The Effect of Positive CSR Engagement on Firm's Financial Distress Risk in Europe

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Abstract

This study examines the influence of Corporate Social Responsibility on the financial distress risk of a company. The Environmental, Social and Governance (ESG) factors are employed as a proxy for CSR, while three different measures are applied to assess financial distress levels, namely Altman's Z-Score, Ohlson's O-Score and Shumway's Hazard Model. After analyzing a European dataset of 1097 publicly listed firms covering the period from 2002-2018, the results suggest that positive CSR engagement reduces the likelihood of falling into costly financial distress, whilst the findings are even more profess for non-crisis periods as well as environmentally sensitive industries. The results are robust to differences in reporting dates, prior levels of financial distress and reverse causality. Collectively, the findings are in line with the stakeholder view of CSR, suggesting that improving firm-stakeholder relationships decreases a firm's financial distress risk.

Keywords: Corporate Social Responsibility, ESG, Financial Distress, Altman Z-Score, Ohlson O-Score, Shumway Hazard model

Sustainable Development Goals: SDG08, 09, 10, 11, 12, 13, 14, 15, 16, 17

Abstrato

Este estudo examina a influência da Responsabilidade Social Corporativa (RSC) no risco de crise financeira de uma empresa. Os fatores ambientais, sociais e de governação (ESG) são utilizados como substitutos para a RSC, enquanto três medidas diferentes são aplicadas para avaliar os níveis de dificuldades financeiras, nomeadamente o Z-Score da Altman, o O-Score da Ohlson e o Modelo de Risco de Shumway. Após análise de um conjunto de dados europeu de 1097 empresas cotadas na bolsa, abrangendo o período de 2002-2018, os resultados sugerem que o envolvimento positivo em termos de RSC reduz a probabilidade de cair em situações de dificuldades financeiras dispendiosas, enquanto que os resultados são ainda mais professos para períodos que não sejam de crise, bem como para indústrias sensíveis do ponto de vista ambiental. Os resultados são robustos às diferenças nas datas de notificação, níveis anteriores de dificuldades financeiras e causalidade inversa. Coletivamente, os resultados estão de acordo com a visão de RSC das partes interessadas, sugerindo que a melhoria das relações entre as partes interessadas diminui o risco de angústia financeira de uma empresa.

Palavras-chave: Responsabilidade Social Empresarial, ESG, dificuldades financeiras, Altman Z-Score, Ohlson O-Score, Modelo Shumway Hazard

Objetivos de desenvolvimento sustentável: ODS08, 09, 10, 11, 12, 13, 14, 15, 16, 17

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"I know that all good things must come to an end and I've had an incredible ride. I just want to end it on the right note." – Alonzo Mourning

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Table of Contents

List of Tables

List of Figures

List of Abbreviations

Altman Z	Altman Z-Score
CFP	Corporate Financial Performance
CGS	Corporate Governance Score
CSR	Corporate Social Responsibility
ENV	Environmental Performance
ESG	Economic, Social and Governance
EU	European Union
FP	Financial Performance
HML	High Minus Low Stocks
IV	Instrumental Variable
MDR	Multivariate Discriminant Analysis
NGO	Non-Governmental Organization
Ohlson O	Ohlson O-Score
OLS	Ordinary Least Squares
ROA	Return on Assets
R&D	Research & Development
Shumway	Shumway Hazard Model
SIC	Standard Industry Classification
SMB	Small Minus Big Stocks
SOC	Social Performance
SRI	Socially Responsible Investment
US	United States
WML	Winner Minus Looser Stocks

1. Introduction

Over the last few decades, the issue of how firms deal with the interests of its stakeholders and the availability of resources, being of environmental, social or any remaining kind, has been an ongoing debate. In this context, the concept of Corporate Social Responsibility (CSR) was implemented by firms all over the world as a strategic tool. A substantial number of firms have used equity capital to establish socially responsible business strategies, which range from reducing their carbon footprints to improving labor policies and setting up corporate policies that benefit the environment. Whereas, socially irresponsible activities are being penalized by society and states. For instance, in the wake of the Volkswagen (VW) emission scandal, the company's market value declined by more than 20% overnight, while the Facebook stock lost 20% in value due to its data privacy dispute.

Firms foremost purpose is to make decisions that maximize the wealth of their firm's equity holders, thus maximize earnings. However, the view of CSR suggests that firms need to address the needs of all stakeholders, i.a. customers, local communities, suppliers, environment, employees, even if that results in negative NPV projects (Carroll, 1991). The key challenge to CSR lies within the contradicting views of maximizing shareholder and stakeholder value.

The current market environment is shifting towards an increasing interest of customers on the circumstances of production of goods and the environmental footprint of the supply chain. Thus, for a firm to stay competitive, it has become increasingly important to consider the relationships with all stakeholders. Society now expects companies to not only produce goods and services but start to take on a more valuable and responsible role in society. Hence, firms started to use CSR, amongst other reasons like stakeholder pressure, to differentiate themselves from competitors by filling gaps to enrich society's but also individual's quality of life (Jamali & Mirshak, 2007). Due to economic challenges such as the global financial crisis and the growing threat of the climate change, the pressure from external stakeholders on how to deal with available resources is increasing, amplifying CSR as part of the business strategy formulation of firms (Habek, 2014). In that sense, companies are including Economic, Social and Governance (ESG) factors on their risk governance structures and 90% of the world's largest companies are today filling sustainability reports, (McPherson, 2019). Additionally, investors are considering the value of socially responsible investment (SRI) when investing, which deals with the investment in companies that boast a great focus on positive CSR activities (Oh et al., 2013).

Extensive academic literature has investigated whether or not doing good for society actually benefits the business itself, thus evaluating the monetary rewards connected to CSR activities. In this context, research is pinned between shareholder and stakeholder view of CSR in the business context. The majority of earlier studies cover the link between CSR and financial performance (Jiao, 2010; Nelling & Webb, 2009; Orlitzky et al., 2003) and agree with the shareholder view of CSR, thus stating that a firm's CSR engagement can harm its risk position. Ullmann (1985) and Aupperle, Carroll, and Hatfield (1985) state that financial resources used for CSR engagement will be more beneficial when invested in profitable projects or used to solve debt constraints. More recent studies focus on the firm value creation potential through CSR activities and agree with the stakeholder view of CSR, suggesting that, amongst others, a firm's creditworthiness will be enhanced through the application of CSR (Sun & Cui, 2014). Despite the broad research on CSR and its effects, the relationship between the concept and a firm's risk profile is rather limited (Hsu & Chen, 2015). While some studies investigate the effect, research is restrained to Australian and US firms, where the understanding of CSR differs from the European perspective (Al-Hadi et al., 2019; Zheng et al., 2019). The lack in research is essential because whether CSR activities affect financial risk, in particular financial distress, offers an updated method to capture risk when assessing firm value. A situation of financial distress limits a company's potential to obtain funding and make use of tax shield benefits. Hence, if positive CSR engagement lowers financial distress risk, then, by implication, firm performance will be enhanced. In addition, possible strategic tools for managers could be adopted to enhance shareholder value and address stakeholder needs. Besides creating a "societal benefit", incorporating CSR as a part of the business strategy lowers cost of capital, cost of debt and diminishes capital constraints (Boubaker & Nguyen, 2019). Moreover, policymakers and regulators could decrease financial distress risk and help stabilize the economy by encouraging sustainability reporting and draft new regulations that support CSR related activities.

To fill the gap in existing literature, the present study aims to analyze whether CSR engagement of firms has an impact on their financial distress risk and therefore providing guidance for managers but also investors in their strategic and investment decision-making processes. In particular, CSR is proxied by a firm's ESG score, while three distinct bankruptcy prediction models quantify financial distress. The main hypothesis states that positive engagement in the total corporate social performance, measured as an aggregated ESG score, decreases the financial distress risk of a company. The study uses 9171 publicly listed European companies as its sample, between the years of 2002 to 2018, on which a set of OLS-regressions

was performed. The study contributes to existing literature in several ways. First, it examines the link between CSR and financial distress for European companies. Second, it adds to the body of literature that explains financial distress factors. Third, it expands research on the relationship between CSR and a firm's ability to raise capital.

The remainder of this paper is organized as follows: Section 2 discusses related literature and develops the hypotheses of this study. Section 3 outlines the data and sample collection, introduces the testing methodologies and displays key descriptive statistics. All relevant results are presented and discussed in Section 4. Section 5 concludes.

1.1. Development of CSR practices in Europe

On a global scale, the European Union can be characterized as one of the nations which has traditionally been more considerable and engaged regarding corporate social responsibility and the additive of social and environmental concerns to the bottom line of profit maximization. However, the concept has experienced even more sensation and relevance in recent years among European companies.

Even though, CSR relishes a wide acceptance of its core definition (Donaldson & Preston, 1995), it is crucial to understand that its relevance as well as its interpretation and operationalization diverges across time and different areas. While this is valid for differences among continents like Europe, the US and Asia, it is also applicable to smaller scales of regions, e.g. between Western Europe and Central and Eastern Europe (Steurer et al., 2012). Prior studies suggest that most companies act within the legal obligations and boundaries that are set in the environment of their given region (Lewicka-Strzalecka, 2006). In line with this, Clarkson (2016) argues that the reasoning for the differences in managing CSR practices lies within its nature of fulfilling a strategic response to its corporate environment, where the environment is specifically framed by the demand and insistence of external stakeholders. This argument is in accordance with the stakeholder theory, which will be described in greater detail in a later section of this study. Nevertheless, the European Union exhibits a form of shared corporate environment, which differs to a great extent from the United States position. Danko et al. (2008) argue that US companies view CSR practices as explicit, while Europe implicitly states a commitment to CSR. Explicit CSR is defined as activities that rely on a voluntary basis. In contrast, implicit CSR is concerned with the belief that corporations exist in a form of institutions that serve its stakeholders and society as a whole. It entails a number of values and

norms that require firms to address stakeholder requirements and demands in a mandatory way (Matten & Moon, 2008).

