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The effect of Corporate Social Responsibility on Corporate Financial Performance during Covid-19 pandemic. Evidence from the European market

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Abstract

This study explores the relationship between Corporate Social Responsibility and Corporate Financial Performance in the European market during Covid-19 pandemic. Previous literature has revealed conflicting results regarding the relationship as well as its resilience during times of crisis. The unexpected and long shutdown in many economic activities, as an attempt to control the spread of the virus, posed significant challenges in the financial market around the world. This created an environment to confirm whether sufficient CSR performance before the crisis would lead to better financial performance in turbulent times. By analyzing cross-sectional data, on 507 small, medium, and large firms in the European market, my analysis indicates that there is a positive and significant relationship between 2019 CSR performance, measured by the ESG score, and financial performance, measured by the Return on Assets, on the two subsequent years, when the pandemic peaked. In addition, I decompose the effect of the different E-S-G pillars on financial performance, and I have found that better Environmental performance is associated with a better financial outlook in the first subsequent year, while in the second year the effect is mainly due to the performance in the Social factor. My analysis result has various regulatory as well as managerial implications.

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Introduction

At the beginning of 2020, while European countries were still recovering from the impact of the Global Financial Crisis of 2008, the rapid spread of an unknown virus triggered the World Health Organization to announce the outbreak of Covid-19 pandemic (World Health Organization , 2020). Countries around the world, aiming to control the spread of the virus and protect, not only the citizens, but also the healthcare system, posed significant restrictions such as lockdowns, curfews, or the pause of economic activities. Thus, the pandemic intimidated not only the health of citizens in every country but also across the financial market, since companies around the world were affected (Rizvi et al., 2020). In Europe, the impact of the pandemic on the market can be described by the movement of the Euronext 100 index, an index of 100 stocks with the best performance in Europe, which lost 35% of its value in a period of just one month, between February 20th to March 19th (KPMG, 2020). Given that Covid-19 pandemic is a health and not an economic crisis, Roubini (2020) predicted its impact on the economy to be more intense compared to the financial crisis of 2008. In that sense, businesses have to adapt their strategies as well as their structure in order to respond to this unprecedented situation.

In recent years, there has been a growing discussion regarding the relationship between Corporate Social Responsibility (CSR) and the financial performance of firms, whilst companies increase their efforts to minimize the impact of their operations on the environment and the society in which they operate (Hwan et al., 2021). Although this trend contradicts the capitalistic theory, according to which, the only responsibility of a corporation is to maximize shareholders' value, more and more corporations are now taking incentives to include CSR-related actions into their strategic planning (Drempetic et al., 2019). The major force for that, apart from regulations forcing companies to either minimize their environmental footprint or to publish data regarding their impact on the environment, is a relatively new theory that anticipates firms that take into consideration not only profit maximization but also the interest of everyone who is affected by their business, to create more value for both shareholders and the society. This theory, named "the Stakeholders' theory", explains why companies that adopt CSR-related strategies, not only bury the associated costs but also create more value than their peers that do not consider CSR friendly strategies.

Previous quantitative studies, however, have shown contradictory results. Although researchers have been exploring this relationship for more than 30 years now, there is still no consensus

regarding the true sign of the relationship. Given the large number of previous studies available, it is more intuitive to focus on meta-analyses that have explored the interaction between CSR and financial performance, analyzing the results of studies performed over the years. The most recent, to my knowledge, meta-analysis was made by Whelan and Atz (2021) in which the authors reviewed over 1000 existing studies and found out that more than half of them have shown evidence of a positive relationship between CSR and financial performance. The result supports the view that companies investing in their CSR performance are able to create value for their shareholders, mainly through increased profits, lower risk, and optimized cost of capital (Giese et al., 2019). However, the question about the resilience of this positive relationship during times of high crisis is still under exploration.

Additionally, Hwang et al. (2021) argued that in order to explore the real CSR effects on the financial performance of firms, it is beneficial to do so when there is an exogenous shock that impacts the market. This way is possible to compare the financial performance of firms and attribute any difference to their CSR level of performance if everything else that might affect the financial performance is taken into consideration. Driven by that, Hwang et al. (2021) explored the relationship between CSR, measured by the ESG scores, and the financial performance of firms in Korea during Covid-19 pandemic. The authors found that firms with higher ESG scores outperformed their peers which scored lower ESG performance, indicating that even in times of crisis, the relationship between CSR and financial performance is apparent and positive.

In my research, I will try to explore if the same positive relationship existed in the European market during the turbulent times of the pandemic. In other words, I will extend the analysis of Hwang et al. (2021) to the European market, enriching the generalizability of their results. To do that, I will explore if there is a positive relationship between the ESG scores of firms before the pandemic with their financial performance in the two subsequent years when the pandemic peaked. In addition, I decompose the effect of ESG scores on the E-S-G pillar scores and explore whether there is a significant effect of any of the ESG subfactors on the financial performance, in 2020 and 2021. To explore my research question, the ESG scores as well as the financial performance of 507 European small, medium, and large capitalization firms were analyzed.

The result of my analysis indicates evidence of a positive relationship between CSR and the financial performance of European firms during the pandemic. This effect is present in the first and second years of the pandemic, highlighting the resilience of the relationship. In addition to

that, I have found that environmental performance is associated with better financial performance in the first year of the pandemic, while in the second year the positive effect is mostly due to performance on the social subfactor. Overall, the result of my analysis is in line with both my expectations and the previous literature, supporting the Stakeholders' theory.

The contribution of my study to the existing literature is clear. First, there is no other study, to my knowledge, that assesses the effect of ESG scores on financial performance during the pandemic in the European market. In addition to that, the choice of a representative sample of small, medium, and large in capitalization companies, allows me to be confident regarding the reliability of the results since there are no unique characteristics in the sample of companies that I have analyzed. Last, my results contribute to the existing debate regarding the impact of the relationship between CSR and financial performance, by providing evidence of a positive effect. It is important to highlight the positive relationship during times of crisis as the pandemic posed significant economic hardships on firms around the globe with many firms struggling to financially survive. These hardships might be a reason to revert the attention from investing in CSR activities to the actual survival of the firm. However, as my analysis presented, investment in improving the ESG performance of a corporation can be interpreted as a means to mitigate the negative impact of an external shock, such as Covid-19 pandemic. In the words of Godfrey et al. (2009), a strong CSR profile can be "an insurance-like protection against negative events" (p.441).

The rest of this paper has the following structure. In section 2, I do provide some important definitions of terms and discuss the theory behind the relationship between CSR and financial performance as well as some previous analysis results. Section 3 describes the data used to explore this relationship, while section 4 focuses on the methodology applied to the research. In section 5, the output of the analysis is presented, followed by Section 6, where I discuss the results, which is the conclusion of my research.

Literature Review

This chapter explores the relationship between CSR and Corporate Financial Performance on a firm level. CSR is considered the driving force of ESG performance, thus companies that adopt CSR-related strategies will most likely have higher ESG scores. In the literature, there are some theories explaining the positive and negative relationship between CSR and Financial Performance. Before these theoretical frameworks are discussed, it is important to provide definitions for the core concepts, such as what CSR is, what ESG scores are, and how they are measured.

According to Wilson (2003), Corporate Sustainability is a corporate management paradigm that requires the organization to pursue social goals while aiming for profitability and economic growth. One dimension of Corporate Sustainability is Corporate Social Responsibility (CSR). In the literature, there is a lack of consensus regarding the definition of CSR. To illustrate this, Whelan and Atz (2021), in their meta-analysis on the relationship between CSR and financial performance, identified more than 33 different definitions of CSR in previous studies. Driven by this plurality in the way CSR is defined, van Marrewijk (2003) concluded that every organization should interpret the concepts of CSR, given its special characteristics, aims, and strategies. In general, though, CSR assumes that there is an ethical obligation of the management to take responsibility for the impact of the organization's value-chain activity on the environment, society, and animal welfare while striving for economic growth, and it mainly focuses on the extent to which management should take into account these considerations (Wilson, 2003;Netherlands Enterprice Agency, 2022).

In recent years, there has been an increase in the interest of investors in socially responsible investments and this has created a need to measure the performance of firms, in terms of social responsibility. Stakeholders, as they are unable to assess the level of responsibility of organizations, either because lacking such specialized skills, or because of information asymmetry, depend their decision-making on sustainability ratings, which are provided by specialized rating agencies, established in the market as intermediaries (Drempetic et al., 2019). One of these ratings is the so-called ESG score, where each letter represents one of the factors of sustainable finance, namely Environmental, Social, and Governance. These scores, in contrast with other CSR measures such as Key Performance Indicators, indicate the performance of each firm, relative to its peers in the industry or the country operating (Thomson Reuters, 2018). While calculating ESG scores, Thomson Reuters for example, which is a well-

established rating agency, collects information about different indicators based on self-reported data and then, weighting these indicators, based on the materiality of the sector that the firm operates (Thomson Reuters, 2018). The importance of that could be best illustrated with an example. One of the measures of the Environmental pillar is Greenhouse Gas Emissions, which measures the amount of CO_2 emission the firm produces in a given year. For a manufacturing firm, this indicator is significant while for an accounting firm, this indicator is less important and will account for lower weight in calculating the ESG score. Thus, by indicating the relative performance, ESG scores are comparable and comprehensive measures of CSR performance. A more detailed description of how these scores are calculated is provided in the Data Section. ESG scores, alongside various financial indicators, are the base for investment decision-making (Drempetic et al., 2019).

Various stakeholders, however, might suffer from information asymmetry regarding financial data. To address this issue and ensure the accuracy and availability of financial data, the IFRS (International Financial Reporting System) has been adopted. This system is a set of rules on how firms prepare their financial statements, what should be reported, and how this should be performed (IFRS, 2022). However, there are no comparable standards for sustainability and social responsibility reporting, and the disclosure of such information is voluntary, making the assessment of the sustainability performance of a corporation even more challenging for stakeholders and sustainability rating agencies (Schäfer, 2005).

