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The Relation between Board Characteristics and the Individual Components of ESG Performance

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Abstract

Companies face increasing pressure by different stakeholder groups to address Environmental, Social, and Governance (ESG) issues in their business practices. Studies have shown that the composition of the board of directors, i.e. board characteristics, impacts ESG performance, but results are mixed. This thesis examines the relationship between three different board characteristics – board size, gender diversity and board independence – and the individual components of ESG performance. No previous research specifically examined these individual components in relation to board characteristics. The aim of this thesis is to examine whether board size, gender diversity, and board independence influence Environmental, Social, and Governance performance differently. Based on a sample of companies listed on the STOXX Europe 600 over the period 2018-2020 and using fixed effects panel regression models, this research finds a negative relationship between board size and the governance rating of a company. The regression analyses also suggest that gender diversity as well as board independence positively impact environmental and governance ratings. Overall, the findings of this study suggest that smaller, gender diverse, and independent boards tend to achieve higher sustainability performance scores. These findings highlight the importance of optimizing board characteristics to improve the Environmental, Social, and Governance performance of a company.

Keywords: *ESG Performance; Environmental, Social, and Governance; Board Size; Gender Diversity; Board Independence; Board Characteristics; Corporate Governance.*

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List of Abbreviations

<i>BS</i>	Board Size
<i>CSRCOM</i>	Corporate Social Responsibility Committee = Overseeing and monitoring sustainability initiatives, ensuring its alignment with regulatory standards.
<i>DIV</i>	(Board) Gender Diversity
<i>ENV</i>	Environmental performance/rating
<i>ESG</i>	Environmental, Social, and Governance
<i>GOV</i>	Governance performance/rating
<i>IND</i>	Board Independence
<i>ISO</i>	International Organization for Standardization = Code representing the name of a country.
<i>LEV</i>	Leverage = Extent to which a company relies on borrowed funds in relation to its total assets to finance operations.
<i>LNTA</i>	Natural logarithm of total assets = Normalized measure of company size.
<i>NBM</i>	Number of Board Meetings
<i>SIC</i>	Standard Industrial Classification = Code categorizing the industries that companies belong to, based on their business activities.
<i>SOC</i>	Social performance/rating

1. Introduction

Over the years, investors have shown a rising commitment to using Environmental, Social, and Governance (ESG) criteria in their investment decision-making process. This indicates that more and more investors are using ESG ratings in their assessment of which company to invest in (Friede et al., 2015). Transparency regarding environmental and social aspects has become a primary concern of corporate stakeholders (Chouaibi et al., 2022). Therefore, more and more companies are providing non-financial information, e.g. ESG related reports. Investors use ESG data to assess the long-term sustainability and ethical impact of investment opportunities across three dimensions: environmental management, social responsibility, and corporate governance practices. As businesses face increasing pressure to address these dimensions, understanding the factors that influence ESG performance has become an important area of research.

One of the key factors that has been widely studied that may influence a company's ESG performance is the composition of its board of directors (Lei et al., 2022). The board of directors represents the interests of the company's shareholders and different stakeholder groups. They have the responsibility to ensure transparency around the sustainability practices of the company, as the company's stakeholders may be concerned about the risks associated with sustainability (Bamahros et al., 2022). Since the board plays an important role in formulating, monitoring, and controlling the sustainability strategies of the company and how to report these, the composition of the board influences the ESG performance of the company (Bektur and Arzova, 2022; Chouaibi et al., 2022; Suttipun, 2021). By examining the relationship between different board characteristics and ESG performance, companies can improve their ESG ratings by changing the composition of the board of directors.

More specifically, this thesis explores the impact of three board characteristics – namely board size, gender diversity, and board independence – on the individual components of ESG performance. Examining these components (Environmental, Social, and Governance) separately is interesting because each pillar is influenced by different internal and external factors. According to Martiny et al. (2024), a limited focus on the separate pillars of ESG performance may decrease the value of a study because there are many different factors that may influence corporate practices and the Environmental, Social, and Governance rating. The factors influencing the ESG components might thus not be the same. Martiny et al. (2024) also mention different drivers of each component of ESG performance. Environmental performance, for instance, is often driven by external pressure of different stakeholders regarding environmental concerns and requirements set by governments and regulatory bodies to reduce pollution, manage waste, and promote greener activities. Social performance is often influenced by social concerns within the industry, stakeholder relationships, and community engagement efforts.

Governance performance is often driven by compliance with corporate governance standards and internal communication. Researching the different components of ESG performance separately allows for more targeted strategies to improve ESG performance and better addresses the specific challenges and opportunities associated with environmental, social, and governance issues.

In general, it is said that larger boards of directors have more expertise, more connections, and more diversity, which allows for more different viewpoints to base decisions on for management (Gurol and Lagasio, 2022). Larger boards, however, can also suffer from coordination problems and free-rider issues (McKnight & Weir, 2009). Because of these reasons, the size of the board has an important effect on the ESG performance of a company (Birindelli et al., 2018). Previous research has shown mixed results regarding this relationship. Furthermore, more diverse boards, in terms of gender, tend to make better decisions and have a broader perspective on corporate issues, including ESG matters (Lu and Wang, 2021; Shakil et al., 2020). The presence of female directors can lead to more comprehensive discussions and a greater focus on ethical and social issues (Haque & Ntim, 2017). The level of independence of a board can also impact how effectively ESG policies are implemented and monitored within a company. Independent directors are free from ties to the management of the company which allows them to objectively provide unbiased oversight and ensure that the interests of shareholders and other stakeholders are protected. Boards with a higher level of independence may be more likely to provide effective oversight of ESG initiatives (Arayssi et al., 2020; García-Sánchez et al., 2018). Additionally, independent directors may be more concerned with maintaining their reputations and are thus more likely to advocate for ethical and sustainable practices, positively influencing the sustainability performance (García-Sánchez et al., 2015; Ruiz-Castello et al., 2024).

In short, several studies have examined the relationship between different board attributes and the ESG performance of a company. These studies resulted in mixed results on the proposed relationships. Moreover, there is no research that specifically examines the influence of these board characteristics on the separate pillars of ESG performance. This study aims to examine whether board size, gender diversity, and board independence may influence the Environmental, Social, and Governance component of ESG performance differently. The central research questions this research aims to answer can thus be formulated as:

“How do board characteristic (i.e. board size, gender diversity, and board independence) relate to the sustainability performance of a company in each of the separate Environmental, Social, and Governance pillars?”

Analyzing the separate components of ESG performance is important for several reasons. Firstly, it allows for a more nuanced understanding of how different board characteristics influence specific aspects of ESG. For example, while board independence could largely impact the governance component, gender diversity could have a stronger impact on social performance. Secondly, investors and stakeholders increasingly demand transparency in specific ESG areas rather than an overall rating, making it essential to understand the drivers behind each component (Khan et al., 2016). Finally, companies might need to adjust several governance strategies to improve specific ESG components, since common internal corporate governance practices encourage firms to disclose more sustainability related information (Lu and Wang, 2021).

Based on a sample of 581 companies across 20 countries over the period 2018-2022 listed on the STOXX Europe 600 index, this research finds a strong negative relationship between board size and the governance rating of a company. The regression analyses also suggest that gender diversity has a positive impact on the environmental and governance rating, meaning that companies with more female directors tend to achieve a better environmental and governance rating. Furthermore, this research finds evidence that board independence positively impacts two sustainability performance measures, i.e. Environmental and Governance performance. Overall, the findings of this study suggest that smaller, gender diverse, and independent boards tend to achieve higher sustainability performance scores.

This thesis aims to contribute to the growing body of literature on ESG performance by providing a detailed examination of how board size, gender diversity, and board independence influence the individual components of ESG performance. To the best of my knowledge, this is the first study that researches the Environmental, Social, and Governance pillar independently. In this, it may offer valuable insights for policymakers, investors, and company executives, aiming to improve sustainability and corporate governance practices in their companies. This research may help companies to find how to change the composition of its board of directors in order to better align business strategies with sustainability goals.

The remainder of this research proceeds as follows. Section 2 highlights the existing literature on the relationship between board attributes and ESG and proposes nine hypotheses, one for each combination of board characteristic and ESG pillar. Thereafter, Section 3 explains the data and methodology used to conduct this research. Section 4 provides the empirical findings of this research and Section 5 provides the conclusion, limitations, and policy implications.

2. Literature Review

2.1 Board of Directors

Before this paper can focus on the relationship between different attributes of the board of directors and the Environmental, Social, and Governance performance, it is important to understand the commitments of the board regarding the topics of sustainability. The most important concern of the board of directors of a company is to represent and protect the interests of the shareholders, and other stakeholders. This can be achieved through, for example, rating the sustainability performance of the company, which allows to assess risks and opportunities related to climate change, long-term value creation, and business sustainability (Bamahros et al., 2022). Therefore, the board of directors has the responsibility to ensure transparency regarding the sustainable practices of the firm. The board also plays an important role in the decision-making process: they are responsible for making strategic decisions on how the business should engage in sustainable activities and what/how to report these (Chouaibi et al., 2022). This means that the composition of the board of directors plays an important role in the quantity and quality of sustainability disclosures, which ultimately influences the ESG ratings (Bektur and Arzova, 2022). In other words, the board of directors plays an important role in overseeing a company's ESG initiatives, setting strategic direction, and representing shareholder interests. Therefore, understanding how board characteristics influence the Environmental, Social, and Governance performance of a company is important for investors, corporate governance practitioners, and policymakers.

By examining the association between different board characteristics and ESG performance, regulators and companies can improve ESG practices by, for example, changing the composition of the boards. Which type of board characteristic needs changing, depends on the specific ESG pillar that the company wants to improve. No previous research explicitly examined the influence of board characteristics on the separate Environmental, Social, and Governance pillars. This study aims to determine whether different board attributes may influence each pillar differently than the overall ESG performance. To focus on this topic of board characteristics, which may seem relatively vague, three attributes are highlighted as independent variables: board size, gender diversity, and board independence. Various studies already focused on the association of these characteristics and ESG performance (e.g. Lei et al., 2022; Suttipun, 2021), but no study explicitly focused on each pillar separately.

2.2 ESG performance

Environmental, Social, and Governance (ESG) performance is an extensively researched topic within the corporate social responsibility literature (Husted and de Sousa-Filho, 2019). The subject of ESG ratings first emerged almost half a century ago, in the 1980s. The aim of these ratings was to evaluate the environmental, social, and governance performance of companies for investors (Berg et al., 2022). Rating agencies are responsible for providing scores with regard to a company's ESG performance based on several criteria. Every rating agency uses different criteria in assessing each ESG pillar (Boffo and Patalano, 2020). In essence, the ESG performance of a company reflects its commitment to addressing sustainability topics into their business activities. Investors that base their investment activities on ESG performance want to ensure themselves that the companies they invest in act responsible regarding sustainable activities (Pollman, 2022). Berg et al. (2022) formulated the essence of rating agencies as follows: "ESG rating agencies allow investors to screen companies for ESG performance, like credit ratings allow investors to screen companies for creditworthiness".

When analyzing ESG factors, however, the governance factor is often excluded. Several papers, such as Khan et al. (2021), researched the environmental and social performance of companies, but excluded the governance performance. Understanding the governance performance is equally as important as any of the other two pillars. But what does each pillar of ESG performance entail precisely?