To overcome the issue of regional legal affection and create a uniformly framework, the European Union developed a Green Paper in 2001. The aim of the Green Paper was to inspire the dialogue on how the European member states should enhance the blooming of CSR on a national as well as international level. One of the key principles is the creation of increasing reliability in regard to a uniformly validation and evaluation of CSR activities. In addition, transparency, research on innovative practices and full usage of past experiences were of great importance when establishing the framework. It states that in order to reach the goal of a sustainable and socially responsible economy, all players have to take on active and participative roles (European Commission, 2001). The paper marked the starting point of a more open and universal discussion regarding CSR implementation within businesses and encouraged the development of other initiatives. While, the EU was facing a variety of crisis in the recent years like e.g. the refugee crises or the aftermath of the financial crisis in 2008, it was challenging to follow up on CSR activities and its framework. However, several initiatives were published and formed like the United Nations Sustainable Development Goals in 2015 or the EU Taxonomy just very recently that encouraged and promoted the development of CSR in Europe. Not only investors started to seek socially responsible investments, but also the pressure from external stakeholders is increasing more and more, while even managers started to accept the importance of more active engagement.

1.2. The ESG Framework

In order to measure the CSR engagement of a firm, this study follows the approach of several researchers in the field (e.g. Chen et al., 2016; Lins et al., 2017) by using an ESG score as a proxy. ESG scores are an illustration of a strategic ESG framework and they transparently and neutrally measure a company's relative ESG performance across various ESG themes. Before accurately quantifying the methodological approach of ESG in this study, it is important to elaborate on the concept and framework used to calculate the scores themselves. Research generally focuses on two main databases for retrieving CSR information: MSCI ESG and Refintiv Datastream ESG scores. In line with Chen et al. (2016), Lins et al. (2017), among others, I collect ESG scores from Refintiv Datastream ESG scores. The database determines the importance of comparable, precise and transparent ESG data and measures a company's relative performance based on objective and clear designed scores that are a reflection of the

company's ESG performance, commitment and effectiveness sourced from publicly reported information. The ESG score relies on more than 400 datapoints, ratios and analytics that are conducted for a total of 10 different themes within the three main pillars: Environmental, Social and Governance. The sources of the data include company websites, annual reports, NGO websites, stock exchange filings, CSR reports and news filings. The focus of the collection process lies on data quality, which is achieved through a combination of algorithmic and human processes (Refinitiv Reuters, 2020).

The weighted average of the three pillar scores forms the total ESG score, while each pillar is constructed on a portion of the 10 distinct categories. Figure 1 illustrates the affiliation of each category to its respective pillar score.

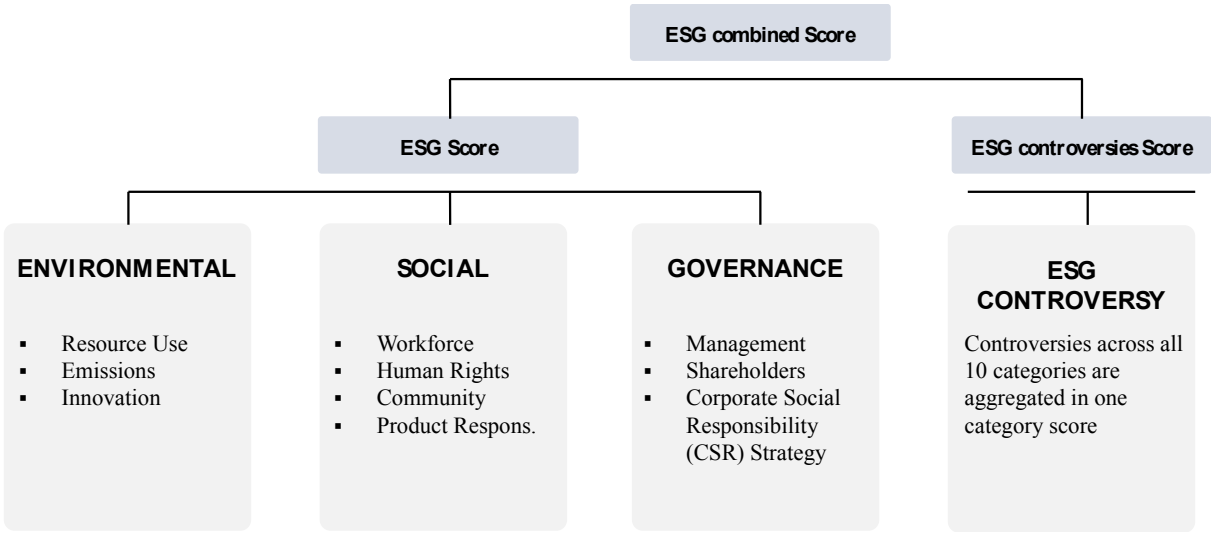

Figure 1*: ESG scores methodology framework. Source: Refinitiv 2020*

For example, under the social pillar, rating agencies analyze how well a company treats its workforce, how freely the workforce can exercise its human rights, how much a company is giving back to the society and where their products stand in terms of social responsibility. Each category is assigned its own weight allocation, which is displayed in Table I (Refinitiv Reuters, 2020).

Refinitiv Datastream provides ESG scores in two different metrics. On the one hand, simple to understand percentages are offered, ranging from 0% to 100% with 100% being the best score achievable and on the other hand letter grades from D- to A+ are retrievable. For the purpose of the thesis, the percentage scores are being used as they are more comprehensible to evaluate.

Table I

Weight Allocation ESG Factor

The table represents the weight allocation of each category to the respective ESG pillar. The weight allocation of the three ESG pillars demonstrates the total ESG score. Source: Refinitiv 2020.

Factor	Weight
Resource use	15%
Innovation	13%
Emissions	15%
Environmental Score	43%
Workforce	13%
Human Rights	5%
Community	9%
Product Responsibility	4%
Social Score	31%
Management	17%
Shareholders	5%
CSR Strategy	3%
Governance Score	26%
ESG Score	**100%**

In the context of this study, it is important to keep in mind that most of the metrics measured to arrive at three pillar scores as well as the total ESG score is based on activities that the companies already implemented and where its effects are actively measured through various indicators for the year of interest. Therefore, it is feasible to use the current year's ESG score to accurately display the company's CSR engagement and the consequences resulting therefrom for the same year.

2. Literature Review and Hypothesis Development

Empirical Analysis on the relationship between Corporate Social Responsibility and financial distress is diverging and still in the early stages. Even though, many studies have examined the correlation between CSR and financial performance, literature lacks in fully exploring the link to financial distress. In order to develop the hypothesis and display the contribution of this paper, existing literature regarding the subtopics and their interconnection will be discussed in the following sections.

2.1. Corporate Social Responsibility

Corporate Social Responsibility as part of Social Responsibility of business is one of the earliest concepts that has been highly elaborated by academics in the study of business and social relations. Howard R. Bowen's findings in his publication Social Responsibilities of the Businessman (1953) marked the starting point of today's enlarging interest and modern discussion of different approaches of Corporate Social Responsibility. In his early developed theory, he suggests that Corporate Social Responsibility is associated with the duty of corporations to demonstrate behaviors, make decisions and pursue goals, which are not only desirable regarding their profitability, but also in line with the values of our society (Bowen, 1953).

The term CSR has been defined in various ways, yet no universal definition has been established (McWilliams et al., 2006). While Milton Friedman (1970) views CSR from a sole economic standpoint of increasing shareholder wealth, other theories vary from a segmentation into four elements of responsibility, being economic, legal, ethical and philanthropical (Carroll, 1979) to the stewardship theory, where managers have a moral obligation to act ethically responsible without considering the financial implications for the firm (Donaldson & Davis, 1991). Despite different definitions of the concept and divergent dimensions of the responsibilities for managers, it seems that the modern approach suggests a dependency of the economic system on firms stepping up to solve the problems of the public (Hakimy et al., 2012).

In contrast to the agency problem and shareholder theory (Friedman, 1970), R. Edward Freeman (1984) introduces a more beneficial view on firm's engagement in CSR activities that was an extension of the inducement-contribution framework by Chester Barnard's (1938). The stakeholder theory suggests that firms need to address the needs of various groups that can influence the firm's performance. He defines the stakeholders of a company beyond the traditional view on constituents by including silent stakeholders like local communities and the environment (Simmons, 2004). Thus, stakeholder theory proposes a new way on the responsibilities of firms that exceed the pure profit maximization principle as it implies that the needs of shareholders cannot be fulfilled by exhaustively disregarding other stakeholders needs (Foster & Jonker, 2005; Hawkins, 2006).

Freeman's study has become a widely utilized base for later research and academic papers, although it has been affronted for solely concentrating on power endeavors between the firm and its stakeholders (Scherer & Palazzo, 2007). In addition, other studies elaborate on the challenge of aligning the ethical component of Corporate Social Responsibility with the

implementation of the management perspective of stakeholder theory (Crane et al., 2009; Parmar et al., 2010; Windsor, 2006). Besides no direct link between CSR activities and the stakeholder theory, both concepts agree with the justification that satisfying stakeholders' needs became a vital element of business strategy, thus supporting the application of CSR within the business context to efficiently fulfill stakeholders' interests.