Despite being voluntary, ESG reporting has been increasingly adopted by firms, mainly due to the surge in the demand for more transparent data regarding environmental and social issues (Siew, 2015). In addition, the disclosure of information regarding the sustainability performance of firms has been empowered by agreements such as the United Nations Global Compact (UNGC) and the United Nations Principles for Responsible Investing (UNPRI). The first one consists of a set of principles regarding human rights, labor, environment, and anti-corruption, that corporations voluntarily follow. This agreement increases the reporting on ESG data, by forcing firms to prepare annual reports regarding their strategies and operations and thus provides stakeholders with more information needed (United Nations, 2018). According to United Nations (2018), in 2018 there were 9,500 companies across 160 countries that agreed to follow UNGC and provide the required reporting. Working together with UNGC, the UNPRI is an international network of investors that encourages its signatories to incorporate ESG factors in the decision-making process (United Nations, 2018).

From what is described above, it is apparent that there is a growing interest to encourage corporations to adopt CSR-related strategies, aiming to mitigate the impact of their business on society and the environment. However, these strategies are associated not only with costs that the firm has to accommodate but also with resources in general that need to be invested. For a firm to follow this direction thus, there should be a benefit that would exceed the cost. Whether or not this benefit exists is a debate that has been going on for years now. Theories have been developed to support both answers to this question, and here it is important to present the argumentation behind each of these theories.

2.1 Theories

The first step in order to assess the relationship between ESG scores and Financial Performance is to understand the driving force for this relationship. In this chapter, I will present the theoretical framework behind the potential sign of the relationship between CSR and Financial Performance. First, the theories that explain a negative relationship will be presented, followed by the theories that can explain a positive relationship. Last, the mechanisms behind the positive relationship will be discussed.

2.1.1 Theories for negative relationship

Shareholders Theory

The key behind the theoretical framework that explains the negative relationship between CSR and the financial performance of a firm is the associated cost. The fact that a firm has to invest money in order to be socially responsible contradicts the shareholders' theory as first described by Nobel Prize Winning economist Milton Friedman in 1962.

According to Friedman, the term social responsibility is contradictory to the idea of a free market, in which the only responsibility of a corporation is to use its resources and engage in activities that will increase profits. Friedman limits these activities to the activities that are "within the rules of the game (...) without deception or fraud" (Friedman, 1962 p.112). In other words, the main focus of the company should be to increase the wealth of its shareholders by engaging in activities that are within the limits of the law. If companies engage in socially responsible activities, he argues, the free market is not able to work efficiently, leading to failures such as product shortages, labor shortages, and black markets. Furthermore, Friedman (1962), to emphasize this theory, is wondering, if there is indeed a social responsibility of the firm other than maximizing profits, how would the leaders of the company know what this

responsibility encloses? Can a businessman decide on this own what the social interest is, in order to take the appropriate decision for the firm to serve it? Following that, he argues that the inclusion of something other than the shareholders' interest will lead to misused time and funds and by extension to value destruction.

The shareholder theory considers managers as agents of the shareholders that are responsible to do business while fulfilling the shareholder's interest, which is primarily to make as much money as possible (Friedman, 1962). As shareholders are the owners of the corporation and generated profits are their wealth, is unethical for managers to spend funds on activities other than making money since this money does not belong to them. Investing in socially responsible aspects has been found to create additional costs for the company (Palmer et al., 1995) while additional costs are associated with a reduction in profits (Baumol, 1991). Thus, spending funds to improve CSR contradicts the concept of value creation through maximizing profits as described by the shareholders' theory.

Shareholder theory, however, does not completely rule out the social responsibility of firms. Instead, it is laid upon shareholders to decide whether and how to contribute to society but not the firm to commit to these activities on their behalf (Friedman, 1962). If managers decide to engage in activities that contribute to fulfilling societal interests, they should make sure that such activities are the best investment opportunity available and that wealth will be generated for the shareholders (Smith, 2003).

2.1.2 Theories for positive relationship

Stakeholders Theory

The key to the theoretical framework that explains a potential positive relationship between CSR and Financial Performance is whose interest the corporation should serve. As described above, the shareholders' theory argues that the firm should only focus on serving the interest of its shareholders, meaning its owners, which is not other than making profits. Opposers of this theory, however, propose that the firm should also serve the interest of its employees, suppliers, debtholders as well as the local community in which the firm operates. In other words, the company is responsible for fulfilling the interest of everyone that holds a stake in the company (Crainer, 1995).

Given the abovementioned, it is not surprising that the theory has been named “The Stakeholders Theory” and came as a response to the Shareholders Theory. The first to present

the stakeholders' theory was Edward Freeman in 1984 according to whom, this theory assumes that values are necessary for doing business and denies the separation thesis, meaning that it denies the state that ethics and economics can be separated (Freeman, 1984). Given that, Freeman argues that the purpose of the firm is not only to make profits but also to create value for everyone who is affected by its activities, the so-called stakeholders. As the main stakeholders are considered not only the owners of the firm but also the employees, the debtholders, the suppliers, the customers, and the local community. The level of stake is not defined by Freeman's work; thus, one could argue that the number of stakeholders could be infinite. This weakens the theory, as focusing on serving the interest of an infinite number of stakeholders can disorient the management of the firm.

Arguments regarding how the stakeholder theory can explain the positive relationship between CSR and Financial Performance are plentiful in the literature. For example, Downing (1997) concluded that if the interest of various stakeholders is mismanaged, this can result in value destruction through consumer boycotts, bad market reputation as well as lobbying of government officials towards protective legislation against the interest of the firm. Whysall (2000), while exploring the consequences of stakeholder mismanagement, found out that the results can be widespread and resilient in time, creating losses to the corporation and reducing financial performance. In other words, these two findings indicate that low CSR, which can be translated as stakeholders' interest mismanagement, leads to worse financial performance. Hence, improving the management of stakeholders' interests will also improve financial performance (Whysall, 2000).

The stakeholder theory distinguishes two types of stakeholders, the internal and the external ones. Regarding the interest of the internal stakeholders, previous literature supports that by taking into consideration the interest of internal stakeholders the company can create value. Huselid (1995), for example, concluded that by investing in the employees and good human resource management practices, the firm improves financial performance mainly through the decrease in employee turnover and the increase in the productivity of the working force. Regarding the interest of external stakeholders, the local community, for example, previous literature provides similar results. Shrivastava (1995) found out that investing in activities to reduce a corporation's environmental footprint beyond the present regulations not only decreases production costs by reducing resource consumption and by increasing efficiency but also eliminates future costs that the corporation may face due to the changing regulatory environment. In addition, investing in environmental activities can generate a competitive

advantage for retail companies, as long as the product is presented as eco-friendly (Shrivastava, 1995). These findings support the stakeholder theory and can provide a sufficient explanation for why CSR can be associated with higher financial performance.

After presenting the "Stakeholder Theory" that demonstrates the positive relationship between CSR and financial performance, it is necessary to discuss the mechanisms behind this relationship.

2.1.3 Transmission Channels

In this section, the only to my knowledge studies, that have tested the transmission channels between improved CSR and the company's valuation as well as financial performance will be discussed. These transmission channels are important to mention, since in this way one may understand how CSR performance adds value for stakeholders.

Flammer (2015) argued that there are three potential transmission channels explaining how CSR leads to improved financial performance namely, sales growth, employee satisfaction, and investment growth channel. First, she argues that companies with higher levels of CSR may be more favorable to customers that are responsive to sustainable practices, and thus adapting CSR strategies will increase companies' sales. Her analysis support this theory, since following the adoption of CSR-related proposal, she observed an increase in the sales of companies. Second, another channel that the author explores is through employee satisfaction. More precisely, she argues that CSR strategies increase employee satisfaction and that companies that care about the relationships with and between employees attract a more talented working force, while higher employee satisfaction leads to higher returns. The analysis of the effect of the adoption of CSR proposals on employee productivity provides support to her argumentation and the employee satisfaction transmission channel. Last, Flammer argues CSR strategies may lead to more efficient technologies and processes which not only reduce the environmental footprint of the company but also produce financial benefits. If this is the case, the adoption of CSR proposals will lead to higher profits and thus to increased capital investment. The analysis, however, did not show evidence of higher capital investment after the adoption of such strategies, weakening the support to the last transmission channel.

Giese et. al (2019) in an attempt to link ESG information with the valuation and the performance of companies used a standard discounted cash flow model to examine three transmission channels - namely the cash-flow, the idiosyncratic risk, and the valuation channel-

which can explain how ESG characteristics empower the valuation and the performance of firms.

The first transmission channel (Figure 1) that Giese et al. (2019) discuss is the Cash-Flow Channel. Driven by previous literature, they argued that companies with a strong ESG profile are more competitive than their peers, due to more efficient utilization of sources and better innovation management. This competitive advantage generates higher profits and thus higher dividends making these companies more favorable for investors that focus on sustainable investing. Even though their analysis cannot measure the competitive advantage, they have found that companies with higher ESG scores pay relatively higher dividends than companies with the lowest ones.

Figure 1: Cash-Flow Transmission Channel

The second transmission channel (Figure 2) that the authors discuss is the Idiosyncratic Risk Channel. They argue that companies with high ESG scores are characterized by better risk control and higher compliance with standards and thus they seldom experience incidents such as fraud and corruption. This minimizes the downside risk the stock of the company is exposed to. By comparing the tail risk of companies with high and low ESG scores, the authors find that companies with high ESG performance experience a lower frequency of idiosyncratic risk incidents, supporting the argumentation that higher ESG is translated to better operational risk management and by extension lower tail risk.

Figure 2: Idiosyncratic Risk Transmission Channel

The third transmission channel (Figure 3) that explains how high ESG scores result in better performance is the Valuation Channel. The authors argue that companies with high ESG scores are exposed to lower systemic risk and thus have lower costs of capital. According to the CAPM model, the beta of a stock represents not only the systemic risk that the company is exposed to but also the equity risk premium translated into the return rate that investors require from the company (Ruefli et al., 1999). Given that, lower systemic risk leads to a lower beta

which means that investors require a lower rate of return. This leads to the last step of the transmission channel, which is the higher valuation since, according to the Discounted Cash-Flow model, a lower cost of capital results in a higher valuation of the company (Giese, Lee, Melas, Nagy, & Nishikawa, 2019) The analysis of Giese et. al (2019) revealed that companies with high ESG score have a lower average systemic volatility, as well as lower beta. This resulted in higher valuation, as companies with higher ESG scores had relatively larger book-to-price and earnings-to-price ratios, providing support to the Valuation Channel.