2.2.1 Environmental pillar

The environmental pillar of ESG performance evaluates a company's impact on the natural environment. Environmental criteria may include topics such as pollution, carbon emissions, climate change, energy consumption, water usage, waste management, and natural resource use (Antolín-López and Ortiz-de-Mandojana, 2023; Del Vitto et al., 2023; Disli et al., 2021). Within this pillar, companies are expected to adopt practices that minimize their ecological footprint, such as using renewable energy sources, reducing greenhouse gas emissions, and implementing sustainable supply chain practices. By effectively managing these factors, companies can mitigate risks related to climate change and resource scarcity. This may lead to an increase in the company's reputation and attract environmentally conscious investors and customers. Unlike the social and governance pillars, the environmental pillar specifically focuses on the ecological impact of the company, emphasizing the company's role in combating climate change and promoting a sustainable environment. The importance of this pillar lies in mitigating environmental risks (TCFD, 2017).

2.2.2 Social pillar

The social pillar of ESG performance addresses a company's relationships with its stakeholders, including employees, customers, suppliers, and communities. Key aspects of social performance include labor practices, employee health and safety, diversity and inclusion, human rights, community engagement, and product responsibility (Antolín-López and Ortiz-de-Mandojana, 2023; Del Vitto et al., 2023; Disli et al., 2021). Companies are expected to create safe working conditions, promote diversity and equal opportunities, and ensure fair treatment of all workers throughout the company. Additionally, companies should engage with and contribute positively to the communities in which they operate. This may involve investing in community development, supporting local economies, and ensuring that their products and services are safe and beneficial to society. By focusing on social performance, companies can build stronger relationships with stakeholders and enhance employee morale and productivity. The social pillar differs from the environmental pillar in that it focuses on human and social capital rather than the ecological impact of the company. Unlike the governance pillar, which focuses on corporate structure and decision-making, the social pillar addresses the company's ethical obligations and social responsibilities towards people and communities.

2.2.3 Governance pillar

The governance pillar of ESG performance focuses on a company's governance structures, policies, and practices that ensure accountability, transparency, and ethical behavior (OECD, 2015). This includes the composition and effectiveness of the board of directors, executive compensation, shareholder rights, risk management, and compliance with laws and regulations (Antolín-López and Ortiz-de-Mandojana, 2023; Del Vitto et al., 2023; Disli et al., 2021). Good governance practices involve ensuring that executive compensation is aligned with company performance and protecting the rights of shareholders. Effective risk management and internal controls are also crucial to prevent fraud, corruption, and other unethical behaviors. Governance performance is critical for maintaining investor confidence and ensuring that the company operates in a transparent and accountable manner. Ensuring a strong corporate governance performance allows companies to diminish the likelihood of corporate scandals, improve decision-making processes, and ultimately improve their long-term sustainability and financial performance. This pillar is distinct from the environmental and social pillars as it primarily focuses on the internal governance structures of the company and the ethical behavior of its management. While the environmental pillar deals with ecological risks and the social pillar addresses a company's relationships with its stakeholders, the governance pillar ensures that the company's internal controls and structures are aligned with ethical standards and regulatory requirements (OECD, 2015).

2.3 Empirical Studies and Hypothesis Development

This study focuses on three attributes of the board of directors that influence the Environmental, Social, and Governance performance of a company. These board characteristics are board size, gender diversity, and board independence. Several previous studies have focused on the relationship between different board attributes and ESG performance (e.g. Lei et al., 2022; Suttipun, 2021). Such studies have mentioned several theories as explanation for the empirical relation between board characteristics and ESG performance. For instance, agency theory and stakeholder theory are often mentioned to explain the empirical results in research on the relationship between board characteristics and sustainability performance (Chouaibi et al., 2022). In general, these theories state that improvement in the quality of a company's ESG disclosure leads to more transparency and subsequently higher ESG ratings. This is because the evaluation of a company's ESG performance is based on the level of company's disclosure regarding ESG related topics. These theories, however, do not provide any insights in the level of disclosure regarding the individual ESG pillars. Nevertheless, it might be useful to have a general idea of what these two theories entail to explain the relationship between board characteristics and sustainability performance in this study.

The **agency theory** states that potential conflicts of interest may arise between principals (shareholders) and agents (company executives, i.e. management). These conflicts, called agency problems, occur when the agents are expected to act in the best interests of the principals but may instead pursue their personal goals (Chouaibi et al., 2022). As an example of a potential problem related to the context of this study, principals might highly regard the sustainability performance while agents value this subject less and focus more on achieving financial goals. The monitoring and controlling functions of the board of directors is highlighted as a mechanism to resolve such agency problems, since the board must ensure that the company's activities comply with the interests of the shareholders (Gurol and Lagasio, 2022). The agency theory proposes that increased ESG disclosure and performance is used as a tool to reduce information asymmetries and mitigate conflicts of interest between principal and agents (Suttipun, 2021).

The **stakeholder theory** is essentially an extension of the agency theory in that it considers the interests of all stakeholders of the company, and not just the shareholders, in its decision-making processes (Chouaibi et al., 2022). Stakeholders may include employees, customers, and communities, in addition to shareholders. The board plays an important role in formulating sustainability strategies and monitoring the company's communication with stakeholders. ESG disclosure is used as a mean of communication by supporting the needs and expectations of all stakeholders (Suttipun, 2021) and diminishing information asymmetries (Bamahros et al., 2022). Stakeholder theory thus expands the focus of the board of directors beyond shareholder interests to include the broader impact of the company's actions on society.

As mentioned earlier, agency theory and stakeholder theory are frequently used to explain the relationship between the sustainability performance of a company and board attributes. Based on the literature review, this paper formulates several hypotheses for each of the researched board characteristic and their influence on the Environmental, Social, and Governance performance of a company. In this, the hypotheses are substantiated using the agency theory and/or stakeholder theory. The board attributes used for this research – board size, gender diversity, and board independence – are presented individually below, with each section first reviewing the existing literature on the board characteristics' relationship with the overall ESG performance, followed by the relationship with the individual pillars.

2.3.1 Board Size

Board size refers to the number of directors that are on the board. The most important function of the board of directors is to protect shareholders' interest by monitoring management. The size of the board influences the effectiveness and efficiency of this function (Miranda et al., 2023). Moreover, the size of the board of directors has an important effect on the ESG performance of firms (Treepongkaruna et al., 2024). A larger number of directors may result in both positive as well as negative consequences for the company. Larger boards may bring a more diversified level of perspectives and experience to the decision-making process of a company's goals, but it may also lead to challenges in coordination and efficiency (Guest, 2009; Chintrakarn et al., 2017). Several studies have used agency theory to explain how board size may influence the effectiveness of monitoring and controlling sustainability activities (Birindelli et al., 2018; Chouaibi et al., 2022). According to this theory, a larger board might offer a broader range of expertise and perspectives, which allows the board to better monitor ESG initiatives. However, if the board of directors becomes too large, it may suffer from coordination problems and reduced efficiency.

On the one hand, there are some studies that found a positive relationship between board size and ESG performance. Birindelli et al. (2018), for example, found a positive relationship between board size and ESG performance. They examined the sustainability performance of a large sample of European and U.S. listed banks over a period of 5 years from 2011 to 2016. This study resulted in the conclusion that board size is a very important board characteristic to enhance a bank's ESG performance. Gurol and Lagasio (2022) conducted a similar research over a sample of 35 banks from 12 different European countries and their results also indicated that board size is positively and significantly related to ESG performance. Furthermore, some studies have found a positive relationship between board size and the quality and quantity of ESG disclosures when researching the effects of board size on ESG performance of non-financial companies (Chouaibi et al., 2022; Khalid et al., 2022).

Chouaibi et al. (2022), for instance, used data from 253 non-financial companies listed in Europe between 2010 and 2019. Their research found that the total number of directors on the board has a significantly positive effect on the quality of sustainability disclosures by the company. Khalid et al. (2022) used a sample of 564 firms from fifteen developed economies. They also found that board size is directly and significantly linked with sustainability disclosures and ESG performance. Moreover, Treepongkaruna et al. (2024) suggest that larger boards, that is boards with more human capital and more interactions with stakeholders, are better able to effectively promote sustainable activities within the organization. This positive relationship of board size on ESG performance and disclosure can be intuitively explained as follows. A larger board size with more board members indicates that the board has more expertise, more connections, and more diversity, which allows for more different viewpoints to base decisions on for management (Gurol and Lagasio, 2022).

On the other hand, however, there are also studies that found a negative relationship between board size and ESG performance. For example, Balogh et al. (2022) researched which ESG disclosure factors are relevant for large Czech companies. They were unable to find a relationship between board size and ESG disclosure when board size is at the market average. This suggests that an increased number of directors on the board does not necessarily indicate improved ESG disclosure. Furthermore, Ellili (2022) investigated the impact of board size on ESG disclosure by differentiating between financial and non-financial companies over a sample of UAE-listed firm between 2010 and 2019. This paper found that, overall, board size negatively affects non-financial companies' ESG disclosure. Halid et al. (2022) studied the influence of several board characteristics on ESG performance using a sample of 165 Malaysian-listed firms. They did not find any relationship between board size and ESG ratings.

Even though the results from previous studies are mixed, most of the discussed papers suggest that board size is positively related with ESG performance. Therefore, a similar positive relationship is expected to be found regarding the overall ESG rating. However, Khalid et al. (2022) found that board size influences the environmental and governance pillar differently than the social pillar. They argue that board size positively promotes environmental and governance reports, while the findings for the level of social disclosure are positively insignificant. Moreover, as opposed to the research of Khalid et al. (2022), De Masi et al. (2021) found that board size insignificantly and negatively influences both the environmental and social pillar, while it significantly and negatively influences the governance pillar. The findings of both papers support the research question of this study as it examines how board size influences each component of ESG performance individually. The following three sections will briefly discuss the literature on the Environmental, Social, and Governance pillar and board size, after which the hypotheses are formulated.

Environmental pillar

Looking at the environmental pillar of ESG performance individually, the study of Khalid et al. (2022) found a significant positive relationship between board size and the environmental pillar over a sample of 564 companies across 15 developed economies. The main focus of this research, however, concerned the level of ESG disclosure and not the individual ESG ratings. The study of De Villiers et al. (2011) researched to what extent several board characteristics have an impact on the environmental performance of a company. As a measure for environmental performance, they used the KLD ratings for the fiscal years 2003 and 2004. The KLD ratings can be considered as a predecessor of the Environmental rating, as it measured whether a company displayed any of five environmental strengths. De Villiers et al. (2011) found that the environmental performance of a company is higher when that company has a larger board of directors. This is consistent with the resource dependence theory as larger boards consist of more diverse expertise and experience on environmental matters. This allows the board to make more informed decisions on business activities that support the environment. Similarly, Walls et al. (2012) researched how the board of directors could influence the environmental performance, using a sample of companies listed on the S&P 500 index. They also used the KLD environmental scores as a measure of environmental performance and found that board size is positively associated with environmental performance. This result suggests that larger boards are better capable of increasing the environmental performance of firms.

An explanation for the empirical evidence of a positive relationship between the environmental performance of a company and its board size, may be that smaller boards could face challenges in effectively addressing environmental concerns due to limited capacity and expertise (Khan et al., 2021). Even though previous studies found a positive relationship, it is still interesting to conduct research regarding this relationship, as both papers of De Villiers et al. (2011) and Walls et al. (2012) were conducted over a decade ago, when the concept of ESG performance had not been introduced yet. Besides, in their research, companies were given a high performance score if they performed strongly in any of five categories. Nowadays, the Environmental score is based on more extensive requirements. Due to the above, the following hypothesis is reached:

Hypothesis 1A. *Board size is positively related to environmental performance.*

Social pillar

A study by Zubeltzu-Jaka et al. (2021) examined the relationship between board size and corporate social performance (CSP) by reviewing a sample of 80 papers. CSP refers to the social performance of a company and it includes the consequences of both deliberate and unintended externalities of business activities towards the stakeholders of the company. This concept is closely linked to the Social pillar of ESG performance.

