (1975). The Theory of Agency: A Framework. *Social Science Research Network*. https://doi.org/10.2139/ssrn.1021642

Olateju, D. J., Olateju, O. A., Adeoye, S. V., & Ilyas, I. S. (2022). A critical review of the application of the legitimacy theory to corporate social responsibility. *ResearchGate*.

Ozili, P. K. (2023). The Acceptable R-Square in Empirical Modelling for Social Science Research. In *Advances in knowledge acquisition, transfer, and management book series/Advances in knowledge acquisition, transfer and management book series* (pp. 134–143). https://doi.org/10.4018/978-1-6684-6859-3.ch009

Parmar, B. L., Freeman, R. E., Harrison, J. S., Wicks, A. C., Purnell, L., & De Colle, S. (2010). Stakeholder Theory:The State of the Art. ˜ *the œAcademy of Management Annals*, *4*(1), 403–445. https://doi.org/10.5465/19416520.2010.495581

Peng, L. S., & Isa, M. (2020). ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) PRACTICES AND PERFORMANCE IN SHARIAH FIRMS: AGENCY OR STAKEHOLDER THEORY? *Asian Academy of Management Journal of Accounting and Finance*.

Pozzoli, M., Pagani, A., & Paolone, F. (2022). The impact of audit committee characteristics on ESG performance in the European Union member states: Empirical evidence before and during the COVID-19 pandemic. *Journal of Cleaner Production*, *371*, 133411. https://doi.org/10.1016/j.jclepro.2022.133411

Refinitiv. (2024, May 29). Wikipedia. https://en.wikipedia.org/wiki/Refinitiv

Schwab, K., & Vanham, P. (2021, January 22). *What is stakeholder capitalism? It's History and Relevance*. World Economic Forum. Retrieved May 23, 2024, from https://www.weforum.org/agenda/2021/01/klaus-schwab-on-what-is-stakeholder-capitalism-history-relevance/

Senadheera, S. S., Withana, P. A., Dissanayake, P. D., Sarkar, B., Chopra, S. S., Rhee, J. H., & Ok, Y. S. (2021). Scoring environment pillar in environmental, social, and governance (ESG) assessment. *Sustainable Environment*, *7*(1). https://doi.org/10.1080/27658511.2021.1960097

Shanaev, S., & Ghimire, B. (2022). When ESG meets AAA: The effect of ESG rating changes on stock returns. *Finance Research Letters*, *46*, 102302. https://doi.org/10.1016/j.frl.2021.102302

Sharma, P., Panday, P., & Dangwal, R. C. (2020). Determinants of environmental, social and corporate governance (ESG) disclosure: a study of Indian companies. *International Journal of Disclosure and Governance*, *17*(4), 208–217. https://doi.org/10.1057/s41310-020-00085-y

Socially responsible investing. (2024, May 23). Wikipedia. https://en.wikipedia.org/wiki/Socially_responsible_investing

S tate of the Global Climate 2023. (2024). In *World Meteorological Organization*.

Tang, D. Y., Yan, J., & Yao, C. Y. (2021). The Determinants of ESG Ratings: Rater Ownership Matters. *Social Science Research Network*. https://doi.org/10.2139/ssrn.3889395

Velte, P. (2023). Sustainable board governance and environmental performance: European evidence. *Wiley*.

Vuko, T., & Čular, M. (2014). Finding determinants of audit delay by pooled OLS regression analysis. *Croatian Operational Research Review*, *5*(1), 81–91. https://doi.org/10.17535/crorr.2014.0030

Who Cares Wins: Connecting Financial Markets to a Changing World. (2004). In *United Nations*.

Zhou, X., Caldecott, B., Harnett, E., & Schumacher, K. (2020). The Effect of Firm-Level ESG Practices on Macroeconomic Performance. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3618748

Appendix A

Table II

Countries	Number of companies
Austria	10
Belgium	10
Czech Republic	1
Denmark	15
Finland	22
France	79
Germany	57
Greece	9
Hungary	3
Ireland	2
Italy	41
Netherlands	19
Norway	17
Poland	7
Portugal	6
Spain	33
Sweden	42
Switzerland	36
Turkey	18
United Kingdom	204
Total	631

Note: The table provides the number of companies for the period between 2017-2022 by countries in Europe.