Figure 3: Valuation Transmission Channel

Against this background, it is apparent that there is not one single mechanism that explains the positive relationship between CSR and Financial Performance. Giese et al. (2019) concluded that the transmission mechanism between CSR and the Financial Performance of companies is not one-dimensional but a multichannel process. Unfortunately, as also observed by Whelan and Atz (2021), the literature that explored the mechanisms behind the relationship between CSR and financial performance is narrow. Against this background, there is limited evidence that supports these transmission channels and thus the generalizability of these results.

2.2 Previous Empirical Analyses

2.2.1 Recent Meta-Analyses

Given that there have been more than 30 years of research on the topic of CSR and financial performance, the literature is rich. Thus, it is reasonable to focus the analysis primarily on more recent meta-analyses where most of the previous studies have been reviewed.

A recent meta-analysis by Whelan and Atz (2021) reviewed over 1000 studies that have been published between 2015 and 2020 and explored the relationship between ESG scores and financial performance. They divided their analysis into “corporate” studies – meaning studies that explored the relationship between corporations – and “investment” studies, studies that explored the performance of portfolios. In the “corporate” side of the analysis, they found that 58% of studies show a positive relationship between ESG scores and financial performance, mainly measured by Return-on-equity (ROE), Return-on-assets (ROA), or stock price while

only 8% of the studies found a negative relationship. In addition, they reviewed 13 "corporate" meta-analyses and found consistent positive results. This not only strengthens their results but also indicates that the positive relationship between ESG scores and financial performance is "robust across time and space" (Whelan & Atz, 2021 p.2).

Interestingly, what is particularly relevant for this study is another meta-analysis conducted by Huang et. al (2020) where they explored the effect of economic fluctuations on the relationship between CSR and financial performance. First, the results show that 39.8% of 437 studies reviewed found positive relationships, however, 49.7% found insignificant results. They argued that often studies that explore this relationship fail to model or do not even include in their econometric model the moderating effect of macro-level economic fluctuations, and that, had this variable been included or modelized correctly, the true positive relationship between CSR and financial performance would have been shown. To prove this, they measure economic fluctuations by the changes in the growth rate of real GDP per capita and incorporated it in their model to observe how much variation in the results of previous studies this variable can explain. Among other factors, such as different measures of CSR and financial performance, publication time, and publication selection bias, the omission of economic fluctuations could explain twice as much variation as all the other factors combined.

Another recent meta-analysis was conducted by Wang et. al (2016). In their analysis, they reviewed 42 studies and 119 effect sizes and found evidence that supports the positive relationship between CSR and financial performance. In addition, they explored the role of the environment that the company operates in the relationship and concluded that the positive relationship between CSR and financial performance is stronger for companies that operate in developed economies, where the market mechanisms work efficiently, rather than in developing countries. Last, they aimed to explore the direction of the causality in the relationship between CSR and financial performance, meaning whether better CSR leads to better financial performance or vice versa. However, they did not find support that prior improved financial performance results in higher CSR performance, providing support to their hypothesis that the causality goes from CSR to financial performance.

In line with these results, are also the results of Velte (2017). In his research, he focused on the impact that ESG performance has on the one-year lagged Financial Performance. The use of lags allows the econometrical model to measure the impact of ESG on Financial Performance since ESG performance will not immediately lead to improved financial performance (Choi & Wang, 2009), and not the other way around. The author measured Financial Performance both

by accounting (ROA) and market-based (Tobin's Q) measures. After analyzing data from 412 firm-year observations between 2010 and 2014, he concluded that all three ESG factors have a positive and significant effect on accounting-based performance while no significant impact on market-based performance.

Given the nature of CSR, it is very likely that many different factors might affect both CSR and Financial Performance, factors that are challenging either to be identified or measure. Driven by that, Flammer (2015) argued that only a random experiment would address this issue, however, such an experiment is both costly and difficult to be implemented in real life. What she did, instead of such an experiment, is to compare the effect that shareholder-sponsored proposals that marginally pass or fail in annual meetings have on accounting-based financial performance, arguing that the passage of such proposals is the same as randomly assigning CSR to companies and hence is not correlated with firm-specific characteristics. The main finding of this research is that the passage of CSR-related proposals improves accounting-based financial performance implying that CSR significantly increases shareholders' value. This study might not use ESG metrics to assess the impact of CSR on financial performance but is interesting and relevant to this thesis as it uses a unique way to measure CSR, however, gives the same results as other studies that use classic CSR measures. This shows that the positive relationship between CSR and financial performance is robust in the way CSR is measured.

Regardless of the lack of consensus in the literature, previous meta-analyses provide evidence that the true relationship between CSR and financial performance is apparent as well as positive. However, Hwang et. al (2021) argued that, in order to explore this relationship and attribute any difference in financial performance to differences in CSR activity, an exogenous shock is required to be present. In that sense, the next section discusses analyses that explored the presence and the sign of the relationship during turbulent times such as the financial crisis of 2008 and the Covid-19 pandemic. In addition, it is important to test the resilience of the relationship in times of crisis, since then the costs associated with the CSR incentives are even heavier to carry.

2.2.2 CSR and financial performance during crises

As mentioned above, the literature that examines the relationship between CSR and financial performance is numerous. However, there is a lack of studies that examine whether this relationship is resilient during times of crisis. A potential reason for this lack could be that the increased attention on CSR is something that has been growing in recent years. Thus, there are few crisis incidents to be examined. In this part, relevant to this thesis papers that have tested the relationship between CSR and the financial performance of firms during different crises will be discussed.

Lins et al. (2017) focused their research on exploring whether companies with better CSR performed better, during the financial crisis in 2008. More precisely, they examined if firms, by investing in social capital, had higher financial performance, during a time that the importance of trust in corporations surged. By comparing firms with high and low CSR ratings, they found that the higher the rating, the better the financial performance, measured by the stock returns. This positive relationship, however, existed only during the financial crisis and not during the recovery period which suggests, according to the authors, that CSR activities are important only during times when the trust in corporations is limited. In addition, they argue that the mechanisms through which higher CSR leads to better financial performance are profitability, sales growth, and employee productivity. These findings are in line with the argumentation of Flammer (2015), that better CSR management improves financial performance through empowering sales growth as well as labor performance. Against this background, these transmission channels seem to be resilient during times of crisis.

Gallego-Álvarez et. al (2013) explored whether environmental performance is associated with the financial performance of firms during the financial crisis. The authors used as a measure of the environmental performance of the greenhouse gas emissions of 855 international companies from 2006 to 2009, while as a measure of financial performance they used only accounting-based indicators (ROA). Their analysis showed that there was no relationship between environmental and financial performance before the crisis, however, during the crisis, companies with higher environmental performance performed better in financial terms. According to the authors, this highlights that companies "must continue to invest in their environmental sustainability even in times of crisis" (Gallego-Álvarez et. al, 2013 p.371).

The most relevant to this thesis research is the research of Hwang et. al (2021). In their paper, the authors examined the effect of ESG activities on the financial performance of firms in the

Korean market during the Covid-19 pandemic. They argued that, although ESG activities might generate costs and harm the financial performance of a company in the short-term, in the long-term, companies with higher ESG scores should be less affected by the impact of the Covid-19 pandemic. By using the ESG rating provided by the Korea Corporate Governance Service (KCGS) as well as ROA as a proxy of the financial performance, they explored whether high ESG-scored firms had relatively lower losses in the first quarter of 2020 when the pandemic spread. Their analysis showed that investing in ESG activities is a shield against the impact of the pandemic, as companies with higher ESG scores had a smaller decline in their ROA in the first three months of 2020. And more precisely, they found that this positive effect between ESG and financial performance is stronger for the Social and Governance dimensions of the ESG score. In addition, they found evidence that the mechanism behind this positive relationship is the relatively higher profitability and the relatively lower earnings volatility of firms that performed better in terms of ESG activities during the pandemic. This is in line with the findings of Giese et. al (2019) and the first transmission channel they found, namely the cash-flow channel.

Although the research by Hwang et. al (2021) seems to answer the question of whether the positive relationship between CSR and financial performance was resilient during the Covid-19 pandemic, there is a concern regarding the external validity of the results. Even the authors themselves limit the generalizability of their conclusions only to the Korean Market since their analysis used single-country data. This motivates us to assess if the same applies to other markets, such as the European Market.

Given the findings of previous literature, as these were discussed above, I expect European firms with a higher level of CSR to have better financial performance than their peers who had a lower level of CSR. First, according to Whelan and Atz (2021), a stronger CSR profile is associated with higher quality management, and second, Flammer (2015) argued that companies with a higher level of CSR are characterized by more efficient processes as well as more efficient resource management. These three characteristics are the core of the argument regarding why I expect firms with high CSR performance to be more resilient during times of crisis. Not only did I expect firms with high-quality management to be able to respond faster and more efficiently in the turbulent times of the pandemic but also firms with more efficient processes and more efficient resource management to be less vulnerable to the sudden loss of income due to the pause of certain economic activities in the second quarter of 2020. Last, as Giese et al. (2019) argued, a high ESG profile triggers better innovation management.

According to Li-Ying and Nell (2022), a way for firms not only to mitigate the impact of the pandemic but also to create new market opportunities during times of crisis is through creative destruction, a framework that can explain how firms innovate. Against this background, it is apparent that firms with a higher level of innovation are more likely to expand their value chain by deploying new market opportunities as well as changing to more efficient processes and thus creating value.