To understand the development and basis of Corporate Social Responsibility within the context of business and literature it is important to elaborate on the four-part definition of CSR first introduced in 1979 by Archie B. Carroll but revised in a pyramid structure in 1991. The basic argument suggests that managers need to have three principles in place in order to practice CSR within the firm, being a basic understanding of CSR, defined stakeholders to whom the firm has a responsibility and a definition regarding the approachability of the issues (Carroll, 1979). The four dimensions are divided into economic, legal, ethical and philanthropy streams that are considered to be additive but not sequential (Carroll, 1995). The base of the pyramid suggests that firms are expected to produce goods and services and make a profit, while the legal component discusses societies expectation of businesses to obey the law. The third layer is concerned with the ethical standards and practices that exceed those enforced by law. Lastly, discretionary responsibility is the firm's philanthropic offerings that are directed at returning good to society (Carroll, 1991).

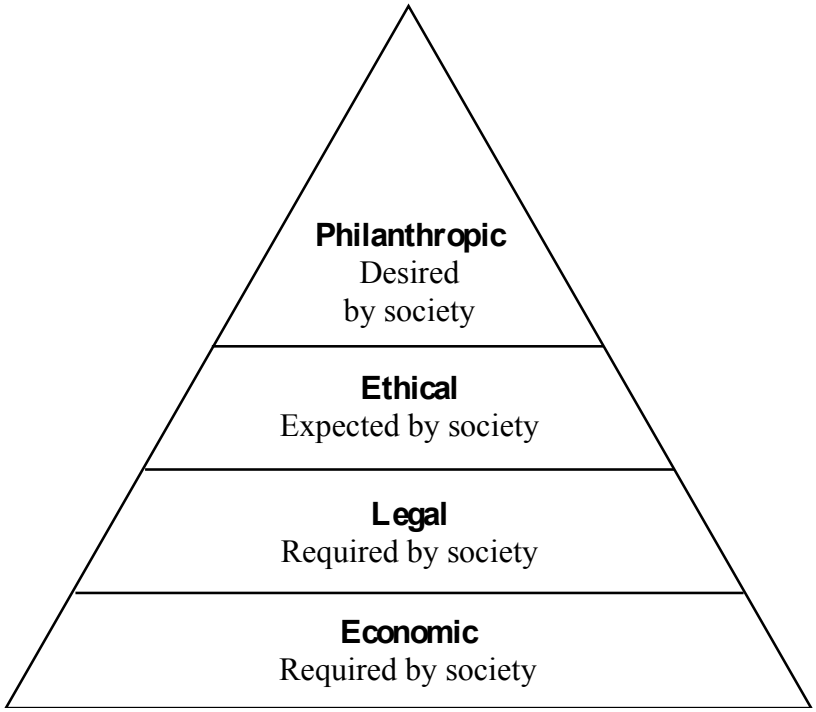

Figure 2: *Pyramid for four-part definition of CSR by Archie B. Carroll*

According to the Commission of the European Communities (2001), corporate social responsibility is best described "[...] as a concept whereby companies integrate social and environmental concerns [...] on a voluntary basis." Despite the non-existence of a uniformly definition in literature, for the proceeding of the study, CSR will be understood by the general definition of the Commission of the European Communities.

2.2. CSR & Financial Performance

Many academics have examined the relationship between corporate financial performance (CFP) and financial distress. In line with previous research, this study follows the assumption that CFP and financial distress are closely interconnected (Opler & Titman, 1994; Safieddine & Titman, 1999; Jandik & Makhija, 2005). Hence, before investigating the link between financial performance and financial distress, it is indisputable to first elaborate on CFP as it can be visually displayed as the intermediary between both concepts.

As the importance of environmental management, accompanied by the significance of corporate social responsibility is progressively increasing (Cho et al., 2019), the literature examining the interdependence between CSR and financial performance is likewise gaining more relevance. Jamali and Mirshak (2007) find that firms use CSR as an instrument to differentiate themselves from other companies, while others even claim that it is not only seen as an important business strategy but also as a tool to attract the increasing number of socially responsible investors (Cho et al., 2019; Oh et al., 2013).

Prior researches on the relationship between corporate social responsibility and corporate financial performance is vast. Even though, on average, in more recent studies the relationship is positive, there is also literature proving a negative relationship between the two. Most conventional views, backed by Alexander and Buchholz (1978), believe that investing in CSR represents additional costs for the company, which deteriorates their profitability. These results are in line with other authors' research (Stanwick & Stanwick, 1998; Baird et al., 2012). However, contradicting views argue that companies with low CSR could also be, to some extent, more exposed to risk than high performing firms and note a positive relationship between CSR and CFP (McGuire et al., 1988; Simpson & Kohers, 2002; Jo & Harjoto, 2011; Saeidi et al., 2015). Van Beurden & Gössling (2008) reviewed 34 studies on this subject and argued that studies showing a negative relation between the two indicators relied on outdated material.

As financial performance can be examined in very different ways, prior studies have found distinctive outcomes when investigating the relationship between CSR and financial performance. McWilliams and Siegel (2001) suggest that implementing corporate social responsibility practices can help the firm to distinguish its products on its competitive market. Other studies stress that it will reduce its exposure to possible government-imposed fines (Shane et al., 1983; Stagliano, 1991), while Ruf, Muralidhar, Brown, Janney and Paul (2001) argue that employee loyalty and commitment as well as customer goodwill will be enhanced. Examining the same question from a different view, Mackey, Mackey and Barney (2007) use a theory-based model in which supply and demand of socially responsible investments are applied as proxies to identify whether those opportunities improve, diminish or present no effect on the market value of firms. They conclude that managers of listed companies finance CSR projects that do not maximize the present value of the future cash flows, nevertheless, improve the market value of their firm.

Whereas a large extent of literature has analyzed the relationship between CSR and CFP, only a small amount focuses on the riskiness of firms. Orlitzky and Benjamin (2001) found support for the argument that a higher CSR performance decrease's a company's financial risk. Yet, the authors used a rather small sample for their study and the time period analyzed, 1978-1995, was outdated as the implementation of CSR practices among firms is just becoming more common since the beginning of this century. Also, the majority of studies examine an aggregate measure of CSR, which might be ignoring the fact that each dimension might not be equally significant for firms and investors.

However, complementary to studies that elaborate on which type of risk CSR strategies are associated with, some researchers have looked at which dimensions of CSR strategies have more or less impact on firm characteristics. Olritzky et al. (2003) suggest that improved social as well as environmental performance lead to a positive effect on CFP, where the impact of environmental performance has shown to be moderately lower. In line with their result, Salama et al. (2011) and Sharfman and Fernando (2008) find a negative relationship between the environmental behavior and financial risk of the company. Apart from slightly different measures of the ESG scores, Cheng, Ioannou, and Serafeim (2014) also conclude that the environmental and social constraint have an impact. Their findings suggest that especially the environmental dimension reduces capital constraints and lead them to the conclusion that agency costs and information asymmetry can be eased by improved ESG execution. However, for instance, another study by Bouslah et al. (2013) presents somewhat divergent results. By

using different subsamples, they find both negative and positive relationships. Equivalent vagueness can be proposed in terms of the governance dimensions and diversity.

After reviewing the literature on the relationship between CSR and financial performance, it can be stated that various studies found diverging results. One reasonable explanation for the disparity is the lack of a universal definition of CSR and how to measure it quantitatively as well as the usage of outdated samples of prior studies. As CSR has just been gaining more importance within firms and society, recent samples are much more meaningful. In addition, even though the costs occurred in relation to implementing CSR policies have to be funded right away, the benefits will most likely not show until much later. However, overall, in accordance with Van Beurden & Gössling (2008) it can be stated that on average more recent studies find a positive relationship between CSR and financial performance.

2.3. Financial Distress

Literature on financial distress occupies a long and accomplished history. First attempts to predict bankruptcy and distinguish between healthy and collapsed firms started with Beavers's (1966) initial application of individual ratios, moved to the Altman's (1968) Z-Score, which is using multivariate discriminant analysis (MDA) to predict the likelihood of bankruptcy, and since then has observed many more models approaching – for example the O-score by Ohlson (1980) who uses a logit model and Zmijewski's (1984) Probit model, which is based on accounting data but applies different independent variables. A more advanced model was introduced in 2001 by Shumway, who offers a discrete-time hazard model in order to predict the failure of a company based on not only accounting but also market data. Contrarily to the basic static logit models that incorporates solely one year for each observation, the hazard model integrates the full life span of data- all years of observation- for each firm within the dataset.

Financial Distress is a very broad term that has been associated with very different definitions, ranging from insolvency to failure, bankruptcy and default. Many studies model financial distress as the point when a firm enters into bankruptcy status (Frydman et al., 1985; Jo et al., 2001; Theodossiou et al., 1996). Others propose alternative measurements as the change in equity prices, interest coverage ratio, missed dividend payments and the first year that current maturities of long-term debt exceed cash flows. The lack of a universal definition of when companies enter into financial distress limits the prediction literature as some alternative indicators used do not necessarily incorporate a situation of financial distress (Platt

& Platt, 2002). In addition, some effects might be an issue of causality rather than a prediction of financial distress (Opler & Titman, 1994).