Appendix B

Table III

Industry	Type	Number of companies
Real Estate Management & Development	Non-Manufacturing	10
Diversified Telecommunication Services	Non-Manufacturing	17
Banks	Non-Manufacturing	51
Insurance	Non-Manufacturing	31
Air Freight & Logistics	Non-Manufacturing	5
Health Care REITs	Non-Manufacturing	2
Health Care Technology	Non-Manufacturing	1
Consumer Staples Distribution & Retail	Non-Manufacturing	11
IT Services	Non-Manufacturing	8
Hotels, Restaurants & Leisure	Non-Manufacturing	17
Financial Services	Non-Manufacturing	7
Office REITs	Non-Manufacturing	3
Retail REITs	Non-Manufacturing	4
Media	Non-Manufacturing	17
Diversified REITs	Non-Manufacturing	5
Entertainment	Non-Manufacturing	2
Professional Services	Non-Manufacturing	12
Passenger Airlines	Non-Manufacturing	7
Software	Non-Manufacturing	4
Technology Hardware, Storage & Peripherals	Non-Manufacturing	2
Ground Transportation	Non-Manufacturing	4
Health Care Providers & Services	Non-Manufacturing	5
Life Sciences Tools & Services	Non-Manufacturing	3
Household Products	Non-Manufacturing	2
Consumer Finance	Non-Manufacturing	1
Broadline Retail	Non-Manufacturing	2
Distributors	Non-Manufacturing	1
Diversified Consumer Services	Non-Manufacturing	1
Residential REITs	Non-Manufacturing	1
Specialized REITs	Non-Manufacturing	2
Interactive Media & Services	Non-Manufacturing	3
Wireless Telecommunication Services	Non-Manufacturing	3
Capital Markets	Non-Manufacturing	19
Total		263

Note: The table provides the number of non-manufacturing companies for the period between 2017-2022 by industry type

Appendix C

Table IV

Industry	Type	Number of companies
Oil, Gas & Consumable Fuels	Manufacturing	22
Electric Utilities	Manufacturing	12
Metals & Mining	Manufacturing	20
Construction Materials	Manufacturing	8
Chemicals	Manufacturing	23
Electronic Equipment, Instruments & Components	Manufacturing	6
Personal Care Products	Manufacturing	5
Health Care Equipment & Supplies	Manufacturing	12
Beverages	Manufacturing	10
Marine Transportation	Manufacturing	3
Machinery	Manufacturing	32
Electrical Equipment	Manufacturing	8
Pharmaceuticals	Manufacturing	13
Commercial Services & Supplies	Manufacturing	11
Containers & Packaging	Manufacturing	4
Automobile Components	Manufacturing	12
Household Durables	Manufacturing	11
Paper & Forest Products	Manufacturing	5
Communications Equipment	Manufacturing	3
Aerospace & Defence	Manufacturing	16
Construction & Engineering	Manufacturing	17
Energy Equipment & Services	Manufacturing	9
Textiles, Apparel & Luxury Goods	Manufacturing	13
Automobiles	Manufacturing	7
Gas Utilities	Manufacturing	4
Building Products	Manufacturing	6
Semiconductors & Semiconductor Equipment	Manufacturing	6
Food Products	Manufacturing	12
Multi-Utilities	Manufacturing	9
Transportation Infrastructure	Manufacturing	6
Trading Companies & Distributors	Manufacturing	11
Specialty Retail	Manufacturing	15
Industrial Conglomerates	Manufacturing	5
Independent Power and Renewable Electricity Producers	Manufacturing	4
Biotechnology	Manufacturing	3
Tobacco	Manufacturing	2
Water Utilities	Manufacturing	2
Industrial REITs	Manufacturing	1
Total		368

Note: The table provides the number of manufacturing companies for the period between 2017-2022 by industry type