Driven by the abovementioned, the main hypothesis of my research is constructed as follows:

H1: *European firms with high ESG scores performed better during Covid-19 pandemic, compared to firms with low ESG scores.*

According to Brammer et. al (2008), when assessing the impact of ESG performance on the financial performance of a firm, it is important to decompose the ESG factors and explore the relationship between every sub-factor (E-S-G) with the financial performance separately. Following their analysis and given that there is no previous analysis to assess whether the relationship between ESG sub-factors and the financial performance of firms is resilient during times of crisis, I will try to explore this aspect of CSR and financial performance relationship by constructing three exploratory hypotheses. These hypotheses will follow the main hypothesis given in section 2 and will be as follows:

H2: *Firms with high Environmental Pillar scores performed better during Covid-19 pandemic, compared to firms with low Environmental Pillar scores.*

H3*: Firms with high Social Pillar scores performed better during Covid-19 pandemic, compared to firms with low Social Pillar scores.*

H4*: Firms with high Governance Pillar scores score performed better during Covid-19 pandemic, compared to firms with low Governance Pillar scores.*

Data

3.1 Variable Description

Sample

To answer the research question of whether firms with higher ESG scores performed better during the Covid-19 pandemic in the European Market, data from a list of companies that constitute the STOXX Europe 600 will be used. The STOXX Europe 600 is an index consisting of 600 small, medium, and large firms based on their market capitalization. Thus, it can be considered a representative sample of the European economy. The companies that build up the index are based in European countries, including countries that do not participate in the Eurozone (UK, Norway, Denmark, Luxemburg, Ireland, and Sweden). This index has been used in previous studies which have explored the relationship between CSR and financial performance in the European Market ((Gaio & Henriques, 2020); (Zaiane & Ellouze, 2022)). Following Gaio and Henriques (2020), I exclude from the sample publicly owned companies as well as financial institutions, intending to avoid any potential bias due to the special regulatory environment in which these firms operate.

This list was retrieved from the Eikon database[1] and constitutes the sample of this research. After retrieving the list of the companies, the values for the following variables were collected: Thomson Reuters' ESG Scores, E-S-G Pillar Score, Returns on Assets, Market Capitalization, Replacement Value of Total Assets, Total Assets, Historic Beta, Dept Ratio, Country, and Sector. The ESG Scores, E-S-G pillar Scores, Total Assets, Historic Beta and Dept Ratio, as time-variant characteristics, their values were collected from the year before the pandemic, meaning 2019. Return on Assets, Market Capitalization, and Replacement Value of Total Assets, as measures of financial performance, their values of the first and the second year of the pandemic, meaning 2020 and 2021, were collected. After dropping missing values in the dependent and independent variables as well as creating the one- and two-year lags of the financial performance variables, the dataset contained 507 firm-specific observations.

[1] Eikon Database is accessible through the Erasmus Data Service Center of the Erasmus University of Rotterdam, and it is available in Y1-7 room on Polak Building.

Variables

3.1.1 Independent variables: ESG scores

Recent meta-analyses on the relationship between CSR and financial performance (Huang, Sim, & Zhao, 2020)(Huang et al., 2020; (Whelan & Atz, 2021) have argued that the main source of mixed results in the literature is the differences in the way one can measure CSR. ESG scores in addition, although they have been used widely by researchers as a measure of CSR to examine the relationship between it and financial performance (Velte, 2017); (Brammer, Brooks, & Stephen, 2008); (Byun, 2018); (Hwang, Kim, & Jung, 2021) have also received criticism, due to the lack of a particular methodology used by agencies that provide them (Orlitzky, Schmidt, & Rynes, 2003). This brings up the issue of transparency in the way the ESG score is calculated, making it one of the criteria I used to choose the more suitable ESG rating provider to use.

Thomson Reuters ESG rating bases its competitive advantage on the unique selling point of transparency. The agency offers full transparency in the way ESG data are collected, stored, and analyzed as well as in the way ESG scores are calculated. This allows investors and researchers to completely comprehend the ESG score of each firm as well as easily extract any information needed. Last, the Thomson Reuters agency values the materiality of ESG data disclosure, meaning that alongside ESG performance indicators, the Thomson Reuters ESG scores take into account the amount of material – to each industry – information every company discloses and acknowledges companies that disclose relevant and material information. These characteristics render Thomson Reuters ESG scores the "best-in-class" ESG data in the market (Thomson Reuters, 2018 p.3), and this, combined with the availability of these ESG scores from the Eikon Dataset, is the motivation behind the choice of this database for this research.

Thomson Reuters ESG Scores indicate "the relative ESG performance, commitment and effectiveness across 10 main themes" (Thomson Reuters, 2018 p.3). What is important to mention is that the ESG Scores represent the performance of each company in terms of ESG, relative to each peer in the industry or the country that the firm operates. The benchmark for the Environmental and Social pillars is the industry that the firm operates in and for the Governance pillar is the country where the firm bases its headquarters (Thomson Reuters, 2018).

The calculation of the ESG scores is based on the performance of the firm in a variety of indicators, which, depending on what is material for the industry that the firm operates, are

weighted differently. This results in a score that can take values from 0 to 100, with a higher score indicating better performance. The ESG Score variable thus is a continuous variable and is a proxy of the level of CSR of each firm. More details on how Thomson Reuters calculates the ESG scores, can be found in Appendix 8.1.

3.1.2 Dependent variables: Financial Performance

Since the research question is whether firms with higher ESG scores performed better during Covid-19 pandemic, compared to firms with low ESG scores, a measure for the financial performance is needed as well. In previous studies that explored the relationship between CSR and financial performance, some authors have used accounting-based indicators of financial performance such as ROA (Gallego-Álvarez et al., 2013; Hwang et al., 2021) while some others alongside accounting-based indicators, used market-based indicators as well, such as Tobin's Q (Velte, 2017)(Velte, 2017; Gaio & Henriques, 2020; (Zaiane & Ellouze, 2022).

According to Orlitzky et al. (2003), market-based indicators represent the perception of the market for the firm and its growth opportunities and thus do not represent the actual financial performance of firms. Thus, following the analysis of Hwang et al. (2021), I use ROA as a measure of the financial performance of firms. ROA stands for Return-on-Assets and represents the net income of the firm relative to its total assets, and it is calculated using the following formula (Thomson Reuters, 2018):

$$Return\ on\ Assets\ (\%) = \frac{Net\ Profits}{Total\ Assets}$$

As it might be obvious, the ROA variable is a continuous variable that aims to capture the financial performance of the firm in the way as the ability of the corporation to generate profits. In addition to that, it is important to mention that the higher the ROA the better the financial performance of the firm.

3.1.3 Controls

In line with previous studies, I also include control variables (Choi & Wang, 2009; Velte, 2017; Gaio & Henriques, 2020; Hwang, Kim, & Jung, 2021).

Drempetic et. al (2019) in their research on the effect of the **size** of the firm on its ESG score, found a positive as well as significant relationship between the size and the ESG performance

of firms. They measured firm size in multiple ways, to ensure the resilience of the results in the way the size is measured. Among others, they used the number of employees, total assets, and market capitalization. In addition, Zaiane and Ellouze (2022) found that there is a moderating effect of the size of the firm in the CSR performance, and thus not including it in the model will potentially lead to omitted variable bias. Due to data availability, in this study, only the natural logarithm of the total assets will be used as a proxy for the size of the firm. I use a logarithmic transformation of the total assets in euros, in line with (Gallego-Álvarez et al, 2013; Drempetic et al., 2019; Hwang et al., 2021), to account for the skewness of the variable.

Choi and Wang (2009) argued that the level of risk that the firm is exposed to is an important control variable when the relationship between CSR and financial performance is examined. The reason is that risk affects financial performance by increasing the cost of capital (Choi & Wang, 2009). If the risk of default is high, investors require higher returns on the investment and thus firms have to bury higher costs to access capital. The risk is divided into two parts, the systematic and the unsystematic risk.

To measure the systematic risk, following Velte (2017), I include in the model the **beta** of the stock of each company. The beta is an indicator of stock volatility relative to the overall movement of the market. A positive beta indicates for example that the stock follows the movement of the market, while a negative indicates that the stock moves in the opposite direction of the market.

To model the unsystematic risk, following (Fischer & Sawczyn, 2013; Velte, 2017; Gaio & Henriques, 2020; Hwang et al., 2021), I use the **dept ratio** of each firm, which is calculated by dividing the total debt by the total assets. According to Thomson Reuters, the formula to calculate the debt ratio is the following:

$$Debt\ Ratio(\%) = \frac{Short\ Term\ Dept + Long\ Term\ Dept}{Total\ Assets}$$

In addition, following Zaiane and Ellouze (2022), I also control for country-specific characteristics that might affect the financial performance of firms. To do so, I create dummy variables for every **country** and include them in the model estimation.

The last control variable used in the model is the **sector**. According to Zaiane and Ellouze (2022), there is a moderating effect of the sector on the ESG score. The authors argued that

firms that operate in environmentally sensitive sectors such as oil, gas, and chemicals, engage in more meaningful CSR activities because they have to meet higher expectations from shareholders while on the other hand, firms that operate in less environmentally sensitive sectors tend to engage in "symbolic" CSR initiatives (Zaiane & Ellouze, 2022). To categorize the sectors, I use the SIC code provided by the Eikon Database. Given that, I construct dummy variables for every industry. As shown in Appendix 8.2, I distinguish 39 sectors in that firms in the dataset operate.

3.2 Descriptive Statistics

Table 1: Tabulation of Countries

Country	Freq.	Percent
AUSTRIA	5	0.99
BELGIUM	14	2.76
DENMARK	20	3.94
FINLAND	15	2.96
FRANCE	74	14.60
GERMANY	59	11.64
IRELAND	7	1.38
ITALY	26	5.13
LUXEMBOURG	2	0.39
NETHERLANDS	24	4.73
NORWAY	15	2.96
POLAND	5	0.99
PORTUGAL	3	0.59
SPAIN	21	4.14
SWEDEN	47	9.27
SWITZERLAND	47	9.27
U.K	123	24.26
Total	507	100

The dataset contains observations of 507 European firms. Table 1 shows the different countries where companies have their headquarters, as well as the number of observations of each country. The country with the most observations is the United Kingdom with around 24% of the firms having their headquarters there, while the least observations are in Portugal, Austria, Luxembourg, and Poland. The other big European economies, meaning Germany, France, and the Netherlands, represent 31% of the dataset. In addition, it is noteworthy that 20% of the observations are in Nordic countries. The rest observations are spread across European countries, such as Belgium, Italy, Spain, and Portugal.