Furthermore, traditional studies depict financial distress as a disturbing event, being especially costly for debtholders and nonfinancial stakeholders as it initiates a progression for firms to act in a destructive manner (Opler & Titman, 1994). In addition, it diminishes the opportunity of access to loans and due to the agency conflict increases costs of stakeholder relationships, as different parties aim for different interests. However, more recent studies argue that financial distress sometimes enhances corporate performance and promotes changes in a firm's legal form that require excess leverage. In line with that, Jensen (1989) and Wruck (1990) suggest that financial distress causes managers to take on value-maximizing projects that improve firm value, which would otherwise have been neglected. While, according to literature financial distress can be both– beneficial and costly- depending on the situation, Cutler and Summers (1988) show that it is rather challenging to quantify the costs and value of financial distress.

Most of the wide literature addressing financial distress focuses on financial distress and bankruptcy prediction models and theories. The predication models are primarily based on accounting measurements, thus using cash flow, profitability and leverage ratios as independent variables (Hillegeist et al., 2004). The two models that are mostly cited and applied in other studies as a measure of probability of default are the Altman Z-score (1968) and Ohlson O-score (1980). Papers that deploy those models are for example Francis (1990), Berger, Ofek and Swary (1996), Dichev (1998) and Griffin and Lemmon (2002). However, traditional models have been criticized by many researchers. Mensah (1984) suggests that the predictability of such measures is limited due to the nature of accounting statements and the change in distribution of accounting ratios over time. Hillegeist et al. (2004) argue that accounting statements are of restricted adequacy as they are composed on a going-concern basis. More recent studies examine the application of market variables or a combination of both (Hillegeist et al., 2004). Shumway (2001) proposes a discrete-time hazard model, instead of the multivariate discriminant analysis suggested by Altman. Black and Scholes (1973) and Merton (1974) introduce market-based models using a contingent claims approach that are based on structural models with a set of underlying assumptions. Many recent papers have used this approach for assessing the likelihood of corporate default. Yet, evidence is vast when it comes to the performance of those models (Agarwal & Taffler, 2008). A more detailed overview regarding bankruptcy prediction models can be found in Allen et. al (2004). In addition, in order

to demonstrate their significance and importance within bankruptcy literature, a list of selected papers citing the Ohlson O-score and Shumway Model is reported in Appendix I (Table V).

2.4. CSR & Financial Distress

Previous literature that studies the relationship between CSR and financial distress in general conclude a negative effect. As already analyzed, financial performance of firms is on average positively impacted by increasing application of CSR related activities. The stakeholder theory implies that firms should consider the needs of various stakeholders instead of the pure shareholder profit maximization principle. Godfrey et al. (2009) and Attig et al. (2013) find that incorporating the needs of external stakeholders and strengthening the relationship leads to improved financial performance and future growth. Limkriangkrai, Koh, and Durand (2017) use a sample of Australian firms and conclude that ESG performance is positively correlated to leverage, which could be explained by lower capital constraints. In line with their result, Cheng et al. (2014) find that capital constraints can be reduced by increasing CSR implementation as higher stakeholder involvement as well as clarity and reporting regarding CSR practices will be established. Furthermore, a recent study suggests that CSR can increase firm value by reducing systematic risk (Albuquerque et al., 2019). Taken together, the findings suggest that ESG activities are negatively correlated with financial risk, leading to a lower probability of getting into a crisis for the firm (Oikonomou et al., 2012).

Risk management is closely connected to a firm's engagement in corporate social responsibility. According to risk management theory, a company that is facing times of financial distress, yet actively manages CSR policies, can achieve positive moral capital for different stakeholders that can serve as a safeguard for the company (Godfrey, 2005). Those associations lead to favorable affiliations of a firm towards external stakeholders, resulting in loyalty and beneficial appearance of the company (Luo & Bhattacharya, 2009). Chang et al. (2014) conclude that loyalty preserves a company from bad restrictions in case of a crisis, thus generating more stable cash flows and reducing risk. In line with their result, Godfrey et al. (2009) build on their theory and display that shareholder value experiences less negative fallout in case of a turmoil for firms that practice CSR engagement. To conclude, the risk management theory supports the argument that financial distress risk of a company and engagement in CSR are negatively correlated.

As previously outlined, CSR and stakeholder theory are closely linked to each other. In this context, implementing CSR practices within the firm is associated with a well performing

management (Gross, 2009). One common explanation as to why firms fall into financial distress can be given by malpractice of management (Altman & Hotchkiss, 2006), thus firms with quality CSR engagement are less likely to fall into financial distress than otherwise due to improved quality management. In addition, a firm's attractiveness as an employer might be improved by incorporating CSR activities, resulting in attracting and keeping a highly skilled workforce (Greening & Turban, 2000; Turban & Greening, 1997).

There is a wide body of literature that already examined the relation between CSR and financial performance. However, while studies are diverging in their results, there is more scientific consensus on the relationship between CSR and financial distress risk. Studies that explored the topic generally correspond to a negative correlation. Gross (2009) uses a US sample and concludes that CSR engagement is negatively correlated with the degree of financial distress. In line with his result, Al-Hadi et al. (2019) find a negative association between positive CSR performance and financial distress for publicly listed Australian firms. Moreover, they suggest that the correlation is even stronger for firms that are already in a mature stage of their firm life cycle. Nevertheless, previous research on the topic is rather limited and inadequate. Research is especially limited in studying the effect among European firms. Building up on preceding findings, the study will analyze the relationship between CSR and financial distress among a sample of European firms. I expect to identify a negative correlation between the two concepts in line with preceding studies. Therefore, the first hypothesis of this study is formulated as follows:

H1*: Positive engagement in the total corporate social performance, measured as an aggregated ESG score, decreases the financial distress risk of a company.*

Cheng et al. (2014) uses ESG performance as an indicator of corporate social responsibility activities. This paper will follow the same approach and use ESG as a proxy for CSR.

While some studies already examined the relationship between CSR and financial distress, none of them elaborated the individual effect of the ESG components on financial distress. To summarize, literature on the individual components of ESG and FP generally correspond to a positive relationship. Following the previous argument that financial performance and financial distress are two closely interconnected concepts, this paper argues that environmental, social and corporate governance activities individually as the three dimensions of corporate social responsibility are negatively associated with financial distress. Thus, firms that invest in the three are less likely to fall into situations of financial distress.

$\boldsymbol{H2_1}$*: Positive environmental activities decrease a company's risk to fall into Financial Distress.*

$\boldsymbol{H2_2}$*: Positive social activities decrease a company's risk to fall into Financial Distress.*

$\boldsymbol{H2_3}$*: Positive corporate governance activities decrease a company's risk to fall into Financial Distress.*

Lastly, literature lacks in sufficiently exploring the distinction between different industries and in how far this could affect the potential impact CSR activities can have on financial performance and ultimately financial distress risk. The importance of the ESG dimensions respective to the business activity is very likely to diverge depending on the sector. Eccles et al. (2015) claims that ESG information has to be defined on a sector basis as the activities might have a different value creation potential for the business itself in one industry than the other. Supporting the same thesis, Jo and Na (2012) limited their analysis to 'sinful industries' and find that positive CSR activities of firms in industries that are considered to be controversial negatively affects firm risk. Moreover, they were able to conclude that the impact of risk mitigation through CSR activities is more economically and statistically significant in controversial industry firms than in non-controversial ones. Following a congruent reasoning, Bouslah, Kryzanowski, and M'Zhali (2013) display the importance of differentiating between types of firms among their industry and the ESG dimensions as their results diverge for S&P 500 firms and non-S&P 500 firms, resulting in a significant positive and negative correlation. Based on the argument and in line with Sassen et al. (2016) this paper argues that the effect of CSR engagement on the financial distress risk of company's differs for environmentally sensitive industries due to specific industry requirements.

H3*: Positive engagement in the total corporate social performance, measured as an aggregated ESG score, has different effects on a company's financial distress risk for environmentally sensitive industries.*

3. Data & Methodology

3.1. Sample composition

Data on CSR measures is retrieved from Refinitiv ESG database. Financial information is obtained from Refinitiv Datastream. The Refinitiv ESG score database is one of the largest data collections concerning ESG measurements and widely used in the CSR literature (e.g., Krüger, 2015; Liang & Renneboog, 2017; Lins et al., 2017; Shen et al., 2016; Stellner et al., 2015). The

database covers approximately 350 firms in 2002 and continually increases up to around 1159 firms in 2018. After cleaning the dataset, due to missing distress risk measures and control variables and excluding financial firms because of their different capital structure, 216 companies were considered in the starting year of the sample. Over the entire time span of 17 years, the number of companies available for each year increases significantly up to 798 observations in 2018. The final sample is an unbalanced panel of 9171 firm-year observations consisting of 1097 individual firms from 2002-2018. The Refinitiv ESG database includes 20 different European countries with firms in broadly all industries, classified from the STOXX Europe 600 index as well as smaller European companies. The distribution of companies across industries and years is shown in Table II.

Table II

Observations by Year and Industry

The table represents the distribution of companies across years and industries. The assignment of the industries is according to the Fama and French 12 Industry Classification. The industries are Business (BI), Chemicals (CH), Consumer Durables (C[D]), Consumer Non-Durables (C[ND]), Healthcare (HC), Manufacturers (MA), Oil & Gas (OG), Others (OT), Transportation (TR), Utilities (UT), Wholesale (WH).