Zubeltzu-Jaka et al. (2021) found that companies with a larger board of directors generally achieve a better corporate social performance compared to companies with smaller boards. These findings are consistent with the stakeholder theory, since a larger board better reflects the diversity and the involvement of the stakeholders of the company within the company. De Villiers et al. (2011) mention that larger boards are more likely to have better connections with the stakeholders of the company, which allows for better alignment of the social desires of these stakeholders.

Radu et al. (2022) measured the performance of a company regarding the social dimension using the Bloomberg social performance score and they also concluded that board size is positively related to the social performance of a company. This result could be explained following the stakeholder theory: a larger board of directors, containing more knowledge and expertise, has more connections with the different stakeholder groups of the company. Following this larger connectivity, the board of directors are better able to coordinate business activities with the stakeholders, obtaining a better social performance. For these reasons, the following hypothesis is developed:

Hypothesis 1B. Board size is positively related to social performance.

Governance pillar

To the best of my knowledge, no study has individually examined the relationship between board size and the governance rating of ESG performance. Some papers focusing on board size and ESG performance in general have briefly mentioned the impact on the governance rating. For instance, Khalid et al. (2022) found a positive relationship between board size and governance performance in their study of 564 companies across 15 developed countries. The study of del Carmen Briano-Turrent and Rodríguez-Ariza (2016) focused on the level of corporate governance compliance among a sample of companies in Latin America. In this context, corporate governance refers to the effectiveness of the management of a company and it ensures that the company does not participate in illegal or improper activities. With their research, del Carmen Briano-Turrent and Rodríguez-Ariza (2016) found that, while board size is positively correlated with the governance ratings, the size of the board negatively influences the level of corporate governance compliance. This result can be explained because a larger board may make it more difficult to come to an agreement with all board members on which corporate governance practices to participate in. There is a greater diversity of opinions, which is in line with agency theory. Following this theory, the board of directors may suffer from coordination problems and reduced efficiency when it is too large. This could potentially undermine the boards' ability to effectively monitor corporate governance practices. Based on these studies, this paper proposes the following hypothesis:

Hypothesis 1C. Board size is negatively related to governance performance.

2.3.2 Gender Diversity

Gender diversity of the board is about the composition of the board of directors. A more diverse board, in terms of gender, is said to consist of members with different backgrounds. They differ in knowledge, professional experiences, perceptions, and opinions (Adams et al., 2015). This may help companies in addressing important ESG related issues. According to Lu and Wang (2021), it is more likely for a more diversified board to disclose sustainability information and try to improve their ESG performance. Other studies agree that ESG performance is influenced by gender diversity of the board (e.g. Birindelli et al., 2018; Shakil et al., 2020; Suttipun, 2021). These studies, however, do not discuss whether gender diversity influences the sustainability performance in every ESG dimension, which is the ultimate research question of this paper.

The association between gender diversity and sustainability performance or disclosure is widely researched. According to Lu and Wang (2021), for example, it is more likely for a more diversified board to disclose sustainability information and try to improve their ESG performance. Numerous other studies agree that the overall ESG performance of a company is positively influenced by gender diversity of the board (e.g. Ellili, 2022; Gurol and Lagasio, 2022; Harjoto and Wang, 2020). Overall, it is found that a larger proportion of female directors on the board positively impacts ESG performance (Harjoto and Wang, 2020). The paper of Gurol and Lagasio (2022) studied the relationship between a banks' board structure and its sustainability performance. They found that the ratio of female directors on the board is positively and significantly related to ESG disclosures. The study of Arayssi et al., (2020) also found that participation of women on the board impacts and positively enhances the level of ESG disclosure. De Masi et al. (2021) showed that reaching a critical mass of women on the board – at least three – increases the level of ESG disclosures and positively influences every component of an ESG rating. Moreover, Chouaibi et al. (2022) state that gender diversity on the board has a positive effect on the quality of the Integrated Reporting Framework. The study of Suttipun (2021) mentioned that the presence of female board committees positively influences ESG-related activities. Furthermore, Ellili (2022) concluded that board gender diversity has positive and significant for both financial as well as non-financial companies.

The results of these studies could be explained in three different ways. Firstly, it is said that women tend to be more aware of serious sustainability challenges and that they actively attempt to solve these challenges, which makes women more ethical responsible due to their personal and professional traits (Birindelli et al. 2018; Shakil et al. 2020). Women have other psychological characteristics than men, such as concern for the well-being of others, compassion, and empathy. This can ensure that women adopt more socially responsible behaviors (Arayssi et al., 2020; Birindelli et al. 2018). Secondly, women are in general better at multitasking and communicating than men (Suttipun, 2021). This may lead to increased awareness of sustainability topics within the decision-

making process of the company. Lastly, the research of Chouaibi et al. (2022) suggests that female directors are more focused on the interests of stakeholders and are more active in implementing transparency strategies which improves the quality of ESG disclosures (Ellili, 2022).

In addition, Torchia et al. (2011) researched whether an increased number of women on the board could contribute to firm innovation. They found that having at least three women on the board of directors makes it possible to increase the level of firm innovation. Abtahi et al. (2023) support these findings. They found that companies in Canada whose board of directors consists for 25% of women are more innovative. The study of Dicuonzo et al. (2022) found that companies that are investing more in R&D – Research and Development, in other words, innovation – and patents display better overall ESG performance than companies that invest less in R&D. This means that the level of female board participation increases the awareness towards ESG challenges (Birindelli et al., 2018; Shakil et al., 2020), which leads companies to finding more innovative solutions to address these sustainability challenges more effectively (Dicuonzo et al., 2022).

On the other hand, however, there are also studies that found a negative relationship between board gender diversity and ESG performance. For example, Balogh et al. (2022) did not find a significant relationship between the level of gender diversity on the board of directors and general ESG performance based on a study of companies in the Czech Republic. The study of Halid et al. (2022) also could not find any association of board gender diversity and ESG scores. Furthermore, based on a sample of 176 Latin American companies, the analysis of Husted and de Sousa-Filho (2019) found that the presence of women on the board of directors has a negative impact on ESG disclosure in Latin America. The authors argue that their analysis would not have resulted in a positive relationship, even if there was a critical mass of women on the board, because of the cultural setting of Latin America. The study of Cucari et al. (2018) researched the relation between board diversity and ESG disclosure metrics using a sample of 54 Italian companies for the period 2011–2014. Their study revealed that the proportion of women on boards of directors has a significant negative impact on ESG performance.

These negative, or insignificant, relationships could be explained by the fact that countries are characterized by different cultural patterns – such as male-dominated collectivism (Husted and de Sousa-Filho, 2019). Moreover, several studies argue that the relationship between gender diversity and ESG performance is not statistically significant if the board of directors consists of less than three female directors (Manita et al., 2018). The study of Khatri (2022) could only find a significant result if the board consisted of at least 30 percent women. Balogh et al. (2022) emphasized that female directors in the Czech Republic have little impact on the ESG performance because of the institutional environment and low representation of women on Czech boards.

As discussed above, the cited papers present contradictory results. Some studies suggest the existence of a positive relationship between gender diversity and the overall ESG performance (e.g. Chouaibi et al., 2022; Ellili, 2022; Gurol and Lagasio, 2022; Harjoto and Wang, 2020; Suttipun, 2021), while other studies found a negative relationship (Husted and de Sousa-Filho, 2019; Cucari et al., 2018) or were unable to find any relationship at all (Balogh et al., 2022). Although the results are mixed, most papers presented evidence for a positive relationship. Such a relationship is therefore expected as well regarding this analysis. This analysis' aim is, however, to analyze how gender diversity influences each ESG pillar individually. The upcoming three sections will provide a brief overview of the existing research on the relationship between gender diversity and the three separate pillars of ESG. Following this, the hypotheses are developed.

Environmental pillar

The study of Dyck et al. (2023) researched whether renewal of the board affected environmental performance of the firm among a sample of over 3,000 firm from 41 countries. With their research, they found that the presence of women on the board of directors significantly improved the environmental performance of these firms. Dyck et al. (2023) states that having a female board member is associated with an Environmental rating that is approximately 15% higher. They believe that this result could be explained because the appointment of any new female directors shakes up the way in which the board consults with each other, so that more attention is paid to environmental matters. Another explanation is that female director have strong preferences, by nature, to implement environmental-friendly business activities.

Moreover, Post et al. (2011) found that companies demonstrated higher ratings of environmental performance if they have at least three female directors on their board. Furthermore, higher levels of gender diversity on the board of directors positively influences the amount of disclosure regarding environmental topics, such as CO2 emissions and greenhouse gases (Liao et al., 2015). This study examined the impact of the proportion of female board directors on the level of voluntary disclosure of greenhouse gas emissions over a sample of the 329 largest companies in the United Kingdom. Liao et al. (2015) suggest that this positive relationship may be explained by female directors being, in general, more concerned about environmental topics than male. Consequently, female directors are more likely to be tasked with environmental matters. The study of Li et al. (2016) also found that the environmental policy of a company is positively affected by a more gender diverse board. Because of these reasons, the following hypothesis is reached:

Hypothesis 2A. Gender diversity is positively related to environmental performance.

Social pillar

In general, it is said that women have other psychological characteristics than men, which makes it more likely that women care about the well-being of others and show more empathy (Arayssi et al., 2020; Birindelli et al., 2018). This statement also applies to female members of the board of directors. The study of Sánchez-Teba et al. (2021) analyzed several scientific articles on the presence of women on the board. They found that an increase in the level of female directors in a male-dominated board leads to increased attention for group interest. Furthermore, Kyaw et al. (2017) researched whether board gender diversity could promote corporate social performance. This research found that more gender diverse boards improve social performance and that this positive effect is larger for emerging markets in Europe. Lin et al. (2018) researched the effects of gender diverse boards on the community, by measuring the level of charitable donations by the company over a sample of selected Taiwanese electronics companies. The researchers found that a more gender diverse board of directors, with a minimum of three female directors, is more likely to give money to the community in the form of charitable donations.

These last three papers all have in common the conclusion of a positive impact of the influence of women on the social behavior within a company. However, they did not research the effects on the Social rating. Disli et al. (2021) found with their research that the percentage of female directors on the board positively impacts the social component of ESG performance. They argue that this result could be explained because women are in general more interested in the well-being of other individuals, such as coworkers, and show more compassion and empathy than men towards these stakeholders. According to Naciti (2019), the arguments mentioned before suggest that women are more oriented to solving social problems than men. Due to the above, the following hypothesis is reached:

Hypothesis 2B. *Gender diversity is positively related to social performance.*

Governance pillar

Besides a positive association with the social pillar of ESG performance, Disli et al. (2021) also found that the percentage of female directors on the board positively influences the governance performance of a company. A reason for this result is that women have a positive impact on the quality of governance practices as companies with more diverse boards experience less financial misconduct because of more diversity of perspectives (Wahid, 2019). Furthermore, the paper of Adams and Ferreira (2009) studied the impact of women in the board room on corporate governance and performance. They found that, in a sample of U.S. firms, female directors have an important influence on board inputs and firm outcomes. This means that more gender diverse boards are better equipped at monitoring and controlling business operations.