Table 2: Descriptive Statistics of variables

Variable	N	Mean	Std. Dev.	Min	Max
Independent Variables					
Overall ESG Score	507	65.92	17.02	0.43	93.76
Environmental Pillar Score	507	62.80	24.09	0.00	98.89
Social Pillar Score	507	69.62	19.82	0.81	98.00
Governance Pillar Score	507	62.61	20.38	0.46	96.88
Dependent Variables					
Return on Assets in 2020	507	5.39	9.44	-32.25	86.95
Return on Asset in 2021	504	8.04	10.44	-16.99	139.40
Controls					
Historic Beta	498	0.89	0.36	-0.36	2.26
Debt Ratio (%)	507	92.51	106.02	-249.31	784.41
Natural Logarithm of Total Assets	507	23.03	1.60	17.29	27.62

***Notes**: This table presents the summary statistics of the numeric variables used to explore the impact of ESG scores on the financial performance of European firms listed in the STOXX Europe 600 in the year 2020. Definitions and details about each variable are given in Section 3.1.3*

In Table 2 the descriptive statistics for each variable are presented. The independent variables, meaning the ESG Scores and the E-S-G Pillar Score, have 507 observations and no missing values. The ESG Score has a mean of 66 out of 100, with the lowest observed value being 0.4 and the highest at 93.7. The same wide range of values applies to the E-S-G Pillar Scores as well, with the mean being between 63 for the Environmental and Governance Pillar and almost 70 for the Social Pillar.

The dependent variable is the accounting-based financial performance (ROA) in a one- or two-year lag. The one-year lag has no missing values while the two-year lag has 3 missing values. The mean of both variables is around 10% with the lower value being -32.2% and the higher 139.4%.

To control for the risk of each company, the historic beta, as well as the dept ratio, are included in the analysis. The Historic Beta has 9 missing values and a mean of 0.89. The minimum value observed is -0.36 while the highest is 2.26. Moving to the Dept Ratio, which is a percentage, the mean is 92.5% with a huge range of values, as the lowest value observed is -249% and the highest 784%, and no missing values. The last continuous control variable used in the model is the natural logarithm of the total assets of each firm as a proxy of the size. The minimum value is 17.29 while the maximum is 27.62, with a mean of 23.03 and 507 observations.

3.3 Correlation Matrix

Table 3: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(11)	(12)
(1) ESG Score$_{2019}$	1										
(2) E Score$_{2019}$	0.83	1									
(3) S Score$_{2019}$	0.87	0.71	1								
(4) G Score$_{2019}$	0.63	0.26	0.31	1							
(5) ROA $_{2020}$	-0.20	-0.21	-0.19	-0.09	1						
(6) ROA $_{2021}$	-0.10	-0.13	-0.09	-0.04	0.59	1					
(9) Beta$_{2019}$	0.13	0.12	0.09	0.14	-0.06	-0.00	1				
(10) Debt Ratio$_{2019}$	0.12	0.10	0.11	0.07	-0.12	-0.16	0.02	1			
(11) Total Assets$_{2019}$	0.48	0.47	0.41	0.27	-0.43	-0.35	0.12	0.30	1		
(12) Country	-0.16	-0.23	-0.19	0.05	0.07	0.08	0.06	-0.02	-0.14	1	
(13) Sector	-0.12	-0.14	-0.12	-0.02	0.11	0.06	-0.13	-0.04	-0.09	0.08	1

***Notes**: This table presents the correlations between variables used to explore the impact of ESG scores on the financial performance of European firms listed in the STOXX Europe 600 in the years 2020 and 2021.*

In Table 3, the correlations between the different variables used are presented. The first thing to notice is the correlations between the E-S-G pillar and ESG-overall Scores. The relatively low correlation between the Governance pillar and ESG-overall score indicates that the Environmental and Social Pillar has a more significant effect on the overall ESG Score than the Governance Pillar Score. In addition, the correlation between two variables of financial performance and ESG-overall and E-S-G pillar scores are negative. This does not support my expectations that the higher the ESG score the better the financial performance of firms. However, the negative correlation cannot be used to answer the research question but only as evidence that there is a negative linear relationship between the ESG score and financial performance.

Moving to the correlations between the variables of financial performance, they all have a positive correlation, which is in line with what one could expect. The better the financial performance on the one-year lag, the better the financial performance in the second year. Another interesting correlation to mention is the correlation between risk measures and financial performance. According to the economic theory and the CAPM model (Ruefli et al, 1999), the higher the risk that the company is exposed to, the higher the returns that one would expect. However, the negative correlations between both systematic and unsystematic risk and the measures of financial performance indicate the opposite. Last, the proxy of firm size seems to have a negative correlation with the measures of financial performance, signaling that the bigger the company, in terms of assets, the worse the financial performance in the next and the second year after Covid-19 pandemic.

The use of a correlation matrix is needed to detect if there is potential multicollinearity between variables, and not to draw any conclusions regarding the effect the independent variable of interest has on the dependent variable. As shown in the correlation matrix, the highest correlation among variables that will be used in the same model is 0.57. This is below the threshold of 0.7, so there is no evidence to suspect multicollinearity in the dataset.

Methodology

4.1 Type of Dataset

Previous literature that examined the relationship between CSR and Corporate Financial Performance has used either one-dimensional or multi-dimensional models (Gallego-Álvarez, et al., 2013; Flammer, 2015; Lins et al., 2017; Velte, 2017; Hwang et al., 2021). However, there is a growing number of studies that use multi-dimensional models or in other words Panel Data. The driving force for using Panel Data is that this type of data offers a higher number of observations, and more degrees of freedom while the data contain more variation (Brooks, 2014). This results in more precise estimations making the results easier to generalize to the actual population. As a potential disadvantage of this type of data, it can be stated that Panel Data requires a lot of observations in multiple years making it hard to be gathered.

The choice of model, however, should not depend on whether it is hard or not to gather the appropriate data, but only on the relationship that the model will try to identify and test. The research question of this thesis is whether firms with higher ESG scores performed better in terms of financial performance, compared to firms with lower ESG scores, during the Covid-19 pandemic. In other words, this analysis will try to assess if a higher ESG Score before the pandemic results in a better financial performance during the pandemic. To explore that, the model needs to take into consideration the ESG Scores of each firm right before the pandemic hit – the year 2019 –, and the financial performance of each firm when the results of the pandemic started to show, the years 2020 and 2021. To capture that, there is no need to use panel data. Cross-sectional data containing the ESG Scores as well as other control variables in the year 2019 and the measures of financial performance in the years 2020 and 2021 would provide the model with enough information to examine if the hypothesis can be accepted or not.

Using the year lags have been suggested from previous literature, with the argument that the effects of good CSR are not immediately shown in the financial performance of a firm, but one or two years are required to identify the benefits of performing well in terms of social responsibility (Choi & Wang, 2009). In addition, the use of lags is beneficial for assessing the issue of reverse causality. Simply put, there is no consensus in the literature on whether good CSR results in better financial performance or good financial performance results in better CSR. The slack resource theory, as described by Waddock and Graves (1998) attributes better CSR performance to previous good financial performance. In other words, the authors argued that when a firm experiences good financial performance, there are more resources to finance incentives that improve CSR performance, and thus the direction of the causality is from the financial performance to the CSR performance and not on the other way around. On the contrary, the good management theory, which is an extension of the Stakeholders' theory (Section 2.1.2), argues that the direction of the causality is from the CSR performance to the financial performance. Position this differently, this theory is in line with the claims of the Stakeholders' theory that a company can create value by considering the interest of not only its shareholders, but also of clients, workers, and the society in which it operates (Whysall, 2000). However, by using the one- and two-year lags, the risk of bias caused by potential reverse causality is mitigated since the financial performance of 2020 or 2021 cannot influence the level of CSR in 2019.

4.2 Model Estimator

When using cross-sectional data, the best linear unbiased estimator is the OLS (Ordinary Least Square) estimator, under the condition that the assumptions of OLS estimation, which will be discussed later, hold. This method estimates the predicted values of the dependent variable as a straight line and calculates this line by minimizing the sum of squared distances between the predicted and the actual value – or, in other words, the squared residuals (Brooks, 2014). As explained by Brooks (2014), in a bivariate linear model given by the equation $\boldsymbol{y = a + bx + u}$, OLS estimates the coefficient b, meaning how much x will change by an incremental change in y, by dividing the total covariance between the two variables x and y that exists in the sample, by the covariance of x. The error term (u) of this equation, however, which is the sum of the residuals, is there to remind us that the predicted values are not perfect and the relationship between the dependent and the independent variable cannot be calculated with accuracy.

In this thesis, the model will be slightly more complex, mainly due to the number of variables that will be used. However, the model that I chose to investigate the research question assumes that there is a linear relationship between CSR and subsequent financial performance. How these variables are measured has been discussed in the previous section. In addition to these measures of CSR and financial performance, I assume that the size of the firm, the level of risk that the firm is exposed to as well as the sector and the country that the firm operates will also affect the dependent variable, and thus should be taken into consideration by the model. The sector, as well as the country, will be done by creating dummy variables for every country and sector identified in the dataset, which will take a value of 1 if the firm operates in a specific country /sector and 0 otherwise. In this way, it is possible to estimate the effect that operating in each sector or country will have on financial performance during the Covid-19 pandemic. All the above mentioned led to four different linear models which are given by the following equations:

$$\boldsymbol{ROA}_{t+1} = \alpha + \beta\, \boldsymbol{ESG}_{t} + \gamma\, ln\, (\boldsymbol{Total\ Assets})_{t} + \delta\, \boldsymbol{Beta}_{t} + \zeta\, \boldsymbol{Dept\ Ratio}_{t} + s_t + c_t + u$$

$$\boldsymbol{ROA}_{t+2} = \alpha + \beta\, \boldsymbol{ESG}_{t} + \gamma\, ln\, (\boldsymbol{Total\ Assets})_{t} + \delta\, \boldsymbol{Beta}_{t} + \zeta\, \boldsymbol{Dept\ Ratio}_{t} + s_t + c_t + u$$

Where:

ROA_{t+1} = Return on Assets of year 2020

ROA_{t+2} = Return on Assets of year 2021

ESG_{t} = ESG Score of the year 2019

S_t: Sector Fixed Effects

C_t: Country Fixed Effects

u: Error term

The coefficient of interest, to answer the research question of whether firms with better CSR experienced better financial performance during the Covid-19 pandemic, is the β. A positive and statistically significant β will indicate that better CSR performance is associated with better subsequent financial performance, providing support to my hypothesis. On the other hand, a negative and statistically significant coefficient will indicate that better CSR performance is

associated with worse subsequent financial performance, providing support to the shareholders' theory (Section 2.1).