Year	BI	CH	C[D]	C[ND]	HC	MA	OG	OT	WH	TR	UT	Total
2002	20	13	15	11	14	36	9	51	17	10	20	216
2003	20	14	15	13	14	37	10	53	17	10	21	224
2004	27	18	18	18	18	56	20	100	23	13	26	337
2005	33	21	25	23	19	62	23	120	25	16	35	402
2006	35	22	26	25	19	65	23	123	26	16	37	417
2007	39	23	28	27	23	69	25	133	26	18	47	458
2008	44	26	31	27	25	75	30	143	30	19	53	503
2009	50	28	35	31	28	80	31	152	33	21	54	543
2010	53	28	37	32	29	86	35	158	35	23	57	573
2011	53	30	38	36	29	90	37	162	35	23	61	594
2012	53	30	39	38	29	97	38	167	37	23	64	615
2013	53	30	40	40	29	102	41	177	38	25	64	639
2014	56	31	40	39	30	103	41	181	40	25	64	650
2015	58	34	45	41	35	112	44	192	41	27	65	694
2016	60	35	46	42	38	116	44	202	47	27	65	722
2017	68	36	48	47	42	127	45	223	50	32	68	786
2018	70	36	49	46	43	131	44	230	49	30	70	798
Total	792	455	575	536	464	1444	540	2567	569	358	871	9171

It is noticeable that the manufacturing sector represents the largest portion of the sample with a total of 1444 observations (Year 2018: 131). The utilities sector also accounts for a great portion amounting to 871 over the entire sample period. Regarding the regional distribution, Northern Europe shows the highest number of observations within the sample with 4321 (Year 2018: 377). Western Europe displays by far the second largest portion with 3352 (Year 2018: 285).

3.2. Regression parameters

As outlined above, all data for the calculation of the regression variables is retrieved from Refinitiv Datastream. Financial ratios were calculated autonomously instead of retrieving readily computed ratios in order to increase the number of available data points. Thomson Reuters Datastream is used by many studies and acknowledged research in literature and considered to be a trustworthy and reliable source. Appendix II (Table VI) gives definitions and explanations of each parameter used in the regression model.

3.2.1. Measuring CSR – Independent variables

To measure CSR, I apply an ESG score as a proxy for social responsibility performance of a company. While the Refinitiv Datastream ESG score database offers a very detailed collection of in-depth variables, this study focuses on the three main pillars: Environmental, Social and Governance – in order to assess the general relationship between CSR and Financial distress risk before evaluating the specific components and sources of each pillar. Thus, a combined ESG score as well as the three pillars individually are being tested.

The ESG Score (*ESG combined*) is measured by the equally weighted average of the individual three ESG scores. The pillar score Environmental (*ENV*) represents the influence of the company on natural and unnatural life of the environment (air, land, water). Specifically, it calibrates the company's dedication and efficaciousness in reducing environmental emissions. The Social pillar score (*SOC*) describes the ability to create trust and loyalty with employees, customers and society. For instance, it measures commitment and effectiveness in the procurement of value-added products and services that ensure customer safety. The last pillar score Governance (*CGS*) identifies i.e. a company's systems and processes designed to ensure that its board members and managers act in the best interests of a company's shareholders. In a broader sense it measures compliance with best practice principles for corporate governance.

3.2.2. Measuring Financial Distress Risk – Dependent variables

As outlined previously, literature provides a wide collection of different models that capture the financial distress risk of a company. In order to quantify the FDR of a firm, this study deploys the Altman Z-Score (*Altman Z*), the Ohlson O-Score (*Ohlson O*) and the 2001 Shumway Model (*Shumway*). Traditionally, the two most cited and adopted models are the Z-Score and O-Score (Wu et al., 2010). However, more recent studies argue that the predictability of those measures is limited and that market variables or a combination thereof provide a better insight into the likelihood of financial distress risk, while the Altman Z-Score experiences criticism. In addition, a large body of literature employs accounting and market-based variables in order to predict bankruptcy (see, e.g., Campbell et al., 2008; Richardson et al., 2015; Tykvová & Borell, 2012). Thus, along with the first two models, to validate more meaningful results and create robustness, a third distress risk model is being applied that combines market as well as accounting data (*Shumway*).

The Altman Z-Score is computed following the procedure outlined by Altman (1968). Accounting data is retrieved as of the most recent annual report date for each particular year to predict bankruptcy for the same year.

To obtain the Ohlson O-Score, financial ratios are calculated using data for the year that bankruptcy risk is aimed to be quantified for. The formula that is applied follows the proposition by Ohlson (1980; Equation 2 from Griffin and Lemmon, 2002). A more detailed explanation of the formula and its ratio can be found in his study as well as Appendix II (Table VI).

Lastly for the combined model, Shumway's prediction model is deployed. The hazard model defines five different variables that are designed to project the distress risk: Total Liabilities/ Total Assets, Net Income/ Total Assets, Relative Size, Excess Returns and Sigma. Following the approach suggested by Shumway, all data is lagged by one year in contrast to the other two models described above. Relative Size is defined as the natural logarithm of the market capitalization of firm *i*, divided by the total size of the European market. Therefore, the European market is proxied by the total value-weighted size of the EURO STOXX 600 and all data is lagged by one. Excess returns are calculated by subtracting the monthly cumulated annual stock returns of the EURO STOXX 600 by the monthly cumulated annual stock returns of firm *i*. Finally, SIGMA is characterized as the idiosyncratic risk of each firm's stock returns. The idiosyncratic risk is caused by company-specific characteristics (Luo & Bhattacharya, 2009) and is measured as the standard deviation of the residuals from the four-factor model

using the monthly excess returns over the past 12 months. The latter model is characterized by the following equation:

$$R_{it} - R_{ft} = \alpha_i + \beta_{iM}(R_{Mt} - R_{ft}) + \beta_{iS}SMB_t + \beta_{iH}HML_t + \beta_{iW}WML_t + \varepsilon_{it}$$

A detailed description of the calculation of SIGMA can be found in Appendix II (Table VI).

In order to be able to compare the results from one traditional and a more recent model, the respective scores of the O-Score and the Shumway model were transmitted into probabilities of bankruptcy. Therefore, a one unit increase in those models displays a one percentage point increase in probability of default.

3.2.3. Control Variables

A firm's likelihood of falling into financial distress is influenced by various factors. With the aim of mitigating effects inside firms, industries and time series trends a number of control variables are applied. Previous research has implemented distinct variables to control for confounding effects, however a multitude of studies uses the same set of parameters with slight distinctions (Al-Hadi et al., 2019; Hillman & Keim, 2001; Waddock & Graves, 1997). The control variables selected for this study are Size, Cash holding, Profitability, Leverage, Liquidity and Research and Development expense, Region, Industry sector and Year effects. A detailed description of each variable is presented below:

i. Firm size (*Size*) is characterized as the natural logarithm of the book value of total assets. The variable manages for differences in funding opportunities and capital constraints, the capacity to deal with competition and differences in resourcing. Prior studies suggest that larger firms are able to handle periods of financial distress better compared to smaller firms due to enhanced market and political power.
ii. Cash holding (*Cash*) is defined as the ratio of cash & cash equivalents divided by the book value of total assets. This variable is important to consider as is shows the amount of readily available capital to cope in times of financial restrictions.
iii. Profitability (*Return on Assets*) is used to control earnings ability and profitability of a firm as firm's that generate greater financial performance face a lower likelihood of falling into financial distress.
iv. Leverage (*Leverage*) measured as short-term and long-term debt divided by the firm's book value of total assets. Due to the high correlation between indebtedness of a company and its level of FDR it is important to control for the leverage ratio.

v. Liquidity (*Quick Ratio*) is defined as the ratio of Cash & Cash Equivalents and Accounts Receivable divided by Current Liabilities. As previous literature suggests a positive association between liquidity levels and riskiness of financial distress (e.g. Subramaniam et al., 2016), I control for Liquidity that shows how well a company is able to meet its financial obligations and funds its day-to-day business operations.
vi. R&D exposure (*R&D*) displays a firm's R&D expenses divided by the book value of its total assets. Companies with a high level of R&D intensity are considered to be more subject to risk of financial distress compared to capital intensive firms.
vii. Finally, Industry sector (*Industry*), Region (*Region*) and Years (*Year*) are controlled for with dummy variables to mitigate effects inside industries, inside different regions and time series trends. To divide the companies into different industries, I use the four-digit SIC code and assign the companies to the Fama and French 12 industry classification (French, 2020). The sample is divided into four European regions: Eastern, Northern, Southern and Western Europe according to the definition by the United Nations Geoscheme for Europe (United Nations, 2020).

3.3. Methodology

The engagement of companies in CSR related activities is currently undergoing a structural change and is receiving increasing importance not only in literature but also in practice. Due to its gaining relevance and wider acceptance, many investors and stakeholders indeed require firms to invest in CSR activities. Thus, this structural change can have an impact on the riskiness of companies hence influencing its risk of falling into financial distress. The aim of this study is to examine whether a firm's positive CSR engagement will lower its financial distress risk over time through a panel data method. The focus of the study is limited to European companies as prior literature lacks in exploring the link between CSR and FDR within Europe and this study seeks to fill this gap. The baseline model used for the analysis is an Ordinary-Least-Squares Regression (OLS) while using cross-sectional data with continuous variables. Year-fixed effects, regional dummies as well as industry dummies are implemented in the regression model to control for changing economic conditions over time and effects inside industries and regions. All regressions are conducted over a time period from 2002-2018. Python was utilized to calculate the bankruptcy prediction models and carry out the regressions.