Gupta et al. (2015) agree with the finding that a more gender diverse board enhances a company's non-financial performance. Their view is in line with the stakeholder theory, suggesting that gender diverse boards are more likely to be sensitive to the needs and concerns of different stakeholders. An increased number of female board members could influence the ability of the board to better understand and address several governance issues and thereby improving the governance performance. In addition, De Masi et al. (2021) found that the effect of women on the board is positive and significant for the governance score, among a sample of companies listed on the FTSE-MIB index during the period 2005–2017. This study states that an increased number of women on the board, with at least three or more, are better able to ensure that their ideas are heard, impacting the decisions of the board. The influence of female board directors is highest for the Governance score, because these female members are better able to communicate and protect the interest of the stakeholders (De Masi et al., 2021). For the reasons presented, the following hypothesis is formulated:

Hypothesis 2C. *Gender diversity is positively related to governance performance.*

2.3.3 Board Independence

Board independence refers to the extent to which the board of directors can act independently of management to make decisions that are in the best interest of the shareholders of the company. According to the study of Arayssi et al. (2020), if a company has a board of directors consisting of a significant number of independent directors, this signals that the board is less likely to be controlled by the management of the firm. In that case, the board can make independent decisions, without interference of managers. The board is responsible for overseeing the ESG performance of the company, including monitoring, evaluating, and setting sustainability targets. Independent directors want to inform investors as much as possible and therefore voluntarily disclose sustainability information. Moreover, a higher proportion of independent board members leads to more ESG disclosure which ultimately results in higher overall ESG ratings (Arayssi et al., 2020). Independent directors bring a commitment to shareholder value, which can strengthen ESG governance and practices. Lagasio and Cucari (2019) also state that a larger number of independent directors among the board of directors is considered to have a positive influence on the implementation of ESG activities by the company.

The study of Bigelli et al. (2023) measured board independence by taking the percentage of independent directors on the board. They found that a greater percentage of independent directors on the board of directors has a positive relationship with ESG ratings. The same method of measuring board independence is used by several other studies (e.g. Cucari et al., 2018; Harjoto et al., 2019; Herda et al., 2012). Harjoto et al. (2019) analyzed the relation between the percentage of independent directors and corporate social performance using a sample of more than 800 U.S. based companies.

On average, 77.2% of the directors in their research sample were considered to be independent. This study found that an increase in the percentage of independent directors positively influences corporate social performance. The authors explain this result by an increased level of internal monitoring by the board of directors. Similar results were found by Cucari et al. (2018). They examined the influence of several board characteristics on voluntary ESG disclosure, using a sample of 54 Italian public companies over the period of 2011–2014. The study of Herda et al. (2012) examined the impact of board independence on the sustainability reporting practices of the top 500 firms in the U.S. Their findings revealed a positive association, indicating that firms with a higher percentage of independent board members tend to produce more comprehensive and higher-quality sustainability reports. In the financial sector, Miranda et al. (2023) found that board independence positively affects ESG performance, which indicates that independent board members of banking institutions encourage participation in ESG-related activities. A larger percentage of independent directors let banking institutions to engage more easily in corporate socially responsible practices beyond the interests of shareholders. García-Sánchez et al. (2018) conducted a similar research and they found that independent board members both consider financial objectives as well as ESG objectives in their decision-making process. They also found a positive relationship between board independence and ESG performance. Furthermore, this study suggests that independent board members are concerned about sustainability issues, reflecting the concerns of the shareholders and other stakeholder groups. As to non-financial companies, Campanella et al. (2021) conducted an analysis using an international sample of 540 companies from Forbes Global 2000 and confirmed the existence of a positive influence of independent directors on ESG performance. The authors interpret this positive relationship as the ability of independent directors to obtain a more unbiased assessment of the performance of a firms' management. Independent directors do not feel inclined to make management's results and activities appear better than they are. This makes them more willing to disclose sustainability information.

The positive influence of independent directors on the implementation of ESG practices and disclosure can be explained from the perspective of agency theory. Following the agency theory, independent directors are able to mitigate or reduce agency costs because they are tasked with the supervision of management's business activities (Naciti, 2019). The primary function of the board of directors is to monitor the behavior of the management. Independent directors make sure that the management does not deviate from the social interest and pursue personal objectives. Dependent directors have direct connections to the management of the company and may therefore be more likely to overlook the pursuit of personal goals.

There are, on the other hand, also studies that found that board independence negatively impacts the overall ESG performance of a company. For example, the study of Birindelli et al. (2018) concluded that the relationship between board independence and the ESG rating of a company is negative. Moreover, Naciti (2019) examined the effect of board attributes on the sustainability, using a sample of 362 large industrial firms included in the Fortune Global 500 list at least once in the period 2013-2016. This study found that a higher number of independent directors results in lower sustainability performance. An excessive amount of independent board members is likely to be self-defeating, because there are fewer insiders with specific knowledge on the board. This significant reduction in the experience, expertise, and reputation of the board means that less well-considered decisions can be made regarding sustainability issues. This leads to a decline in the overall ESG performance (Birindelli et al., 2018). It is uncertain which aspects of ESG performance suffer the most because of an excessive amount of independent board members.

Pucheta-Martinez and Gallego-Alvarez (2019) found that the independence of the board of directors does not motivate companies to disclose sustainability information to the stakeholders. The reporting of ESG issues may be beneficial to all stakeholders, but this may go against the interest or demands of the shareholders. As an independent board of directors should represent the interest of its shareholders, they may decide not to disclose sustainability reports. This hampers the process of assessing a companies' ESG performance. Garcia-Sanchez and Martinez-Ferrero (2018) presented a different point of view as to why independent directors would dislike sustainability reporting. They argue that independent directors closely link their reputational risk to the level of sustainability disclosures. In other words, independent directors do not promote ESG reporting if such reporting does not align with the firm's actual performance, as they are afraid it could damage the company's reputation. The reputational risks associated with sustainability disclosure is that these reports contain potentially misleading information. This explanation is supported by Bansal et al. (2018). They mention that the behavior of independent directors is influenced by reputational risk as they are concerned that the information received from the management could be manipulative and misleading.

While most studies highlight a positive relationship between ESG performance and board independence (Cucari et al., 2018; Harjoto et al., 2019), some support a negative relationship (e.g., Birindelli et al., 2018). For this study, board independence is expected to influence the overall ESG performance, though the sign of this relationship is uncertain. Besides, the purpose of this study is to specifically examine the impact of board independence on each ESG pillar individually. Based on the following three sections, hypotheses are formulated about how board independence may influence the Environmental, Social, and Governance pillars individually.

Environmental pillar

Lu and Wang (2021) as well as Naciti (2019) used the Sustainalytics database to retrieve data relating the sustainability performance of a company and they both found that board independence and environmental performance are negatively related. An increase in the level of independent board members leads to a decrease in the rating of the environmental performance by -0.03 points (Lu and Wang, 2021). In accordance with the agency theory, independent board members are often brought in to ensure objectivity and to protect shareholder interests from the opportunistic behavior of the management of the company (Ruiz-Castello et al., 2024). The shareholders, and thus the independent directors as well, traditionally focus on financial returns. This financial focus might overshadow environmental considerations, especially if the environmental initiatives do not directly contribute to short-term financial returns. In this, Mititean (2022) states that independent board members are less concerned about environmental issues as board independence has a negative impact on the environmental performance of a company. Moreover, Khalid et al. (2022) was unable to find a significant relationship between board independence and the level of environmental disclosure for a sample of 564 companies from 15 developed economies.

Disli et al. (2021), on the other hand, found that board independence has a positive impact on the environmental rating of a company: an increase in the level of independence with one standard deviation leads to an increase in the environmental rating by 9.41% on average. Independent board members usually have more diverse backgrounds which enhances the level of expertise on the board which allows the independent directors to mitigate conflicts between different stakeholder groups and convince managers to participate in more environmental practices (Haque and Ntim, 2017). Furthermore, the study of Gavana et al. (2023) also found a positive relationship between board independence and the environmental rating as retrieved from Refinitiv Eikon. They state that independent directors are less pressured by financial goals and are more concerned about balancing financial and environmental objectives (Liao et al., 2015). Independent directors may feel pressured by growing expectations of society, i.e. different stakeholder groups, to engage in more environmental activities. This pressure may also arise from potential reputation risks since independent directors are afraid to lose their board seat when dealing with controversial situations (Li et al., 2018). Therefore, the professional interests of independent directors may cause them to support strategies that adopt more environmental practices, hoping that this improves their social image (Ruiz-Castello et al., 2024). In other words, independent board members may feel pressured by society or reputational risks to adopt business activities that may benefit the environmental performance of the company. In this, the independent directors are viewed more positively by external stakeholders as it improves the environmental rating.

The previous two paragraphs discussed two different views in academic literature on the relationship between board independence and environmental performance. Because of these different views on the type of relationship, negative or positive, the following hypothesis is formulated:

Hypothesis 3A. Board independence influences environmental performance.

Social pillar

Dunn and Sainty (2009) claim that companies with a larger percentage of independent directors are more likely to show better social performance. This paper examined the relationship between several board characteristics and the corporate social performance score of the fifty best companies in Canada over a five-year period from 2002 to 2006. They argue that independent board members are in general better aware of any social issues and the needs of different stakeholder groups within the company. Because of this, increased levels of independent directors on the board could lead to a broader stakeholder orientation. This is in line with the stakeholder theory: independent board members are more interested in the needs of multiple stakeholders, such as employee relations and safety, instead of just the financial interest of the companies' shareholders. The responsibility of independent board members to shareholders and stakeholders does not conflict because companies with strong sustainability performance often have better financial performance, suggesting that attention to stakeholders is also beneficial to shareholders (Clark et al., 2015). The finding of a positive relationship between board independence and social performance are supported by other studies, such as Biswas et al. (2018) and Veltri et al. (2021). Biswas et al. (2018) performed an additional analysis, examining the impact of board independence on several subdimensions of social performance. These social dimensions are employment quality, health and safety, training and development, diversity, human rights, community, and product responsibility (Biswas et al., 2018). They found that board independence is positively related to all dimensions of social performance, except diversity.

Additionally, Dah and Jizi (2017) suggest that board independence increases the level of social disclosures. They argue that independent directors encourage the social consciousness of the company by directing resources towards socially important projects. These increased social disclosures also signal that the company is actively addressing social issues and is committed to improving them. This is again in line with the stakeholder theory, as the independent board members are committed to a larger group of stakeholders instead of just the shareholders. Because of the reasons presented, this research expects the following:

Hypothesis 3B. Board independence is positively related to social performance.

Governance pillar

Researching papers on the relationship between board independence and governance performance, there is no study that specifically examines this relationship. This does not mean, however, that there are no studies that briefly mention something about this relationship. For instance, Khalid et al. (2022) studied the relation between firm characteristics, governance mechanisms, and ESG disclosures for a sample of 564 firms from fifteen developed economies and were unable to find a significant relationship between board independence and governance disclosure. Disli et al. (2021), on the other hand, found that board independence does positively impact the governance performance of a company. They argue that independent board members are more likely to comply with ethical codes and regulations, because they have a higher objectivity and are concerned about the impact governance activities have on their own reputation. Since independent directors are more concerned about compliance with such regulations, it can be said that independent directors are more sensitive to ethical demands made by different stakeholders (García-Sánchez et al., 2015).