The models that will try to explore this relationship will be the same as the models described above in this section, but with explanatory variables to be the E-S-G pillar score instead of the overall ESG score, respectively. In Appendix 8.3, these models are presented.

4.3 Assumptions of OLS

As mentioned before, for the OLS to be the best linear unbiased estimator, some assumptions need to be addressed. In this section, these assumptions will be discussed, and the results of the appropriate tests will be presented.

Linearity in parameters

The first assumption that needs to hold is the linearity assumption. According to this assumption, there is a linear relationship between CSR and financial performance, meaning that a change in CSR will have the same effect on financial performance, regardless of the initial level of CSR. Put differently, this assumption implies that for a firm with low CSR and a firm with high CSR, a one-unit change in the level of CSR, will result in the same effect on financial performance for both firms (Wooldridge, 1960). If this assumption does not hold, OLS can still provide unbiased estimates, under the condition that nonlinear variables are included in the model, such as polynomials. To test this assumption, a plot of the residuals and the fitted values is required (Brooks, 2014). If the residuals are spread around a horizontal line, there is no evidence of nonlinearity in the data. As shown in Appendix 8.4.1 and 8.4.2, given that the residuals and the fitted values are equally distributed around the horizontal red line, it is likely the relationship between CSR and financial performance to be linear, and the first assumption for unbiased estimates to hold.

Random Sampling

The second assumption that needs to hold for the OLS estimator to provide unbiased estimates is the assumption of random sampling. According to Brooks (2014), a random sample is a sample where “each individual item in the population is equally likely to be drawn” (p.63). In that sense, this assumption assumes that the sample that the analysis is based on is a

representative sample of the actual population. The cross-sectional type of data has the advantage to be considered a random sample of the population and thus the assumption of random sampling is not likely to be violated. In this research, a sample of 600 European companies was drawn from an index that contains small, medium, and large in capitalization firms, constituting a random sample of the population of all European firms.

Sample Variation

According to Wooldridge (1960), this assumption is a weak one since it is very unlikely not to hold. What this assumption assumes is that there is variation in the explanatory variable. This variation will be explained by the model and will be used to explore the relationship of interest. If variation on the explanatory variable is absent, then there is no relationship to be explored. However, if the explanatory variable has different values across the units in the population, and the sample is a random sample of the population, then variation should exist in the explanatory variable by default. To check whether there is indeed variation and the assumption holds, a look at table 2, where the summary statistics are presented, is enough. All variables have a different minimum than the maximum value indicating that there is variation in the dataset.

No perfect collinearity

When more than one explanatory variable explores the same relationship and thus is included in the same model, the issue of multicollinearity (or perfect collinearity) may occur. Multicollinearity occurs when two or more explanatory variables are highly correlated with each other, meaning that there is a linear relationship between them, and including or not one of them in the model will have a serious impact on the results of the analysis. When perfect collinearity or else multicollinearity occurs, then it is impossible to distinguish if the effect on the dependent variable is caused by one explanatory variable or another. As explained in the previous Section (3.3), with a close look at the correlation matrix, there is no evidence of multicollinearity between explanatory variables that are used in the same model. In that sense, this assumption is likely to hold.

Zero Conditional Mean

An interesting for the OLS estimation assumption is that the expected value of the error term should be equal to zero. In other words, this assumption implies that the value of the error term does not depend on the value of the CSR measure, but it is the same for every value. This assumption can be violated for multiple reasons, such as when the model omits a variable that can affect both the dependent and the independent variable (omitted variable bias) or when the model suffers from misspecification, such as measurement errors or the presence of nonlinearities. When the zero conditional mean assumption is violated, the estimations could be biased, either downward or upward, meaning that the expected value of the dependent variable can be higher (upward) or lower (downward) than the true value of the population. In this analysis, omitted variable bias is very likely to be present, which constitutes the main limitation of the analysis. Fischer and Sawczyn (2013) argued, for example, that Research and Development expenditures should always be included in models that estimate the relationship between CSR and financial performance as a measure of the level of innovation that the firm introduces. The level of innovation can affect not only the financial performance of firms by increasing the growth opportunities, but also can be responsible for taking incentives that strengthen CSR performance (Fischer & Sawczyn, 2013). However, due to data availability, it is not possible to include such a measure of innovation in the analysis conducted in this paper, and thus, I acknowledge that the effect of CSR performance on the financial performance of European firms during the Covid-19 pandemic might be underestimated.

Homoscedasticity

The last assumption that needs to hold for the OLS to be the best linear unbiased estimator is the assumption of homoscedasticity. Under this assumption, the errors have equal variance, meaning that the errors are not dependent on the value of the ESG score, which measures CSR performance (Wooldridge, 1960). If this assumption does not hold, then the data suffer from heteroscedasticity. Using OLS and ignoring heteroscedasticity, will result in unbiased, yet not efficient estimates (Brooks, 2014). To test if the assumption of Homoscedasticity holds, the Breusch-Pagan test will be used. The null hypothesis of this test is that there is Homoscedasticity in the data and thus rejecting it would be an indicator of the presence of heteroscedasticity. In Appendix 8.5, the results of this test for each of the two models are shown. All p-values are below 0.01, thus we can reject the null hypotheses that there is

homoscedasticity, with a 99% confidence level. To correct for heteroscedasticity, I use robust standard errors for every estimation.

Results

5.1 ESG Score and Financial Performance with a one-year lag

In this section, the results of the analysis of the relationship between ESG scores as well as E-S-G pillar scores and financial performance in the first year of the pandemic will be presented. In other words, this section explores the relationship between the ESG scores of the year 2019 and the financial performance, measured as ROA, of the year 2020 which is the first year of the Covid-19 pandemic.

The first step is to examine the relationship between the financial performance of European firms during the pandemic with the level of CSR. In the first column is the regression output of the model without including the independent variable. In column 2, where the overall ESG-score is added as the main explanatory variable, the Adjusted R-squared is increased, indicating that the second model can explain more variation. The positive and statistically significant coefficient of the overall ESG score supports my initial hypothesis. The results indicate that one unit increase on the overall ESG score increases the Return on Assets of the next year by 0.053 percentage points, ceteris paribus. This effect is statistically significant at a 10% significance level.

Given that the ESG scores are on a scale of 0 to 100, would be more intuitive, instead of exploring the effect of one unit change in the overall ESG score, to examine the effect of one standard deviation change. According to Table 2, where the summary statistics are presented, the standard deviation of the overall ESG score is 17.02. One standard deviation change in the overall ESG score of the year 2019 would lead to 0.90 percentage points increase in the Return on Assets in the first year of the pandemic. The relative magnitude of this effect is an increase of 16.7% in the Return on Assets in the first subsequent year.[2]

[2] Relative magnitude is calculated as the effect of one unit change of the independent variable on the dependent variable divided by the mean of the dependent variable. In this case, one unit increase of the ESG score is associated with 0.053 increase of the ROA in the next year. The relative magnitude of this effect is 0.90 multiplied by the standard deviation divided by the mean of the ROA in the next year, which is 5.39, as shown in Table 2.

Table 4: Regression Output with one-year lag

	(1) ROA_{2020}	(2) ROA_{2020}	(3) ROA_{2020}	(4) ROA_{2020}	(5) ROA_{2020}
ESG $_{2019}$		0.053*			
		(0.031)			
E Score $_{2019}$			0.040*		
			(0.024)		
S Score $_{2019}$				0.024	
				(0.022)	
G Score $_{2019}$					0.026
					(0.023)
Beta $_{2019}$	-0.916	-1.007	-1.116	-0.906	-1.001
	(2.095)	(2.065)	(2.078)	(2.098)	(2.064)
Debt Ratio $_{2019}$	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Natural Logarithm of Total Assets $_{2019}$	-2.267***	-2.583***	-2.568***	-2.421***	-2.367***
	(0.583)	(0.679)	(0.631)	(0.613)	(0.630)
Constant	57.329***	61.046***	61.590***	59.391***	57.983***
	(12.051)	(12.996)	(12.550)	(12.298)	(12.292)
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	498	498	498	498	498
Adjusted R-squared	0.240	0.244	0.244	0.243	0.244

Notes: *In this table, the results of the regression analysis that explores the relationship between the ESG scores of 2019 and the financial performance of 2020, are presented. In column 1, the model omits the independent variable including only the controls. In column 2, the independent variable, which is the ESG cores of 2019 is added. In columns 3, 4, and 5, the ESG score is decomposed into the 3 pillar scores. In column 3, the independent variable is the Environmental Pillar Score of 2019 while in column 4 is the Social Pillar Score. Last, in column 5, the independent variable is only the Governance Pillar Score of 2019. For all models, the dependent variable is the Return on Assets of the year 2020, as a measure of the financial performance of firms. Country and Sector Fixed Effects are included in all models using dummy variables to control for any effect operating on a given sector or country may have.*
All models use robust standard errors, which are presented in parentheses
**** p<.01, ** p<.05, * p<.1*

In column 3, the relationship between the E-pillar Score and the accounting-based financial performance of European firms in the first subsequent year is explored. The positive and statistically significant coefficient indicates that there is a positive relationship between Environmental performance and the financial performance of firms during the Covid-19 pandemic. One unit increase in the Environmental Score is associated with a 0.040 percentage points increase in the Return on Assets of the next year. Columns 4 and 5 present the regression output when the independent variable is the Social and Governance pillar score respectively.

The insignificant yet positive results are not sufficient to conclude the relationship of these variables with the accounting-based financial performance of European firms during the pandemic.