In order to gain an in-depth understanding of the relationship between CSR and financial distress risk a three-step methodology is applied. Thus, different sets of regressions will be

carried out and analyzed, starting with the most general score and moving to a more detailed analysis therefrom. The first set of regression will therefore examine the link between the overall ESG score (*ESG combined*) and the three different models of financial distress being Altman Z-Score (*Altman Z*), Ohlson O-Score (*Ohlson O*) and the Shumway Model (*Shumway*). The reason why three different bankruptcy prediction models are used is due to achieving higher robustness among results. In addition, the control variables defined above will be included in all of the following regression models. For the first regression the following relationship is tested:

$$FDR_{it} = \alpha_{0it} + \beta_1 ESG\ combined_{it} + \beta_2 Size_{it} + \beta_3 Cash_{it} + \beta_4 ROA_{it} + \beta_5 Leverage_{it} + \beta_6 Liquidity_{it} + \beta_7 R\&D_{it} + \Sigma\beta_8 Industry_{it} + \Sigma\beta_9 Year_{it} + \Sigma\beta_{10} Region_{it} + \varepsilon_{it}$$

The regression aims to test whether a significant relationship between CSR and Financial Distress exists. The results may vary across different bankruptcy prediction models applied; however, I expect to find a negative link between increasing engagement in CSR activities and the level of financial distress risk observed. This expectation is in line with Hypothesis 1. As noted earlier, an increase in the financial distress risk implies a higher level of bankruptcy risk. Thus, coefficient estimates should display a positive algebraic sign for the Altman Z Model and a negative algebraic sign for the other two Models to support H_1.

The second set of regressions aims to give a more in-depth overview of which pillars drive the decrease in financial distress risk when implementing CSR activities. Therefore, all three dimensions of ESG (*ENV, SOC, CGS*) will be used as explanatory variables to estimate the dependent variables, being the three bankruptcy prediction models. The relationship is tested with the following regression equation:

$$FDR_{it} = \alpha_{0it} + \beta_1 ENV_{it} + \beta_2 SOC_{it} + \beta_3 CGS_{it} + \beta_4 Size_{it} + \beta_5 Cash_{it} + \beta_6 ROA_{it} + \beta_7 Leverage_{it} + \beta_8 Liquidity_{it} + \beta_9 R\&D_{it} + \Sigma\beta_{10} Industry_{it} + \Sigma\beta_{11} Year_{it} + \Sigma\beta_{12} Region_{it} + \varepsilon_{it}$$

The results of this regression will display the individual contribution of each ESG dimension to the effect of CSR on financial distress risk. Hence, the outcome is of great interest as it can reveal in which ESG pillar it is most advantageous for a firm to invest in, in order to decrease the level of financial distress risk. Prior literature is diverging in results when regressing the individual relationships of ESG on FDR, however this second model will allow to test for $H2_1$, $H2_2$ and $H2_3$. I expect to find a negative relationship between the individual dimensions and the three bankruptcy prediction models for the majority of tests.

Lastly, in order to test Hypothesis 3, the last set of regressions is performed. Hereby, the same type of regression is carried out for the combined ESG score but dividing the sample into two subsamples according to their classification of environmentally sensitive industries, defined in Table III. Research suggests that some industries are more reluctant to positive engagement in CSR than others. Therefore, it is of great interest to investigate how positive CSR activities are influencing the financial distress risk of firms across industries to a different extent in order to adjust capital employed in the most influential and beneficial way. For environmentally sensitive industries it might be more meaningful to invest in CSR activities to lower the financial distress risk, while for others the effect might be smaller. This regression is based on the assumption that the effects of ESG factors on FDR measures differ due to specific industry affiliations. In line with Hypothesis 3, I expect to find greater coefficients for environmentally sensitive industries.

Table III

Environmentally Sensitive Industry Classification

The table defines the classification to environmentally sensitive and non-sensitive industries according to the ''NAICS Codes of Environmentally Sensitive Industries'' published by the US Small Business Administration, which is matched with the industry classification employed in this study.

Environmentally Sensitive Industries	Environmentally Non-sensitive Industries
Consumer Non-Durables	Consumer Durables
Manufacturing	Business
Oil & Gas	Utilities
Chemicals	Wholesale
Transportations	Healthcare
	Other

3.4. Descriptive Statistics

Table IV reports the descriptive statistics for the bankruptcy prediction models (panel A), independent variables (panel B) and the control variables (panel C) used for the regression analysis. The sample consists of companies all over Europe, yet with the majority of them emerging from Northern and Western Europe, the average and mean values calculated for the financial distress risks are rather low.

The average (median) of the Altman Z-Score is 13,65 (3,43), giving evidence for high positive outliers within the sample when using the Z-Score due to the great discrepancy between mean and median values. When applying the Ohlson O-Score and the Shumway model to the sample, I obtain values of bankruptcy risk of 2,92 (2,31) and 3,47 (3,03) respectively. In terms

of CSR, the average overall ESG score 49,06 and the median value amounts to 49,23. In the sub scores, I find that the environmental pillar receives relatively low scores with 44,78 (45,34), compared to the social and corporate governance dimension with 51,35 (51,28) and 51,03 (51,73) respectively. Lastly, panel C displays the control variables, showing that the average company in the sample reveals an average (median) value of logarithmic book value of assets (size) of 15,49 (15,40), a debt level (leverage) of 0,25 (0,24), an intensity of R&D expense (R&D exposure) of 0,016 (0,0001), cash holding of 0,08 (0,06), a quick ratio (liquidity) of 1,17 (0,94) and a return on assets (profitability) 0,054 (0,049). All values for panel C are displayed in decimal numbers, whenever a ratio with percentage outcome is used average and mean values should be multiplied by 100 in order to get the percentage value.

Table IV

Descriptive Statistics

The table reports main descriptive statistics on the financial distress risk measures (Panel A), the ESG scores (Panel B) and the control variables (Panel C) inside the data sample for the years 2002-2018.

Variable	Mean	Median	SD	Min	Max	Skew	Kurt	N
Panel A: Bankruptcy models								
Altman Z score	13,653	3,432	43,073	0,0014	46,884	15,828	13,192	9171
Ohlson O score	0,0292	0,0231	0,0821	0,0000	1,0000	6,7093	8,2171	9171
Shumway Hazard Model	0,0347	0,0303	0,0536	0,0000	1,0000	4,9097	5,2696	9171
Panel B: ESG scores								
ESG combined Score	49,0554	49,2333	20,3837	0,4967	94,2900	-0,8605	-0,0266	9171
Environmental Pilar	44,7855	45,3400	27,8634	0,0000	98,7400	-1,1250	-0,0347	9171
Social Pilar	51,3503	51,2800	24,4408	0,1500	98,6400	-1,0725	-0,0153	9171
Governance Pilar	51,0303	51,7300	22,0024	0,8200	98,4700	-0,8973	-0,0751	9171
Panel C: Control variables								
Firm Size	15,4890	15,4040	1,7327	7,4283	22,3225	0,0307	0,1504	9171
Leverage	0,2546	0,2408	0,1825	0,0000	2,5379	15,7465	2,0620	9171
R&D Exposure	0,0162	0,0001	0,0439	-0,0001	1,4694	288,1773	11,5906	9171
Cash Holding	0,0824	0,0564	0,0868	0,0000	0,9871	13,1562	2,8219	9171
Liquidity	1,1660	0,9400	1,1623	0,0354	28,5705	103,6765	7,9869	9171
Profitability	0,0536	0,0485	0,1275	-2,9969	2,6339	178,2081	1,3883	9171

Figure 3 shows the distribution of the ESG scores throughout the years. It is apparent that the ESG commitment of companies has sharply increased over the years. A possible explanation could be the increasing importance of positive CSR related activities within businesses and their higher spending regarding ESG performance (Friede et al., 2015). The

mean ESG score increased from 33,97 in 2002 to 56,05 in 2018, which represents an increase of approximately 65%.

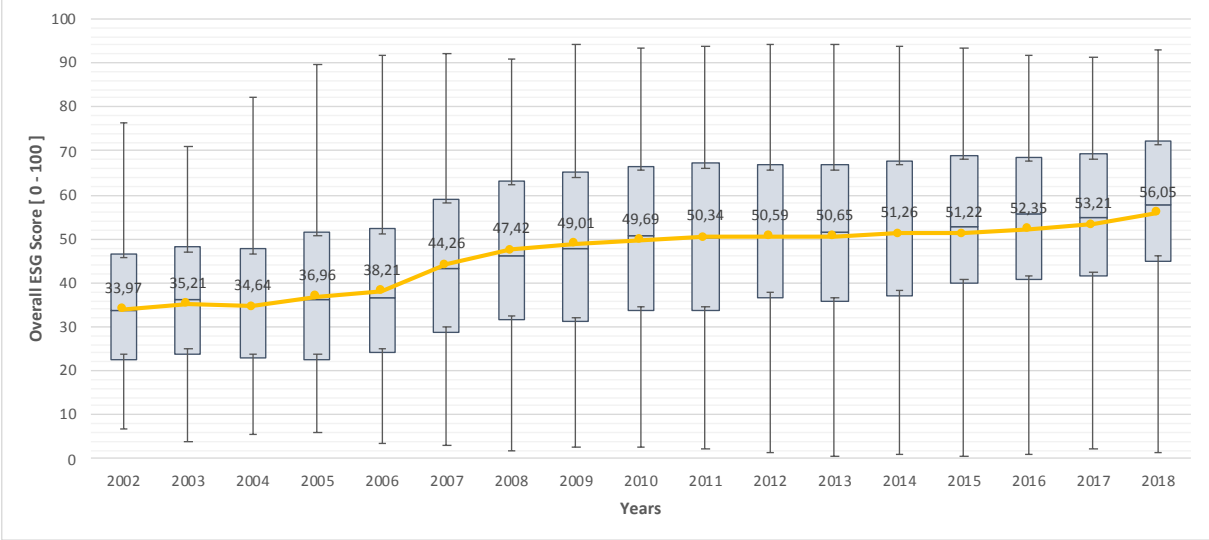

Figure 3: Distribution of the ESG combined score throughout the years

Analyzing the three distinct ESG pillars, a significant jump in the environmental scores from 2006-2007 can be observed due to the renewed 'Sustainable Development Strategy' which was accepted by the European Council in 2006. The strategy entailed a more discrete plan for implementation, monitoring and follow-up, which is why the original paper in 2001 failed to be carried out. In addition, the environmental score shows the lowest score out of the three pillars in 2002 but managed to almost reach the same level by 2018. The social score experienced a steady growth in its scores from the beginning to the end of the observable period. Information on social practices of companies is becoming more and more readily available. As Socially Responsible Investments are increasing as well, many investors are using this information to make their investment decisions. Thus, boosting socially responsible companies and a firm's engagement in socially responsible activities. Lastly, for the governance score no significant changes can be observed since 2002. This can be potentially explained by what investigators name moral self-licensing, where a positive activity is equilibrized by harmful behavior later on (Merritt et al., 2010). An illustration of the distribution of the three pillar scores over the years can be found in Appendix III (Figure 4).