Other studies, such as Al Amosh and Khatib (2021) and De Masi et al. (2021), also found that independent directors have a significant and positive impact on the governance component of ESG performance. Al Amosh and Khatib (2021), for example, state that board independence enhances corporate governance practices and that independent board members understand and act according to several legitimacy requirements. Moreover, independent directors are crucial for providing unbiased oversight and ensuring that management acts in the best interests of shareholders (Adams et al., 2015). The presence of independent directors is associated with higher governance standards and better financial reporting quality since they ensure that the company is managed in a way that is transparent, accountable, and aligned with the interests of its stakeholders. In addition, following the study of García-Sánchez et al. (2015), independent directors want to simultaneously improve the ethical business conduct of a company and encourage managers to meet objectives through good governance practices. Following these arguments, the following hypothesis is devised:

Hypothesis 3C. *Board independence is positively related to governance performance.*

3. Data and Methods

3.1 Sample Selection

As discussed above, this study examines the influence of several board characteristics on the Environmental, Social, and Governance performance of a company. The sample of this study consists of the 600 companies listed on the STOXX Europe 600. This index represents large, mid, and small capitalization companies among 17 European countries (STOXX, 2024). The data regarding this dataset is collected from the LSEG Workspace. This platform provides both the ESG-related data as well as the board-related data needed for this research. Moreover, the LSEG Workspace maintains and calculates the ESG scores for more than 15,000 companies worldwide, based on more than 630 company-level ESG measures (LSEG Data & Analytics, 2024). From these 630 ESG measures, which are processed manually for each company, a subset of 186 of the most comparable and material measurements are selected per industry that power the overall company assessment and rating process. Previous studies on the impact of board characteristics on ESG performance also used the LSEG Workspace, formerly known as Refinitiv Eikon, database to extract ESG performance information (e.g. Birindelli et al., 2018; Halid et al., 2022; Shakil et al., 2019).

Constructing the dataset, the relevant information for the 600 companies listed on the STOXX Europe 600 is retrieved and added to the panel over a period of 5 years, from 2018 to 2022. This research uses both financial as well as non-financial data for its analysis. Many companies from the index have not yet disclosed their financial and/or non-financial reports regarding last year, 2023. Therefore, this study takes 2022 as the last year from which data is retrieved.

As said earlier, the STOXX Europe 600 is an index that represents a fixed number of 600 companies. The composition of this index is shown in Table 1. Since this study explores the impact of board characteristics on ESG performance, the sampling procedure of the dataset begins with the availability of the Environmental, Social, and Governance ratings in the LSEG database. Thereafter, the availability of the data regarding board size, board gender diversity, and board independence is evaluated. Excluding companies with any missing values for at least three years, the final panel dataset for this research consists of 581 companies from the STOXX Europe 600 for which ESG-related data and board characteristics data was available. It was opted not to exclude companies with missing data regarding ESG performance and board characteristics for only one or two years in the final dataset. The final data collected includes 2,905 company-year observations over five years, from 2018 to 2022. The detailed sample selection and its distribution per country is shown in Table 1.

Country	STOXX Europe 600 (# Companies)	Sample (# Companies)	Company-year observations	Percentage
Austria	8	8	40	1.38%
Belgium	16	13	65	2.24%
Bermuda	1	1	5	0.17%
Cyprus	1	-	-	-
Denmark	24	24	120	4.13%
Faeroe Islands	1	1	5	0.17%
Finland	19	19	95	3.27%
France	75	74	370	12.74%
Germany	70	68	340	11.70%
Ireland	12	12	60	2.07%
Italy	35	34	170	5.85%
Luxembourg	8	7	35	1.20%
The Netherlands	34	33	165	5.68%
Norway	13	13	65	2.24%
Poland	9	9	45	1.55%
Portugal	4	4	20	0.69%
Spain	23	22	110	3.79%
Sweden	59	57	285	9.81%
Switzerland	60	57	285	9.81%
United Kingdom	127	124	620	21.34%
United States	1	1	5	0.17%
TOTAL	600	581	2,905	100%

Table 1 - Sample selection and distribution per country

3.2 Variables Measurement

The following three subsections explain how the dependent and independent variables are measured. Furthermore, the control variables used for analysis are reasoned, based on previous research. Table 2 gives an overview of all variables used for this study.

3.2.1 Dependent Variable

In order to explore the influence of board characteristics on the Environmental, Social, and Governance performance of a company, the three pillars of ESG performance are taken as the dependent variables. The performance of these three pillars is measured by taking the individual rating per pillar. The individual rating of each pillar is calculated by LSEG Data & Analytics. It reflects a transparent and objective measure of the Environmental, Social, and Governance performance of a company and is based on publicly disclosed data (LSEG Data & Analytics, 2024).

The ESG ratings from the LSEG Workspace are expressed as a value ranging from 0 to 100 and are published annually. The ratings are explained per quartile, in which the quartiles are labeled from poor to satisfactory, good, and ultimately excellent performance. As previously explained, an ESG rating contains three dimensions: Environmental, Social, and (corporate) Governance. The total ESG rating is calculated as the arithmetic average of its three components. The environmental performance measures how a company reduces environmental emissions, uses natural resources efficiently in its production processes, and researches and develops environmentally friendly products or services. The social performance includes various aspects of a company's ability to be a good citizen, such as building trust and loyalty among its employees, respecting, and protecting fundamental human rights, good business practices, and creating value in accordance with social norms and ethics. Lastly, governance performance measures how a company structures and implements corporate governance systems and processes to ensure and maximize shareholder benefits.

3.2.2 Independent Variables

For this study, three board characteristics are taken as independent variables: board size, board gender diversity, and board independence. **Board size** (BS) is measured by determining the total number of members of the board of directors. This measure has been previously used in several studies such as those of Guest (2009) and Ellili (2022). Following studies of Birindelli et al. (2018), Chouaibi et al. (2022), and Ellili (2022), **board diversity** (DIV) is measured as the proportion of female directors on the board. The last variable, **board independence** (IND), is defined as the percentage of independent members on the board of directors. This approach was used in previous studies by Bigelli et al. (2023) and Miranda et al. (2023).

3.2.3 Control Variables

Besides from the three board characteristics studied in this research, there are many other factors that also may have an impact on the ESG performance of a company. Some of these factors are included in this analysis as control variables to account for their effect on ESG performance, based on existing literature. The first two control variables are additional board characteristics. It is said that more frequent held board meetings allow for more room for sustainability-related discussions, resulting in better ESG performance (Disli et al., 2021). Therefore, board activity is included as a control variable. The other control variable regarding board characteristics is a dummy variable that equals 1 if the company has a committee that oversees and determines the sustainability strategy of the company. In general, if a company has a CSR committee, there is more attention towards ESG-related issues and therefore the ESG ratings are expected to be higher (Bigelli et al., 2023; Birindelli et al., 2018).

The second layer of control variables is related to observable, financial firm-level characteristics. First, this study controls for profitability by measuring ROA using the ratio of net income to total assets (Disli et al., 2022; Naciti, 2019). Profitability may provide additional funds for the management of a company to increase sustainability related activities, which increases ESG ratings. Furthermore, the study of Naciti (2019) found that larger companies show better sustainability performance than smaller companies. This can be similarly interpreted as was the case for profitability: larger firms tend to have more resources available to be used for addressing sustainability issues. For this study, company size is measured by the natural logarithm of total assets (De Masi et al., 2021; Treepongkaruna et al., 2024). Lastly, leverage is measured as total debt divided by total assets. Leverage might increase the ESG rating of a company because debt holders are able to monitor the company (Disli et al., 2022; Ellili, 2022; Mititean, 2022).

In addition, this study includes firm age, industry, and country as control variables. Firm age measures how long the company is operating for. According to Arayssi et al. (2020), older companies are more concerned about their reputation which results in them providing more sustainability-related information. Industry indicates the industrial sector in which the company operates, and country represents one of the seventeen nations in which the company is based. According to Cai et al. (2016), firm characteristics do not fully explain the company's sustainability performance. Country and industry factors also play an important role in the variations of ESG performance across companies.

Type	Variable	Explanation
<i>Dependent</i>	ENV	Environmental score as a percentage.
	SOC	Social score as a percentage.
	GOV	Governance score as a percentage.
<i>Independent</i>	BS	Number of board members on the board of directors.
	DIV	Percentage of women on the board of directors
	IND	Percentage of independent members on the board of directors.
<i>Control</i>	NBM	Number of board meetings during the year.
	CSRCOM	Dummy variable that measures the presence of a committee overseeing the company's sustainability strategy.
	ROA	Profitability of the company, calculated by the Return on Assets: net income divided by average total assets.
	LNTA	Size of the company, measured by the natural logarithm of total assets.
	LEV	Ratio of total debt to total assets.
	AGE	The age of the company.
	SIC	The industrial sector of the company.
ISO	The country of the company.	

Table 2 - Definition of Variables

3.3 Regression Models

This research will adopt an empirical approach to investigate the influence of board characteristics on each of the separate pillars of ESG performance, using a sample of companies from the STOXX Europe 600. To explore this relationship, panel regression models are used where the Environmental, Social, and Governance rating are taken as dependent variable and board size, board gender diversity, and board independence are taken as the independent variables. Furthermore, several control variables are included to mitigate their effect on ESG performance, based on previous research. The regression equations are based on the models used in comparable studies, such as Chouaibi et al. (2021). All variable definitions are shown in Table 2. Since a panel consisting of the same companies over a period of 5 years, from 2018 to 2022, is used, panel data regressions with fixed time and firm effects are appropriate to use for this analysis.

$$ENV_{it} = \beta_0 + \beta_1 BA_{it} + \beta_2 NBM_{it} + \beta_3 CSRCOM_{it} + \beta_4 ROA_{it} + \beta_5 TA_{it} + \beta_6 LEV_{it} \\ + \beta_7 AGE_{it} + \beta_8 SIC_i + \beta_9 ISO_i + \gamma_t + \varepsilon_{it}$$

$$SOC_{it} = \beta_0 + \beta_1 BA_{it} + \beta_2 NBM_{it} + \beta_3 CSRCOM_{it} + \beta_4 ROA_{it} + \beta_5 TA_{it} + \beta_6 LEV_{it} \\ + \beta_7 AGE_{it} + \beta_8 SIC_i + \beta_9 ISO_i + \gamma_t + \varepsilon_{it}$$

$$GOV_{it} = \beta_0 + \beta_1 BA_{it} + \beta_2 NBM_{it} + \beta_3 CSRCOM_{it} + \beta_4 ROA_{it} + \beta_5 TA_{it} + \beta_6 LEV_{it} \\ + \beta_7 AGE_{it} + \beta_8 SIC_i + \beta_9 ISO_i + \gamma_t + \varepsilon_{it}$$

Equation (1) shows the base model that is used to verify the hypotheses regarding the relationships between board characteristics and the environmental performance of a company. *BA* stands for the three board attributes that are used as independent variables for this research: board size, gender diversity, and board independence. This means that equation (1) is used to model the relation between the environmental rating and the three board attributes separately as well as together as robustness check. The same applies to equations (2) and (3). The regression model in equation (2) is thus formulated to investigate the association between board characteristics and the social rating. Lastly, the influence of the three board characteristics on the governance performance is examined using equation (3). Each of these models investigates only one pillar of ESG performance, but they have identical control variables. Moreover, for all these equations, the firm specific fixed effects for a specific company *i* are represented by the control variables regarding the industrial sector (*SIC*) and country (*ISO*). Furthermore, γ_t represents the time specific effects for time *t* and the error term, ε_{it} , is added to explain the differences between the observed values and the theoretical values of the model.

4. Results and Discussions

The final dataset, as described in section 3 of this study, was first analyzed using descriptive analysis. In this way, the level and pattern of the Environmental, Social, and Governance rating could be measured as well as the level and pattern of the other variables included in this research. Thereafter, a correlation matrix is analyzed to test for any multicollinearity problems. Finally, panel data regressions were applied to test the hypotheses formulated in section 2 of this research.