My analysis results show that there is a positive effect of higher ESG scores in the accounting based financial are in line with the results of Velte (2017) and Hwang et. al (2021). Interestingly, the coefficient of the measure of firm size is again negative and statistically significant at a 1% significance level. This indicates that, overall, smaller firms experienced a better accounting-based financial performance compared to large firms.

5.2 ESG Score and Financial Performance with two years lag

Apart from the short-term benefit of improving the CSR performance that was identified in the previous section, my analysis will also explore if such an effect is resilient not only when the crisis hit but also throughout the crisis. In other words, this section aims to explore whether firms that performed better in terms of CSR before the pandemic, experienced better financial performance in the second year of the pandemic as well, meaning during 2021.

Table 5 presents the results of the last model. In this model, the relationship between the level of CSR before the pandemic and the financial performance of the second subsequent year is explored. In column 1, the model misses the independent variable. As in the previous model, including the explanatory variable, increases the amount of variation explained by the models.

Table 5: Regression Output with two-years lag

	(1) ROA_{2021}	(2) ROA_{2021}	(3) ROA_{2021}	(4) ROA_{2021}	(5) ROA_{2021}
ESG $_{2019}$		0.080*			
		(0.041)			
E Score $_{2019}$			0.039		
			(0.025)		
S Score $_{2019}$				0.055**	
				(0.022)	
G Score $_{2019}$					0.039
					(0.030)
Beta $_{2019}$	0.062	-0.072	-0.140	0.086	-0.055
	(2.689)	(2.606)	(2.626)	(2.675)	(2.612)
Debt Ratio $_{2019}$	-0.007*	-0.007*	-0.007*	-0.007*	-0.007*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Natural Logarithm of Total Assets $_{2019}$	-2.026**	-2.501**	-2.316**	-2.387***	-2.182**
	(0.888)	(1.043)	(0.976)	(0.913)	(0.960)
Constant	51.597***	57.170***	55.675***	56.431***	52.654***
	(17.915)	(19.542)	(19.063)	(18.201)	(18.286)
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	495	495	495	495	495
Adjusted R-squared	0.159	0.168	0.162	0.164	0.162

Notes: *In this table, the results of the regression analysis that explore the relationship between the ESG scores of 2019 and the financial performance of 2021, are presented. In column 1, the model omits the independent variable including only the controls. In column 2, the independent variable, which is the ESG cores of 2019 is added. In columns 3, 4, and 5, the ESG score is decomposed into the 3 pillar scores. In column 3, the independent variable is the Environmental Pillar Score of 2019 while in column 4 is the Social Pillar Score. Last, in column 5, the independent variable is only the Governance Pillar Score of 2019. For all models, the dependent variable is the Return on Assets of the year 2021, as a measure of the financial performance of firms. Country and Sector Fixed Effects are included in all models using dummy variables to control for any effect operating on a given sector or country may have.*

All models use robust standard errors, which are presented in parentheses

**** p<.01, ** p<.05, * p<.1*

In column 2, the main explanatory variable is the overall ESG Score. The positive and statistically significant coefficient is an indicator of a positive relationship between ESG scores and accounting-based financial performance of the second subsequent year. This coefficient can be interpreted as follows. One unit increase in the ESG score is associated with an increase of 0.08 percentage points in the Return on Assets after two years, ceteris paribus. This effect is

statistically significant at a 10% significance level. Making use again of the one standard deviation increase in the ESG score of the year 2019, as used in section 5.1.2, this increase would lead to an increase of 1.36 percentage points in the Return on Assets of the year 2021. The relative magnitude of this effect is an increase of 16.9% in the Return on Assets in the second year of the pandemic[3]

In columns 3,4 and 5, the relationship between E-S-G pillar Scores and the accounting-based financial performance in the second subsequent year is investigated. In section 5.1, a positive and statistically significant relationship between environmental and financial performance in the first subsequent year has been identified. It seems that this relationship is not resilient in times of crisis, since in the second year this effect is not apparent. However, as shown in column 4, there is a positive and statistically significant relationship between the Social Pillar score and the accounting-based financial performance. One unit increase in the Social Pillar Score is associated with an increase of 0.055 percentage points in the Return on Assets in the second year of the pandemic. This result is statistically significant at a 5% significance level. Regarding the G Pillar score, the effect is positive yet insignificant, thus no conclusion can be drawn.

Interestingly, the coefficient of the measure of non-systematic risk is negative and statistically significant. This indicates that firms exposed to higher non-systematic risk experienced worse financial performance during the second year of the pandemic. This is not in line with the economic theory and the CAPM model, where a higher amount of risk is associated with higher returns (Ruefli et al., 1999).

[3] Relative magnitude is calculated as the effect of one unit change of the independent variable on the dependent variable divided by the mean of the dependent variable. In this case, one unit increase of the ESG score is associated with 0.080 increase of the ROA in the second subsequent year. The relative magnitude of this effect is 0.080 multiplied by the standard deviation, divided by the mean of the ROA in the next year, which is 8.04, as shown in Table 3.

Conclusion

This research aimed to explore whether firms with a higher level of CSR experienced better financial performance relative to their peers with lower CSR performance, during the Covid-19 pandemic. By analyzing data from 507 small, medium, and large in capitalization companies, my analysis resulted that corporations with high Environmental Pillar Score in 2019 performed better than corporations with lower Environmental Pillar Score, during the two subsequent years meaning 2020 and 2021. More specifically, there is a positive and significant relationship between ESG scores in 2019 and ROA in 2020 and 2021. In addition to that, I decomposed the ESG score to the E-S-G pillar score and explored whether there is a significant relationship between ESG subfactors and financial performance. My analysis showed that there is a positive relationship between Environmental performance and financial performance, measured as ROA, in the first year of the pandemic, while in the second year there is a positive relationship between Social performance and financial performance.

Analysis results are in line with the "Stakeholders' theory" as described by Freeman (1984). This theory argues that corporations taking into consideration the interest of not only their shareholders but also of everyone that is affected by their business, meaning clients, employers, and the society in which they operate, can not only bury the costs that come with adapting CSR related initiatives but also create more value. In contrast with the "Shareholders' theory", which assumes that the only responsibility of a corporation is to maximize the wealth of its owners (Friedman, 1962), the "Stakeholders' theory" predicts that firms that serve the interest of everyone that holds a stake in the company will experience better financial performance mainly due to increased productivity, more long-term profits, and better management (Flammer, 2015; Giese et al., 2019). In line with this prediction, my analysis shows that European firms with a higher level of CSR, performed better than firms with a lower level of CSR, during the turbulent times of the pandemic.

My results are also in line with the findings of previous research regarding the relationship between CSR and financial performance during times of crisis. Although there is no consensus about the sign of the relationship, the most recent meta-analysis in this field, provides evidence of a positive and significant relationship, supporting the "Stakeholders' theory". In addition, papers that explored the resilience of this relationship in times of crisis, have found that CSR strategies can mitigate the impact of serious external shocks, such as the financial crisis of 2008 or the Covid-19 pandemic (Lins et al., 2017; Hwang et al., 2021). My analysis represents an

extension of the research of Hwang et al. (2021), in the way that my thesis aim was to explore whether the relationship that the authors identified in the Korean market applies to the European market as well.

My analysis showed that there is a positive relationship between the level of CSR and the financial performance of European firms during the first and second years of the pandemic. In addition, when I decomposed the ESG score to the E-S-G pillar score and explored the relationship between the E-S-G subfactor and the financial performance in the first subsequent year, meaning the first year of the pandemic, I found that environmental performance is the only subfactor that affected financial performance. This is in line with the results of Gallego-Alvearez et al. (2013) but contracts the results of Hwang et al. (2021) where the authors found that Social and Governance factors are more important during the Covid-19 pandemic in the Korean market. However, during the second year of the pandemic, the effect of environmental performance is not resilient and the positive relationship between CSR and financial performance is attributed to the Social subfactor.

The results of my analysis have various implications. First, my analysis provides support to the quote of Godfrey et al. (2009) who argued that a strong CSR profile can be "an insurance-like protection against negative events" (p.441). As mentioned before, it is important to highlight the resilience of the positive relationship during times of crisis, since the hardships that the pandemic imposed on the market is a solid reason for corporations to switch their attention from adapting and improving the existing CSR strategies to other financial incentives. Although this could threaten the sustainability performance of the firm, it is reasonable for a corporation that struggles financially to focus only on its survival rather than CSR performance. However, as shown in my analysis, a firm can mitigate the impact of a crisis by improving its CSR performance. In addition, my analysis contributes to the existing debate regarding the sign of relationship between CSR and financial performance, by supporting the positive sign. This can constitute an incentive for firms to invest more resources in their CSR performance and thus mitigate the impact of their business on the environment as well as the society in which they operate. Last, the results of my analysis, also have regulatory implications. Encouraging firms to adapt CSR-related strategies and take into consideration the interest of various stakeholders is a way to build a more resilient market that will be able to overcome multiple crises.

Last, regardless of my effort for as much accurate as possible estimation, I acknowledge that my analysis comes with some limitations. First, as described in section 4.3, my analysis might

suffer from omitted variable bias, and thus the effect is slightly underestimated, since, due to data availability, the model did not take into consideration the Research and Development expenditures as a measure of the innovation. In addition, I acknowledge that the relationship between the firm size and the financial performance during the pandemic, contradicts my initial expectations and thus a different measure of a firm's size, such as the number of employees, should be used to test the robustness of the effect. Last, I recognize that using only the ESG score as a measure of CSR is not enough to draw causal conclusions regarding the true relationship between CSR and financial performance. As Flammer (2015) argued, a randomized - like experiment is a more accurate method to explore the relationship with financial performance because many factors can affect both CSR and financial performance and are not easy to be captured.

Future research thus should focus on exploring the resilience of the relationship between CSR and financial performance during turbulent times, by utilizing more advanced statistical methods and additional control variables. In addition, it is important to focus on the decomposition of the effect of the different ESG subfactors and explore whether one factor has a stronger effect on financial performance during times of crisis. Should this relationship be explored, managers and corporations would be able to adapt their strategies and focus on the subfactors that will enrich the resilience of the business during crises, structuring in this way a more resilient market.