In order to account for differences across regions, the sample was divided into the four distinct regions defined by the United Nations. In 2002, Northern and Western Europe display the highest average ESG scores for the sample. Even though, Western Europe always reaches the greatest average score among the entire sample over the years, surprisingly, Southern Europe performs better in later years than the Northern Europe region does. This can be due to the fact that especially Italy and Spain are important economic nations for Europe, thus,

pressure from other nation states and the European commission to become more CSR responsible potentially increased in recent years (European Commission, 2020). Eastern Europe displays by far the worst average scores compared to the other European regions.

Appendix IV (Figure 5) shows the distribution of ESG scores for different industries in 2018. In addition, a comparison is drawn for 2002, the beginning year of the sample. I recognize strong differences among industries and their corresponding distribution of ESG factors. The Transportation sector shows the lowest average ESG score in 2018, while Chemicals display the highest score in the same year. It is noteworthy that at the beginning of the sample collection the distribution differs. Even though, transportation already showed the lowest average ESG score in 2002, the highest scores were presented by the utilities (39,84) and the oil and gas sector (38,05). One possible explanation could be the fact that those industries have a negative association with CSR policies as they are known as polluting industries, already facing public awareness.

4. Empirical Results

The following section shows the regression results that test for the main hypothesis of this study. In addition, further analysis and robustness tests as well as an instrumental variable analysis was conducted. Furthermore, all variables are checked for multicollinearity issues by a correlation matrix in order to prove the absence of an econometric issue present in the analysis. To make sure regional dummies instead of country dummies could be used, correlation between all countries among our sample with ESG scores and its pillars is tested as well. Both tests resulted in an absence of correlation issues, which can be checked in Appendix V (Table VII). None of the independent variables used in the same regression analysis display a correlation value higher than a common accepted value.

4.1. Regression Results

Appendix VI (Table VIII) represents the regression results for Financial Distress as a function of CSR performance, where CSR performance is proxied by the combined ESG score. I find that the combined ESG score can explain variations in the level of Financial Distress. It is important to note that a positive significant coefficient for the Altman Z variable suggests inferior levels of financial distress, while negative significant coefficients for the Ohlson O and Shumway variables provide the same conclusion. The Ohlson O variable as well as the Shumway model show negative significant coefficients at the 1% significance level, while the

Altman Z displays a positive coefficient. Results are therefore in line with H1, meaning that a higher level of CSR performance will lead to lower levels of financial distress, even though the Altman Model was not able to provide a significant result. This can be explained by various reasonings. The coefficients calculated by Altman were used on a much older sample of firms, therefore they do not fit the up-to-date sample of this study. In addition, the sample contains the biggest portion of companies headquartered in Western and Northern Europe where the distress risk of companies is on average much lower than for example in Southern European countries, resulting in an unfit sample for the Altman Model. However, as later analysis shows when the sample is reduced to specific considerations, the Altman Model is able to provide significant results. This proves that the entire sample might not be a good fit for the original regression coefficients calculated by Altman. Therefore, in this context the results of the Ohlson O and Shumway model should be considered more meaningful and valuable. A quantity of prior research on financial distress risk models suggests that Ohlson O and Shumway should be considered superior in prediction of financial distress risk, which makes this argument further plausible. For a detailed list again see Appendix I (Table V). The regression results of a negative relationship between CSR and Financial Distress Risk also agree with the corresponding literature reviewed in a prior section further supporting H1. Overall, the regression results propose that firms who invest in CSR related activities are able to lower their risk of falling into financial distress.

In terms of the control variables, I find statistically significant results for nearly all variables across bankruptcy prediction models, showing expected results. The leverage variable shows significant results at the 1% significance level for all three FDR models, with a negative coefficient for the Altman Z and a positive coefficient for the other two models. Thus, the riskiness of the level of financial distress is positively connected with the level of indebtedness of a firm. In addition, profitability and liquidity return statistically significant regression coefficients at the 1% level for all models, except the liquidity ratio with the Shumway model, meaning that higher profitability and better liquidity ratios lead to lower level of financial distress. In contrast, R&D exposure demonstrates positively significant results for the Ohlson O and Shumway model at the 1% significance level, while the Altman Z concludes no statistically significant result. The regression coefficient for Size is negative for Ohlson O and Shumway in a statistically significant manner at the 1% level, thus supporting the idea that larger firms are able to experience higher financial and political influence than smaller firms, resulting in lower likelihood of FDR. Altman Z shows a significant positive relation (1% level)

to Cash Holding. The coefficients of the control variables are consistent with previous findings (Al-Hadi et al., 2019).

Appendix VII (Table IX) reports outcomes for Financial Distress on the individual pillars of ESG in order to gain a clearer picture on which element is actually driving financial distress risk. However, the results show diverging results and a statement regarding their impact can only be made to some extent. The environmental score provides a positive significant coefficient for the Altman Z and a negative significant coefficient for the Ohlson O at the 1% significance level, while the Shumway model displays a negative coefficient. The results support $H2_1$ suggesting that increasing engagement in environmental activities decreases a firm's level of financial distress risk. The conclusion from the analysis is also in line with theory stating that environmental activity is negatively correlated with financial risk of a company (Salama et al., 2011; Sharfman & Fernando, 2008). Everything else being equal, a one standard deviation increase in Environmental performance induces a 7,74 (0,0027) decrease in financial distress risk, representing a 11,62% (9,54%) decrease over the sample average, proxied by the Altman Z (Ohlson O). In terms of the Corporate Governance Score, a positive significant coefficient at the 1% level is given by the Altman Z, while Ohlson O and Shumway display negative coefficients. The results coincide with $H2_3$, where the Null Hypothesis can be rejected for the Altman Z. Thus, suggesting that a company's engagement in corporate governance activities positively corresponds to stakeholder engagement. The findings are adding on to previous theory that exhibits the generation of additional profits through respectful governance engagement (Gill et al., 2009), leading to lower distress risk. Likely, everything else being equal, a one standard deviation increase in Corporate Governance performance causes a 10,60 decrease in FDR, concluding a 15,91% decrease over the sample average by the Altman Z. In contrast, the Social Score provides diverging and the most surprising outcomes for the three FDR models. While the analysis provided a negative significant result at the 10% level for the Altman Z, it did not manage to achieve significance for the Ohlson O but exhibited a negative statistically significant coefficient for the Shumway model. Thus, suggesting a negative relationship between FDR and Social performance for Shumway, but a positive relationship among the two for Altman Z. Therefore, $H2_2$ cannot be supported and further analysis is required to profess a valid relationship. Results for the control variables show almost identical level of significance and direction of coefficients for all control variables across FDR models.

Lastly, I wanted to assess whether or not the impact of ESG performance on the three different bankruptcy prediction models differs depending on the industry. Therefore, the entire sample is split in environmentally sensitive industries and non-environmentally sensitive

industries. The findings are reported in Appendix VIII (Table X) and support *H3* as it can be observed that environmentally sensitive industries show different sensitivities to a change in risk measures relative to a change in ESG score. The ESG combined score displays a significant coefficient for all financial distress risk measures across both subsamples, except the Altman Z for the non-environmentally sensitive sample. The Altman Z reports a positive significant coefficient at the 1% significance level for the environmentally sensitive sample. The Altman Z non-environmentally sensitive sample was not able to provide a significant coefficient, which is due to the prior outlined reasons. Ohlson O and Shumway exhibit negative significant coefficients for both subsamples. Analyzing the coefficient, it is noteworthy that they differ for each model when comparing the two subsamples while showing higher values for the environmentally sensitive sample across all FDR models. Thus, the results suggest that the reward for investing in CSR activities by lowering the likelihood of financial distress risk will be even higher in industries that are considered to be environmentally sensitive.

4.2. Robustness Checks and Further Analysis

The empirical analysis conducted so far shows that firms that invest in CSR are able to lower their financial distress risk compared to firms that are less CSR-oriented, suggesting that these firms are considered more creditworthy and achieve better access to financing. To address the potential issue in regression analysis and get a better understanding of the relationship between CSR and Financial Distress Risk, a robustness test and additional analysis where conducted. In particular, one is lagging the Financial Distress variables to address the concern of accounting data reported in the middle of the year. In addition, it tests whether this relationship depends on a firm operating in times of a crisis or not and whether financial distress has an influence.