4.1 Descriptive Statistics

Table 3 presents the descriptive statistics of the dependent variables relating to the sustainability performance of a company as well as the descriptive statistics of the explanatory and control variables. On average, the ratings for the Environmental (*ENV*), Social (*SOC*), and Governance (*GOV*) pillars are 65.75, 71.74, and 65.41, respectively. The ratings can range from zero to 100, where a higher score indicates a better sustainability performance in that particular pillar. Moreover, it appears that the companies in this dataset generally score the best in the social pillar, which means that they pay a lot of attention to subjects such as working conditions and human rights.

The average ratings from this sample are larger than the average ratings in the studies of Ho et al. (2021) or Pozzoli et al. (2022). The discrepancy in ESG ratings between this study and the existing studies is probably caused by a difference in sample periods and a difference in rating agency used to collect the ESG ratings. In addition, all three pillars have a relatively large standard deviation, indicating that the variation of the specific ratings is high. In terms of the minimum and maximum scores, it can be seen in Table 3 that for *ENV* as well as *SOC* and *GOV* a fairly low minimum rating is shown, with even the environmental pillar having a value of zero. This indicates that several companies in the dataset are inconsiderate towards their sustainability performance. Based on this data, however, it cannot be determined whether companies score poorly in one specific pillar or in several. For the maximum score, all individual pillars have a value of above 98. This means that there are also companies in the dataset that perform extremely well in addressing and solving sustainability issues.

Looking at the growth of the ESG pillars over the years in Table 4, it can be said that, in general, a positive trend can be seen. For example, the average social rating increased each year of the sample period and grew from 69.25 in 2018 to 73.31 in 2022. The average ratings, however, remained stuck in the third quartile of performance. According to LSEG Data & Analytics (2024), this quartile "(...) indicates good relative ESG performance and above average degree of transparency in reporting material ESG data publicly." This means that, on average, the companies in this dataset do disclose a fair amount of ESG related reports on which the ESG ratings are based. Besides, this table shows that the Environmental rating has increased most over the period of five years.

Variable	Mean	Standard Deviation	Minimum	Maximum
<i>Dependent variables</i>				
ENV	65.74561	22.56370	0	99.14
SOC	71.74047	17.78973	0.25	98.14
GOV	65.41075	19.26098	1.45	98.56
ESG	68.39261	15.56252	5.43	95.58
<i>Independent variables</i>				
BS	10.99686	3.637393	3	30
DIV	34.85123	11.08966	0	75
IND	64.11301	22.74901	0	100
<i>Control Variables</i>				
NBM	10.08993	4.994578	1	48
CSRCOM	0.846583	0.3604519	0	1
ROA	6.666878	11.28491	-63.72	253.09
LNTA	16.43179	1.771889	10.58	21.78
LEV	25.35901	15.59411	0	87.91
AGE	44.87924	36.28990	0	195

Table 3 - Descriptive Statistics

As for the composition of the board of directors, Table 3 shows that, on average, a board is composed of 11 members, with a minimum of 3 and a maximum of 30 members. The average number of board members corresponds to the average of 11 directors from the research of Pozzoli et al. (2022) within the European Union. According to Table 4, the size of the board has hardly changed over the years: on average, there are 11 participants on the board for all years in the period 2018-2022. The average board in this dataset consists for 34.85% of female directors and 64.11% of the directors are independent. For both *DIV* and *IND*, there are companies in the dataset that have no female or independent directors at all. There are also companies where the board consists entirely of independent directors. Moreover, the maximum percentage of female board members is 75%. The average proportion of female directors still reveals gender inequality, but the companies in this dataset score better than those in the European banking sector. According to Miranda et al. (2023), female board participation in banks is only 26.88%. In addition, for both variables the average percentage has increased over time. In 2018, for example, female board participation was on average 31.23%, while it increased to almost 35% in 2020 and to 38.63% in 2022.

Year	ENV	SOC	GOV	ESG	BS	DIV	IND	NBM	CSRCOM	ROA	LNTA	LEV	AGE
2018	60.91	69.25	61.12	64.82	11.03	31.23	63.18	9.21	0.77	7.86	16.23	22.94	42.88
2019	64.32	70.55	63.49	66.89	10.90	32.92	63.64	9.42	0.81	6.92	16.35	25.26	43.88
2020	66.19	72.27	67.69	69.45	11.03	34.99	63.66	11.20	0.85	4.82	16.42	27.59	44.88
2021	68.05	73.27	67.82	70.36	10.97	36.45	64.28	10.41	0.89	7.32	16.54	25.52	45.88
2022	69.18	73.31	66.83	70.37	11.06	38.63	65.81	10.13	0.91	6.41	16.62	25.57	46.88

Table 4 - Descriptive Statistics (Mean) by Year¹.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) ENV	1.00												
(2) SOC	0.65***	1.00											
(3) GOV	0.29***	0.35***	1.00										
(4) ESG	0.80***	0.86***	0.67***	1.00									
(5) BS	0.35***	0.35***	0.08***	0.33***	1.00								
(6) DIV	0.21***	0.18***	0.19***	0.24***	0.13***	1.00							
(7) IND	0.08***	0.13***	0.40***	0.25***	-0.20***	0.02	1.00						
(8) NBM	0.10***	0.04*	0.08***	0.08***	0.02	0.12***	0.11***	1.00					
(9) CSRCOM	0.44***	0.45***	0.33***	0.51***	0.24***	0.18***	0.12***	0.05***	1.00				
(10) ROA	-0.12***	-0.14***	-0.09***	-0.14***	-0.20***	0.00	0.00	-0.13***	-0.13***	1.00			
(11) LNTA	0.47***	0.36***	0.28***	0.46***	0.52***	0.16***	0.10***	0.23***	0.28***	-0.35***	1.00		
(12) LEV	0.15***	0.15***	0.04**	0.14***	0.09***	0.08***	0.01	0.12***	0.16***	-0.14***	0.04*	1.00	
(13) AGE	0.18***	0.15***	0.02	0.15***	0.20***	0.01	-0.07***	-0.01	0.10***	-0.02	0.14***	-0.02	1.00

Table 5- Pairwise Correlation Matrix. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

¹ Even though this research does not focus on the difference in average value of the researched variables over the years, it might be interesting to gain additional insight into the distribution of the sample.

Finally, Table 3 shows the descriptive statistics for the control variables. In this, the first two variables are additional board characteristics. On average, the board of a company is holds 10 board meetings (*NBM*) per year, with a minimum of 1 and a maximum of 48 meetings. This number remains relatively stable over time, with a small outlier in 2020. This is probably related to COVID-19, as the board of directors were faced with many uncertainties and needed to consult with each other more. The variable *CSRCOM* indicates whether the company has a committee that oversees and determines the sustainability strategy of the company. The value of 0.84 shows that most of the companies in this dataset do have a CSR committee. Table 4 shows that this value increased over time, indicating that more companies have appointed such committees to show their commitment in addressing sustainability issues. Concerning the observable, financial firm-level characteristics, the mean profitability ratio (*ROA*) is 6.67%, the mean company size (*LNTA*) is 16.43, and the mean leverage ratio (*LEV*) is 25.36%. Although company size in Table 1 is expressed in natural logarithm, the mean of company size measured by the total assets is €78.60mln. At last, the average age (*AGE*) of the companies in the sample is 44.88.

4.2 Correlation Matrix

Table 5 presents the Pearson correlation coefficients between the variables used in this research as well as their respective significance. The table shows that all correlation coefficients are lower than 0.9, which suggests that there are, in general, no large multicollinearity problems. After a more precise examination of the correlation matrix, it can be seen that the ESG rating is significantly, positively, and highly correlated with its three components: 0.80 (*ENV*), 0.86 (*SOC*), and 0.67 (*GOV*). This can be logically explained as the overall ESG rating is calculated based on the ratings for the three separate components and is consistent with other studies (De Masi et al., 2021). This relative high correlation will not cause any problems for the analysis of this research, because the three pillars of ESG performance are used as the dependent variables and are included in separate regression models.

Furthermore, the coefficients in Table 5 show that board size (*BS*) is statistically significant and positively correlated with all measures of sustainability performance. This also applies to the other two board attributes, gender diversity (*DIV*) and board independence (*IND*). Among them, the correlation between *IND* and *GOV* is the highest with a coefficient of 0.40. This positive correlation suggests that companies with more independent board members also tend to have a higher governance rating. Besides, it is unlikely that this positive relationship is to be due to random chance as the correlation is significant at the 1% level. This reasoning also applies to other statistically significant and positive correlations, but it does not mean that an increase in independent board members, for example, causes a higher governance rating. More research is needed to find out if there is any type of causal relationship.

In addition, board size (*BS*) is significantly and positively correlated to the natural logarithm of total assets (*LNTA*), which measured the size of the company, at 0.52. This correlation indicates larger companies tend to have a larger board of directors, which is consistent with previous studies and with the expectations from the literature review (De Masie et al., 2021; Miranda et al., 2023). Contrary to what could be expected, the correlation matrix in Table 5 shows that the degree of profit, measured by the return on assets (*ROA*), is negatively correlated with almost every variable. This would suggest that more profitable companies tend to have lower ESG ratings, in all three pillars, and smaller boards with fewer female and independent members. The reverse would apply to less profitable companies.

Lastly, most of the independent variables in Table 5 are significantly correlated with each other. Although these significant coefficients do not exceed a value of 0.9, it may still be possible that a multicollinearity problem arises. Therefore, the dataset is tested for multicollinearity by performing a Variance Inflation Factor (VIF) analysis. For this test, a linear regression was first run with the Environmental, Social, Governance, and overall ESG ratings as dependent variables and the remaining variables as independent. Thereafter, the VIF scores were determined for the independent variables. The results of this analysis are displayed in Table 6. This table shows that the VIF scores are lower than the suggested cutoff. Following papers of James et al. (2021) and Pozzoli et al. (2022), when the VIF score is lower than 10, it is safe to say that there are no multicollinearity problems.

	VIF	1/VIF
<i>BS</i>	1.54	0.648529
<i>DIV</i>	1.07	0.932115
<i>IND</i>	1.14	0.877191
<i>NBM</i>	1.09	0.913745
<i>CSRCOM</i>	1.14	0.879268
<i>ROA</i>	1.18	0.845634
<i>LNTA</i>	1.66	0.603077
<i>LEV</i>	1.06	0.943426
<i>AGE</i>	1.05	0.952840
Mean VIF	1.21	

Table 6 - Variance Inflation Factor (VIF)

4.3 Panel Regression Models

Before testing the panel regression models, it was necessary to determine whether panel regression models could be used or not. For this purpose, an F-test for individual effects was performed. This test showed that there are both fixed as well as random effects in the model, which excluded the use of a pooled regression model. Thereafter, a Hausman test was performed to assess which type of panel regression models is most appropriate for this study. This test found that using a fixed effects panel regression model was believed to be the best fit for this research.

Tables 7 to 10 show the results of the fixed effects panel regressions on the influence of board characteristics on the Environmental (Table 7), Social (Table 8), Governance (Table 9), and overall ESG (Table 10) performance. For each table, the first column reports the results on the influence of board size, the second column displays the results regarding gender diversity, and the third column describe how board independence influences each dependent variable. As a robustness check, column 4 of each table reports the results of a panel regression in which all explanatory variables are included. The following four sections describe the regression outcomes per column.