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Appendix

8.1 Thomson Reuters ESG Score Calculation

Thomson Reuters offers a variety of data regarding ESG. First, there is the **overall ESG score**, which indicates "the relative ESG performance, commitment and effectiveness across 10 main themes" (Thomson Reuters, 2018 p.3). These main themes are in the environmental pillar: (a) Resource Use, (b) Emissions, and (c) Innovation; in the social pillar: (a) Workforce, (b) Human rights, (d) Community, and (e) Product Responsibility; and in the governance pillar: (a) Management, Shareholders, and (b) CSR strategy. Plus, there is the **ESG Combined score**, which is the overall ESG score reduced by any potential ESG controversy the company may have been engaged in. This ESG score, put simply, accounts for the ESG performance of the firm as well as any incident that might have been disclosed that affects the ESG performance of the company. In addition, there is **the ESG pillar score**, which is the score of the firm in every of the three ESG pillars (Environmental, Social, and Governance).

All these Scores indicate the relative performance of the company, meaning that the score of each firm represents how this firm performs in ESG activities, compared to its peers in the industry in which it operates. The benchmark for the Environmental and Social pillars is the industry that the firm operates in and for the Governance pillar is the country where the firm headquarters are based (Thomson Reuters, 2018).

To calculate the ESG pillar score, Thomson Reuters selects 178 relevant and material to each industry indicators from a sample of 400 ESG measures and bases the calculation on this subset. After that, the agency collects the information needed from sources such as annual reports, websites, CSR reports as well as the news, and based on an algorithm, calculates the score. The formula used to calculate the score is the following (Thomson Reuters, 2018):

$$\boldsymbol{Score} = \frac{\boldsymbol{N.worse} + \frac{\boldsymbol{N.same}}{\boldsymbol{2}}}{\boldsymbol{N.}}$$

Where:

N. worse: is the number of companies with lower in this pillar score

N. same: is the number of companies with the same in this pillar score

N.: is the total number of companies with a score in this pillar

The individual Score in every pillar aggregate the overall ESG score. To calculate the ESG combined score, Thomson Reuters collects information based on 23 ESG controversy topics. In case a company has been involved in any scandal during the year, the scoring system penalizes it and reduces the overall ESG score (Thomson Reuters, 2018). If there is no such incident, overall ESG and ESG Combined scores are equal (Thomson Reuters, 2018).

8.2 Tabulation of Sector

Table 6: Tabulation of Sectors

ICB Sector	Freq.	Percent	Cum.
Aerospace and Defense	10	1.97	1.97
Alternative Energy	2	0.39	2.37
Automobiles and Parts	12	2.37	4.73
Beverages	9	1.78	6.51
Chemicals	19	3.75	10.26
Construction and Materials	24	4.73	14.99
Consumer Services	3	0.59	15.58
Electricity	15	2.96	18.54
Electronic and Electrical Equipment	14	2.76	21.30
Finance and Credit Services	2	0.39	21.70
Food Producers	13	2.56	24.26
Gas, Water, and Multi-utilities	13	2.56	26.82
General Industrials	13	2.56	29.39
Health Care Providers	3	0.59	29.98
Household Goods and Home Construction	8	1.58	31.56
Industrial Engineering	15	2.96	34.52
Industrial Materials	5	0.99	35.50
Industrial Metals and Mining	10	1.97	37.48
Industrial Support Services	24	4.73	42.21
Industrial Transportation	15	2.96	45.17
Investment Banking and Brokerage Services	28	5.52	50.69
Leisure Goods	6	1.18	51.87
Life Insurance	9	1.78	53.65
Media	12	2.37	56.02
Medical Equipment and Services	22	4.34	60.36
Non-life Insurance	20	3.94	64.30
Oil, Gas, and Coal	14	2.76	67.06
Personal Care, Drug and Grocery Stores	15	2.96	70.02
Personal Goods	13	2.56	72.58
Pharmaceuticals and Biotechnology	25	4.93	77.51
Real Estate Investment Trusts	19	3.75	81.26
Real Estate Investment and Services	12	2.37	83.63
Retailers	12	2.37	86.00
Software and Computer Services	25	4.93	90.93
Technology Hardware and Equipment	9	1.78	92.70
Telecommunications Equipment	3	0.59	93.29
Telecommunications Service Providers	16	3.16	96.45
Tobacco	3	0.59	97.04
Travel and Leisure	15	2.96	100.00
Total	507	100.00	

8.3 Estimated Models

Environmental Sub-Factor

$$ROA_{t+1} = \alpha + \beta\ E\ Score_{t} + \gamma\ ln\ (Total\ Assets)_{t} + \delta\ Beta_{t} + \zeta\ Dept\ Ratio_{t} + s_t + c_t + u$$

$$ROA_{t+2} = \alpha + \beta\ E\ Score_{t} + \gamma\ ln\ (Total\ Assets)_{t} + \delta\ Beta_{t} + \zeta\ Dept\ Ratio_{t} + s_t + c_t + u$$

Where:

$E\ Score_{t}$ = Environmental Pillar Score of the year 2019

ROA_{t+1} = Return on Assets of year 2020

ROA_{t+2} = Return on Assets of year 2021

S_t: Sector Fixed Effects

C_t: Country Fixed Effects

u: Error Term

Social Subfactor

$$ROA_{t+1} = \alpha + \beta\ S\ Score_{t} + \gamma\ ln\ (Total\ Assets)_{t} + \delta\ Beta_{t} + \zeta\ Dept\ Ratio_{t} + s_t + c_t + u$$

$$ROA_{t+2} = \alpha + \beta\ S\ Score_{t} + \gamma\ ln\ (Total\ Assets)_{t} + \delta\ Beta_{t} + \zeta\ Dept\ Ratio_{t} + s_t + c_t + u$$

Where:

$S\ Score_{t}$ = Social Pillar Score of the year 2019

ROA_{t+1} = Return on Assets of year 2020

ROA_{t+2} = Return on Assets of year 2021

S_t: Sector Fixed Effects

C_t: Country Fixed Effects

u: Error Term

Governance Subfactor

$$ROA_{t+1} = \alpha + \beta\ G\ Score_{t} + \gamma\ ln\ (Total\ Assets)_{t} + \delta\ Beta_{t} + \zeta\ Dept\ Ratio_{t} + s_t + c_t + u$$

$$ROA_{t+2} = \alpha + \beta\ G\ Score_{t} + \gamma\ ln\ (Total\ Assets)_{t} + \delta\ Beta_{t} + \zeta\ Dept\ Ratio_{t} + s_t + c_t + u$$

Where:

G Score $_{t}$ = Governance Pillar Score of the year 2019

ROA $_{t+1}$ = Return on Assets of year 2020

ROA $_{t+2}$ = Return on Assets of year 2021

S_t: Sector Fixed Effects

C_t: Country Fixed Effects

u: Error Term

8.4 Linearity Assumption

Residuals and Fitted Values plots

8.4.1 ESG Scores of 2019 and Accounting Based Financial Performance of 2020

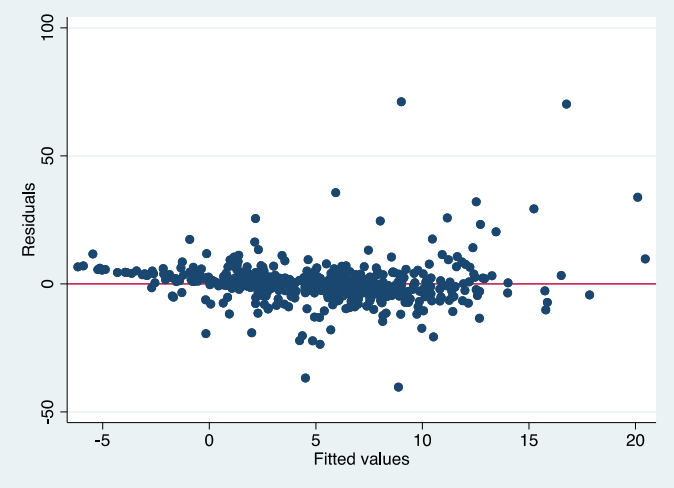

Figure 4: Plots of residuals and fitted values for one-year lag

8.4.2 ESG Scores of 2019 and Accounting Based Financial Performance of 2020

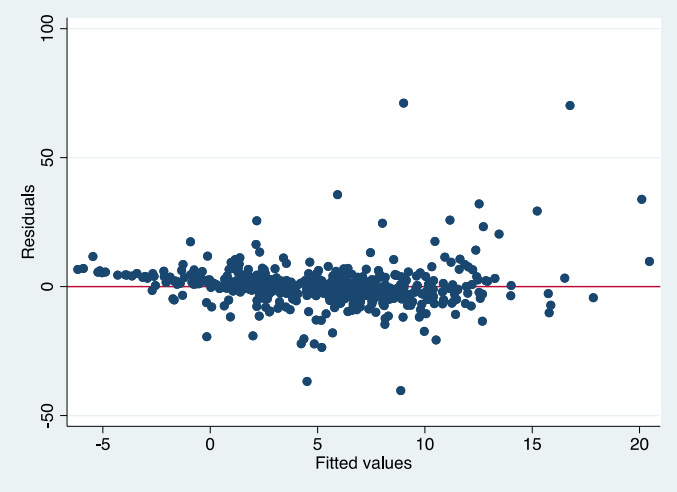

Figure 5: Plots of residuals and fitted values for two-years lag

8.5 Homoscedasticity Assumption

$$(1)\ ROA_{t+1} = \alpha + \beta\ ESG_t + \gamma\ ln\ (Total\ Assets)_t + \delta\ Beta_t + \zeta\ Dept\ Ratio_t + s_t + c_t + u$$

$$(2)\ ROA_{t+2} = \alpha + \beta\ ESG_t + \gamma\ ln\ (Total\ Assets)_t + \delta\ Beta_t + \zeta\ Dept\ Ratio_t + s_t + c_t + u$$

Table 7: Breusch-Pagan Test results

	(1)	(2)
chi-2(1)	**232.60**	**232.60**
Prob > chi-2	**0.000**	**0.000**