4.3.1 Board Size

The first columns (1) of Tables 7, 8, and 9 show the results of hypotheses 1A-B-C, which addresses the relationship between board size (*BS*) and the individual components of ESG performance. Hypotheses 1A and 1B expected a positive relationship between board size and the environmental and social rating of a company, respectively, while hypothesis 1C expected a negative relationship regarding the governance performance. Following the regression results, board size has a negative association with all components of ESG performance, indicating that companies with larger board of directors tend to have lower ESG ratings. These results are not significant for the Environmental and Social pillars. However, board size negatively and significantly influences the Governance pillar. This results is significant at the 1% level ($p < 0.01$) and suggests that increasing the board size by one member decreases the Governance rating by 120.1%. These findings support hypothesis 1C, whereas hypotheses 1A and 1B are not supported due to an insignificant negative association. These results align with Disli et al. (2021), who also found a significant negative relationship between board size and both the Governance pillar as well as the overall ESG rating.

Variables	(1) ENV	(2) ENV	(3) ENV	(4) ENV
BS	-0.048 (-0.289)			0.003 (0.018)
DIV		0.054* (1.784)		0.049 (1.616)
IND			0.052** (2.151)	0.049** (2.011)
NBM	0.035 (0.592)	0.028 (0.483)	0.036 (0.612)	0.030 (0.503)
CSRCOM	9.574*** (11.154)	9.542*** (11.125)	9.478*** (11.042)	9.450*** (11.009)
ROA	-0.053* (-1.909)	-0.055** (-1.986)	-0.053* (-1.931)	-0.055** (-2.001)
LNTA	2.758*** (3.321)	2.680*** (3.249)	2.722*** (3.304)	2.675*** (3.223)
LEV	-0.024 (-0.819)	-0.024 (-0.823)	-0.024 (-0.828)	-0.024 (-0.826)
AGE	1.208*** (8.872)	1.114*** (7.629)	1.184*** (8.674)	1.099*** (7.518)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
F	58.141***	58.690***	58.945***	46.154***
Observations	2,180	2,180	2,180	2,180
R-squared	0.192	0.194	0.195	0.196

Table 7 - Fixed effects panel regression results: board attributes and environmental pillar. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. t-statistics in parentheses.

Variables	(1) SOC	(2) SOC	(3) SOC	(4) SOC
BS	-0.041 (-0.301)			-0.025 (-0.186)
DIV		0.004 (0.145)		0.001 (0.026)
IND			0.026 (1.318)	0.025 (1.290)
NBM	0.074 (1.549)	0.074 (1.546)	0.075 (1.566)	0.075 (1.554)
CSRCOM	6.038*** (8.635)	6.039*** (8.637)	5.991*** (8.562)	5.989*** (8.551)
ROA	0.008 (0.361)	0.008 (0.358)	0.008 (0.351)	0.008 (0.347)
LNTA	1.361** (2.012)	1.335** (1.985)	1.334** (1.986)	1.348** (1.990)
LEV	-0.006 (-0.269)	-0.007 (-0.275)	-0.007 (-0.276)	-0.006 (-0.273)
AGE	0.686*** (6.182)	0.680*** (5.713)	0.674*** (6.057)	0.673*** (5.639)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
F	30.204***	30.193***	30.468***	23.674***
Observations	2,180	2,180	2,180	2,180
R-squared	0.110	0.110	0.111	0.111

Table 8 - Fixed effects panel regression results: board attributes and social pillar. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. t-statistics in parentheses.

Variables	(1) GOV	(2) GOV	(3) GOV	(4) GOV
BS	-1.201*** (-6.028)			-0.986*** (-5.056)
DIV		0.192*** (5.239)		0.152*** (4.255)
IND			0.269*** (9.480)	0.248*** (8.771)
NBM	0.030 (0.422)	0.019 (0.265)	0.047 (0.669)	0.016 (0.227)
CSRCOM	5.171*** (5.013)	5.163*** (4.992)	4.767*** (4.686)	4.602*** (4.582)
ROA	-0.058* (-1.761)	-0.064* (-1.918)	-0.059* (-1.815)	-0.067** (-2.082)
LNTA	3.222*** (3.229)	2.369** (2.382)	2.505** (2.564)	2.920*** (3.007)
LEV	-0.008 (-0.218)	-0.011 (-0.325)	-0.012 (-0.349)	-0.009 (-0.249)
AGE	0.982*** (6.002)	0.669*** (3.796)	0.872*** (5.393)	0.598*** (3.499)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
F	27.199***	25.818***	35.524***	33.607***
Observations	2,180	2,180	2,180	2,180
R-squared	0.100	0.096	0.127	0.151

Table 9 - Fixed effects panel regression results: board attributes and governance pillar. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. t-statistics in parentheses.

Variables	(1) ESG	(2) ESG	(3) ESG	(4) ESG
BS	-0.387*** (-3.498)			-0.303*** (-2.753)
DIV		0.080*** (3.912)		0.066*** (3.244)
IND			0.101*** (6.340)	0.093*** (5.837)
NBM	0.061 (1.554)	0.055 (1.406)	0.067* (1.710)	0.055 (1.408)
CSRCOM	6.543*** (11.406)	6.528*** (11.390)	6.385*** (11.207)	6.324*** (11.153)
ROA	-0.022 (-1.204)	-0.025 (-1.338)	-0.023 (-1.239)	-0.026 (-1.419)
LNTA	2.546*** (4.589)	2.255*** (4.090)	2.313*** (4.228)	2.423*** (4.420)
LEV	-0.015 (-0.788)	-0.017 (-0.861)	-0.017 (-0.869)	-0.016 (-0.815)
AGE	0.877*** (9.634)	0.745*** (7.633)	0.835*** (9.212)	0.718*** (7.438)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
F	70.644***	71.204***	75.756***	61.704***
Observations	2,180	2,180	2,180	2,180
R-squared	0.225	0.226	0.237	0.246

Table 10 - Fixed effects panel regression results: board attributes and overall ESG performance pillar. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. t-statistics in parentheses.

4.3.2 Gender Diversity

The regression results testing hypotheses 2A-B-C are presented in the second column (2) of Tables 7 to 9. These hypotheses all expected to find a positive relationship between the proportion of female board members (*DIV*) and the respective component of ESG performance. The regression results show that gender diversity is positively associated with all pillars of ESG performance, indicating that higher levels of female board participation lead to higher sustainability ratings. The positive effect of gender diversity is most pronounced for the Governance pillar, showing a significant association at the 1% level ($p < 0.01$) with a coefficient of 0.192. The Environmental pillar is significantly associated with board diversity at the 10% level ($p < 0.1$) with a coefficient of 0.054, while the Social pillar shows no significant relationship. Thus, hypotheses 1A and 1C are supported, but hypothesis 1B is not. These regression outcomes differ slightly from other studies. For example, De Masi et al. (2021) found that the proportion of female board members is positively and significantly associated with the Social and Governance pillars. In contrast, this paper found a significant positive association with the Environmental, but not the Social, pillar. However, both studies agree that gender diversity positively impacts the Governance rating and overall ESG performance.

4.3.3 Board Independence

Column (3) of Tables 7, 8, and 9 presents the results for hypotheses 3A, 3B, and 3C. Hypotheses 3B and 3C predicted a positive relationship between board independence and the Social and Governance pillars, respectively, while hypothesis 3A anticipated any type of relationship with the Environmental pillar. A significant positive association was found for the Environmental and Governance performance of a company. No significant relationship was found for the Social pillar. Hypothesis 3A is supported with a positive association at the 5% level ($p < 0.05$) and a coefficient of 0.052. Hypothesis 3B is not supported as the regression did not find a significant relationship. However, hypothesis 3C is supported, with board independence positively influencing the Governance pillar at the 1% level ($p < 0.01$), with a coefficient of 0.269.

4.3.4 Robustness Check

To examine the effects of the different board attributes on the three individual ESG components, in the previous three sections, the board attributes were estimated using separate models. However, the regression equations could have a different outcome if all board characteristics are included in one model per ESG pillar. To overcome any possible bias in the results, as a robustness check, this research performed an additional regression which examines the combined effects of board size, gender diversity, and board independence on the sustainability performance indicators. The results of these regressions are demonstrated in the column (4) of Tables 7, 8, and 9.

Starting with Table 7 on the Environmental pillar, two points stand out. First, the relationship between board size (*BS*) and environmental performance (*ENV*) changed from negative to positive, though it remains insignificant with a negligible coefficient of 0.003. Second, the previously significant relationship between *BS* and gender diversity (*DIV*) is no longer significant, despite a minimal change in coefficient value. This means that only the significant influence of board independence (*IND*) on the environmental performance remained the same, with a coefficient of 0.049. Regarding the Social component of ESG performance in Table 8, little has changed. No significant relationships were found between the dependent variable *SOC* and the independent variables in models (1), (2), (3), or the combined model (4). Meanwhile, the Governance pillar in Table 9 shows significant relationships with all independent variables, both individually and jointly. Governance performance is negatively influenced by board size (-0.986) and positively by gender diversity (0.152) and board independence (0.248), supporting all related hypotheses.

Moreover, Table 10 examines the total ESG rating, revealing that all board characteristics have significant relationships with ESG performance. This result is interesting as it shows that the different board attributes may indeed influence the overall ESG performance, while they do not influence the separate components of ESG. Board size negatively impacts ESG performance (-0.303), while gender diversity (0.066) and board independence (0.093) have positive associations. These coefficients are smaller compared to those for the Governance pillar, suggesting that board characteristics have a more substantial influence on governance than on overall ESG performance. This is logical, as the total ESG rating is comprised of three components, and Tables 7 and 8 show that the Environmental and Social components have lower associations with board attributes than the Governance pillar.

4.3.5 Control Variables

For this research, several control variables were added to the regression analyses. Examining the regression results relating to these control variables, a significantly positive association between having a CSR committee (*CSRCOM*) and all three components of ESG performance was found. This indicates that a CSR committee, which oversees and controls the company's sustainability strategies, directs more attentions towards ESG-related issues. More attention towards such issues and actively trying to find solutions are benefitting to society and lead to increased ESG ratings (Bigelli et al., 2023; Birindelli et al., 2018). Thus, a CSR committee positively influences each component of ESG. The number of board meetings (*NBM*), however, does not significantly influence any of the ESG components. This variable was expected to positively influence the sustainability performance of a company through increased levels of communication and discussions (Disli et al., 2021). However, *NBM* was found to have a positive but insignificant relation with each ESG performance component in every model.

Furthermore, three control variables were included in the regression models that reflected financial firm-level characteristics: profitability, company size, and leverage. To keep things clear, only the fourth column of each table is considered. The profitability of a company was measured by taking the return on assets (*ROA*) of the company. This proxy for profitability was found to have a significant and negative relation with the Environmental (-0.055) and Governance pillar (-0.067) at the 10% level, whereas it had an insignificant and positive relation with the Social pillar and overall ESG performance. In addition, the natural logarithm of the total assets of a company (*LNTA*) and the ratio of total debt to total assets (*LEV*) were used as a proxy for company size. *LEV* was negatively associated within every model, but this result was insignificant. *LNTA*, on the other hand, was significantly and negatively associated within each model, implying that large companies with more assets tend to receive lower sustainability performance scores. This is counter intuitive since it was expected that larger companies show better sustainability performance because they have more resources at their disposal that make addressing sustainability issues easier (Naciti, 2019).

Lastly, company age (*AGE*) is significantly influencing the ratings for each component of ESG performance. The regressions resulted in a positive association at the 1% level, indicating that older firms tend to have higher sustainability ratings. This result aligns with Arayssi et al. (2020) who suggested that older companies are more concerned with reputational risks, which forces them to adopt sustainable activities.

Hypothesis	ESG component	Expected Relationship	Regression Results	Hypothesis: Rejected or Accepted
<i>Board Size (BS) and ESG components:</i>				
1A	Environmental performance	+	-	Rejected
1B	Social performance	+	-	Rejected
1C	Governance performance	-	-***	Accepted
<i>Gender Diversity (DIV) and ESG components:</i>				
2A	Environmental performance	+	+*	Accepted
2B	Social performance	+	+	Rejected
2C	Governance performance	+	+***	Accepted
<i>Board Independence (IND) and ESG components:</i>				
3A	Environmental performance	+ or -	+**	Accepted ²
3B	Social performance	+	+	Rejected
3C	Governance performance	+	+***	Accepted

Table 11 - Overview of hypothesis testing results. The regression results highlighted in green are significant. More specifically, ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

² Hypothesis 3A expects that board independence influences environmental performance, even though the sign of this relationship was unclear. The regression analyses suggests a positive relationship, meaning that board independence is related to environmental performance. Therefore, hypothesis 3A is accepted.

4.4 Discussions

Table 11 gives an overview of the hypothesis testing results described in the previous paragraph. It provides an overview of the hypothesized relationships, the relationships found in the regression analysis, and indicates whether each hypothesis is accepted or rejected. This table is essentially a concise summary of section 4.3. Based on the results of the panel regression models and previous academic research, the following section discusses the reasoning behind the link between board characteristics and the Environmental, Social, and Governance performance. The board characteristics included in the analysis are board size, gender diversity, and board independence.

4.4.1 Board Size

The first board characteristics tested is board size, which has a significant and negative relationship with the governance component of ESG performance. The negative impact of board size on the Governance pillar has also been found by previous studies of del Carmen Briano-Turrent and Rodríguez-Ariza (2016) and Disli et al. (2021). This result can be explained because a larger board size often leads to coordination problems, reduced efficiency, and difficulty in reaching agreement to adopt corporate practices, which can hinder effective governance. Moreover, following the agency theory, larger boards may suffer from increased agency costs due to a greater diversity of opinions, making it harder to monitor and control management. Besides, McKnight and Weir (2009) have argued that larger boards are ineffective due to coordination issues and free rider problems, where some directors might contribute less, relying on others to fulfill board responsibilities.

So, while larger boards may bring diverse perspectives and expertise, the challenges in coordination, monitoring, and decision-making efficiency can negatively impact the governance component of a company's ESG performance (del Carmen Briano-Turrent and Rodríguez-Ariza, 2016). This results verifies hypothesis 1C. Furthermore, the regression analyses showed that board size has no significant relationships with the Environmental and Social component of ESG performance, indicating that this board attribute does not influence the environmental or social rating whereas it does influence the governance and overall ESG rating.

4.4.2 Gender Diversity

The second board characteristic tested is gender diversity, which is measured by the percentage of female directors participating on the board of directors. The results of the regression analysis show that there is a significant positive relation between gender diversity and both the Environmental and Governance component of ESG performance. These results can be explained using the stakeholder theory, which states that the board of directors is responsible for coordinating the interest of multiple stakeholder groups.

In general, female directors are more focused on the interests of stakeholders which means that gender diverse boards are more likely to be sensitive to the needs and concerns of different stakeholders (Gupta et al., 2015). Moreover, Harjoto and Wang (2020) argue that women's communication skills also help companies improve external relationships with stakeholders. As suggested by Liao et al. (2015) and Dyck et al. (2023), female directors, like the stakeholders, are more concerned about environmental topics, which leads them to directing more company resources to environmental projects. Furthermore, women usually have different knowledge, expertise, and professional backgrounds (Disli et al., 2021) which allows for more diversity of opinions (Wahid, 2019). This diversity of backgrounds could positively influence the quality of governance practices.

In sum, it is assumed that higher levels of female board participation positively impacts the Environmental as well as Governance performance of a company. The result of the panel regression models support hypotheses 2A and 2C. Previous literature on the relationship between gender diversity and the different components ESG performance have found similar results (Adams and Ferreira, 2009; De Masi et al., 2021; Li et al., 2016).

4.4.3 Board Independence

The last board attribute analyzed is the proportion of independent directors. The results of the panel regression models indicate that board independence is significantly and positively related to both the Environmental and Governance pillar. As suggested by Haque and Ntim (2017), independent directors, especially those with diverse backgrounds or knowledge, can enhance a board's expertise, allowing them to mitigate conflicts between different stakeholder groups and convince managers to engage in more environmental practices. This argument is in line with the stakeholder theory as independent directors are more likely to advocate for long-term environmental strategies because they can focus on broader stakeholder interests rather than just short-term financial gains (Gavana et al., 2023). In addition, Ruiz-Castello et al. (2024) note that independent directors may feel pressured by the stakeholders to engage in more environmental activities. They recognize that poor environmental performance can lead to negative publicity which can damage their personal and professional reputations. Thus, motivated by reputation risks, independent directors are more likely to support environmentally sustainable practices to avoid the reputational fallout from environmental missteps (Li et al., 2018).

Furthermore, board independence is also important for good corporate governance because it provides unbiased oversight and ensures that management acts in the best interests of shareholders and other stakeholder groups, reducing any potential conflicts of interest (Adams et al., 2015). Disli et al. (2021) have argued that independent board

members are more likely to comply with ethical codes and regulations due to their higher objectivity and concern about the impact governance activities have on their own reputations. Moreover, since independent directors are more concerned about compliance with regulations and how this may affect their own reputation, it can be said that independent directors are more sensitive to ethical demands made by different stakeholder groups (García-Sánchez et al., 2015). In this way, they avoid engaging in activities that may damage the corporate governance structures of the company.

These results regarding the relationship between board independence and the Environmental and Governance component of ESG performance are in line with the results of previous studies (Al Amosh and Khatib, 2021; Disli et al., 2021; Liao et al., 2015). Furthermore, these panel regression outcomes support hypotheses 3A and 3C. Hypothesis 3A indicated that board independence could both positively and negatively impact the environmental performance of a company and the regression analysis showed a positive relationship.

5. Conclusions

The main objective of this study is to examine the relationship between three board characteristics, namely board size, gender diversity, and board independence, and the Environment, Social, and Governance pillars individually. More and more investors are showing a commitment to using ESG criteria in their decision-making process to assess the long-term sustainability and ethical impact of investment opportunities. This results in companies providing more sustainability reports. Understanding the factors, e.g. board characteristics, that influence ESG performance has become an important area of research. However, more research is needed to explain how these board characteristics may impact the components of ESG performance individually as each pillar is influenced by different internal and external factors.

Examining a sample of 581 companies from the STOXX Europe 600 across 20 countries from 2018 to 2022 and using data from the LSEG Workspace to research the proposed impacts and relationships, multiple fixed effects panel regression models were tested. In answering the central research question of this thesis, the regression analyses found that the composition of the board of directors is an important determinant of the sustainability performance of a company. Overall, the findings of this study suggest that smaller, gender diverse, and independent boards tend to achieve higher sustainability performance scores. The main statistical results are as follows: First, board size shows a significant negative relationship with the Governance performance of a company. Second, more gender diverse boards achieve a better Environmental and Governance rating. Finally, board independence has a significant and positive influence on the Environmental and Governance performance as well.

More specifically, a larger board of directors negatively affects governance performance due to coordination issues, reduced efficiency, and difficulty in decision-making (del Carmen Briano-Turrent and Rodríguez-Ariza, 2016; Disli et al., 2021). Larger boards can also suffer from increased agency costs and free rider problems (McKnight & Weir, 2009). Furthermore, gender diverse boards have a positive impact on environmental and governance performance, with female directors focusing more on stakeholder interests, improving governance quality (Gupta et al., 2015; Harjoto & Wang, 2020), and directing more resources to environmental projects (Liao et al., 2015; Dyck et al., 2023). Lastly, independent directors also positively influence environmental and governance performance by providing expertise, mitigating conflicts, and focusing on long-term strategies (Haque & Ntim, 2017; Gavana et al., 2023). They are motivated by reputation risks to engage in sustainable practices (Li et al., 2018), ensuring unbiased oversight and compliance with ethical codes (Adams et al., 2015; García-Sánchez et al., 2015). These findings highlight the importance of these three specific board characteristics in improving the rating of the different ESG components.

This study contributes to and expands the existing corporate governance literature in several ways. First, it provides new evidence on how different board characteristics influence the sustainability performance of a company. Second, this thesis expands on the existing literature by specifically examining how board characteristics may influence the individual components of ESG performance, i.e. Environmental, Social, and Governance. Previous literature have not examined the relationship between board attributes and all three pillars separately in a single research. The findings of this research may offer valuable insights for company executives, regulators, and investors. This research highlights the importance of optimizing the composition of the board of directors to enhance the Environmental, Social, and Governance performance of the company.

Company executives could use this research to understand how to adjust their board size to avoid coordination problems and inefficiencies, ensuring a more streamlined decision-making process. The positive impact of gender diversity on the Environmental and Governance performance suggests that companies should promote gender diversity in their boards, bringing more attention towards such topics and allowing more diverse perspectives. Furthermore, the benefits of independent directors can improve governance practices and potentially allows for more participation in environmental practices, due to stakeholder expectations/demands. Moreover, regulators can use these findings to shape policies and guidelines that promote good corporate governance practices. By understanding which board characteristics impact the different ESG pillars, regulators can create policies that encourage companies to adopt optimal board structures. Investors can benefit from these insights as well by incorporating board characteristics into their investment decision-making processes. Knowing that certain board compositions are linked to better Environmental, Social, and/or Governance performance allows investors to identify companies with strong sustainability strategies. This can help them to select companies to invest in that are more likely to be more sustainable in the long-term. Investors can also use this information to engage with companies, advocating for changes in the composition of the board to improve the sustainability performance and protect their investment.

While these findings are important, they must be placed in context. There may be other factors that could influence these relationships, such as the cultural context or the legal system of the region in which the company is based. It could be that certain regions do not value sustainability, making the relationship between board characteristics and ESG performance less visible. Furthermore, the legal systems of a country or region may affect the level of ESG disclosures, since some regions may oblige disclosing ESG reports, while others may not. In addition, the choice to use a particular rating agency can have a major impact on the relationships found in the regression analyses. For this research, the ESG data of the LSEG Workspace was used. This particular rating agency could measure the

Environmental, Social, and Governance performance of companies very differently than any other rating agency, such as MSCI. Since such differences in ESG rating could arise, companies may receive completely different ESG ratings from two different rating agencies. So, using a different rating agency may change the relationship between board characteristics and ESG performance. Future research could account for these differences to gain a more complete picture of the relationships between board characteristics and the individual components of ESG performance.

This study also possesses some limitations that should be considered in future research. First, this study examined the relationship between three board characteristics (including board size, gender diversity, and board independence) and the individual components of ESG performance. There are still other board characteristics that are not included, such as board expertise, board tenure, and board remuneration. Future research could investigate how other board characteristics are associated with the Environmental, Social, and Governance pillar individually. Second, this study is based on a sample of 581 companies listed on the STOXX Europe 600. This limited sample of companies could potentially limit the generalizability of the results. Expanding the sample size to include a wider range of companies can enhance the generalizability. Third, this study explores the impact of board characteristics on the sustainability performance of companies on the STOXX Europe 600 as a whole, regardless of the differences between the countries in which these companies are based. More research could be done to examine and compare the dissimilarities between the different countries, as country specific factors may also highly influence the Environmental, Social, and Governance ratings. At last, ESG performance is often measured very differently by various rating agencies, as mentioned in the practical implications. The methods used for measuring the ESG components could be subjective and inconsistent. Future studies could use ESG data from different rating agencies to assess the robustness of the findings.

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