Appendix IX (Table XI) reports the results for lagging the Financial Distress Risk variable for the Altman Z and Ohlson O model. The FDR variable is lagged by one year to investigate the effect of current CSR engagement on the FDR of next year. This procedure eliminates the potential bias of accounting data being reported in early or middle of next year. Regarding the Altman Z model, the ESG combined regression coefficient shows no difference in significance level and sign of the coefficient. When applying the Ohlson O model, the ESG combined coefficient displays a negative significant coefficient at the 1% significance level. Therefore, the results are qualitatively similar to the main regression outputs, suggesting that differences in accounting reporting dates have no effect on the tested relationship between CSR and FDR.

Secondly, I test whether the relationship depends on whether a company operates in times of a crisis. Therefore, the entire sample is divided into two subsamples (crisis and non-crisis period) based on the global financial crisis of 2008-2010. While the crisis started in 2007, the effects were mainly shown in the three following years with the bursting of the housing bubble and the collapse of many companies. The results are displayed in Appendix X (Table XII) and show some really interesting insights. All three models exhibit significant results for the Non-Crisis period, again confirming that CSR engagement lowers the financial distress risk of a company. The Ohlson O and Shumway display negative significant coefficients at the 5% significance level, while the Altman Z reports a positive significant coefficient at the 1 % significance level. It is interesting to note that the Altman Z was not able to provide a significant result when regressing the entire sample but shows a highly significant result for the non-crisis period. One possible explanation could be that the coefficients calculated for the original Altman sample are not robust against times of global crisis. Regarding the Crisis period, the Altman Z and Ohlson O are not able to provide a significant result, while a negative significant coefficient is reported for the Shumway variable. Prior literature suggests that the effect of CSR on a firm's financial health is no longer significant during the financial crisis (Love et al., 2007). Thus, the findings for the Altman Z and Ohlson O are in line with scientific research. The results for the Shumway are quite surprising but could be explained by the nature of the model. In contrast to the other two FDR models, the Shumway model mainly uses market data to calculate the financial distress risk of a firm. Relative Size, excess returns and SIGMA are calculated in relation to the size and performance of the overall market. Therefore, in case the whole market is experiencing a downturn, bad performance of an individual company will show a lesser effect on the distress risk by using those variables instead of individual accounting data. To summarize, the results suggest that the likelihood of financial distress risk of a company can be reduced by CSR engagement. However, in times of a market crisis the effect diminishes.

Lastly, I examine in how far the effect of CSR on FDR of a firm is influenced by the level to which a firm is already financially distressed. Therefore, the entire sample is divided into two subsamples (distressed and non-distressed firms), where the Z-Score serves as a proxy. In line with Chen et al. (2016), the Z-Score of distressed (non-distressed) firms is lower (higher) than 1,81. The results are displayed in Appendix XI (Table XIII). The Ohlson O and Shumway model show negative significant coefficients for both subsamples at a significance level of at least 5%. The Altman Z was not able to provide significant results for any sample, which can be explained by the reasonings already mentioned. In this case, the results suggest that the level of being financially distressed has no effect on the influence of CSR on the likelihood of

financial distress. Thus, even a financially distressed firm could improve its business by investing in CSR activities.

In general, those results show that the prior findings are robust against reporting dates and the ability of CSR engagement to decrease the likelihood of financial distress is not influenced by the level of financial distress a firm is already experiencing but it becomes irrelevant in times of a market crisis.

4.3. Instrumental Variable Analysis

To address the potential issue that the results could be affected by endogeneity or reverse causality issues, resulting from a firm's engagement in CSR activities, an instrumental variable technique is conducted. Reverse causality issues could occur because firms that are less likely to fall into financial distress might be more likely to invest in CSR activities due to having additional capital. Secondly, CSR engagement and the level of financial distress risk of a company could also be influenced by overlooked firm-specific variables. To test for this issue, a 2SLS model is implemented, applying the industry mean ESG scores as an instrumental variable for the ESG combined score. The instrument chosen is in line with previous papers that employed the same instrument when testing for this particular issue (Al-Hadi et al., 2019; Sun & Cui, 2014; Zheng et al., 2019). As shown in the previous analysis CSR engagement levels vary widely across industries due to differences in products, laws and regulations as well as responsiveness to social factors, which is also suggested by previous studies (McWilliams & Siegel, 2001; Waddock & Graves, 1997). Thus, industry mean ESG score is very likely to be correlated with firm level CSR, however I expect it to be uncorrelated with the Financial Distress Risk. In essence, the chosen instrument fulfills the requirement of being uncorrelated with the dependent variable and only affecting the dependent variable through the endogenous variables.

The results of the first stage regression are reported in Appendix XII (Table XIV). Regression (1) is regressing the ESG combined score against the chosen instrumental variable industry mean ESG score and the rest of the control variables. The coefficient of the instrumental variable displays a significant coefficient at the 1% significance level, meaning that it is a sufficient instrument for the testing purposes. Thus, the predicted ESG combined values are viable to be used for the second stage regression and results are depicted in Appendix XIII (Table XV). The findings are in line with the results conducted in the OLS regressions. Ohlson O and Shumway exhibit negative significant coefficients at the 1% significance level

even when endogeneity is taken into consideration. Unlike, the Altman Z did not show a significant coefficient, which is pursuant to the OLS results. Overall, the instrumental variable analysis results show that even with endogeneity taken into consideration, the significant relationship between CSR engagement and financial distress risk remains robust. This suggests that endogeneity cannot explain the link between CSR and level of financial distress risk and further proves *H1* for Ohlson O and Shumway.

5. Conclusions and Limitations

The debate on the sustainable use of resources of any kind will continue to be a driving and increasing element in the business context. Prior literature emphasizes the impact of CSR on financial performance and firm value creation potential. The present study extends the literature in this field by focusing on the direct impact of positive engagement in CSR on the financial distress risk of European firms. The results suggest that positive CSR activities significantly lower the chances of falling into costly financial distress and can be summarized as follows:

Firstly, the combined ESG score provides significant results for the Ohlson O and Shumway model, which supports the argument that positive CSR engagement lowers a firm's financial distress risk. Secondly, the analysis of the individual pillar scores of ESG reveals that investment in environmental and corporate governance performance decreases the likelihood of falling into financial distress, even though significant results could not be exhibited for all models. However, the results contained for the social pillar could not be considered for valuable conclusions - while a significant negative coefficient was obtained for the Altman Z, a significant negative coefficient was provided for the Shumway, generating opposite statements. Therefore, the impact of CSR on the social dimension of ESG cannot be captured by the findings of this study. Thirdly, concerning industry insights, investing in CSR activities in an environmentally sensitive industry significantly lowers the likelihood of financial distress risk to a greater extent than for firms not being part of those industries. Businesses in those sectors are greatly exposed to stakeholder pressure but also suffer from various regulatory requirements, especially regarding environmental aspects. As a consequence, it is expected that those industries show greater variations in changes to ESG performance than companies from other industries. Moreover, the overall findings are statistically robust for reverse causality and omitted variables issues. Lastly, firm's behavior was tested for different scenarios to get an even more in-depth insight as well as provide supplementary robustness. The findings suggest

that investing in CSR lowers a firm's financial distress risk even if the firm is already in a situation of financial distress but is no longer significant in times of a market crisis. Overall, the stakeholder view of CSR is supported by the results, which argues that a firm's financial performance and situation will be enhanced by addressing the need of all of its stakeholders through increased socially responsible performance.

The study offers several practical implications for not only researchers, but also managers, regulators and investors, by looking at an alternative strategy that firms can adapt to enhance shareholder value and tackle disruption. Managers have been torn between "doing good" and "doing well", as engagement in CSR activities drains capital that could otherwise be used for earnings maximization. However, despite the stakeholder pressure, societal benefit and early consequences resulting from inevitable catastrophes like the climate change, the study clearly proofs the economic and financial advantages of investing in CSR and shows that firms can undoubtedly do "good" in order to do "well". Collectively, managers should incorporate CSR in their business strategy to lower the firm's distress risk, enhance firm performance and stabilize the economy. Special focus should be laid on environmental and governance aspects. Moreover, the insights are valuable to investors when performing their risk allocation. In particular, when calculating the risk premiums in regards of future cash flows and the cost of capital as well as the exposure in terms of financial distress risk. Policymakers and regulators need to support the shift by encouraging firms to adopt socially responsible behavior through incentive programs or drafting of new regulations. By making CSR part of the business strategy, managers, investors and regulators could likely help creating a more appealing corporate environment with improved financial stability in a more crisis-resilient economy.

Although the findings allow to draw clear and valuable conclusions, the present study is restricted to some limitations that, however, go beyond the horizon of a master thesis and should be covered in future academic research. One limitation within this study is the selection of the dependent variables, as there is a magnitude of possibilities on how to proxy the financial distress risk of a company. Literature diverges in terms of the most appropriate model to measure FDR, yet due to space limitations it was impossible to include all of them in this study. In addition, even though the Altman Z model is one of the most cited models in the relevant literature, it seemed to be unfit for the selected sample. Lastly, the selected models provided distinct conclusions concerning the social pillar of ESG.

Further research on the precise relationship between positive social engagement and financial distress risk would display an interesting avenue for future research. In addition, it would be fruitful to investigate if the above drawn conclusions would also hold in another legal

system and how CSR-oriented laws and regulations in that system directly impact firms CSR behavior.

The outcome of this study underpins the economic importance of Corporate Social Performance and thereby offers - besides the obvious philanthropic justification – further motivation to effectively incorporate CSR practices in the business strategy.

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Appendix

Appendix I (Table V)

Citation in literature of Ohlson O-Score and Shumway Model

The table gives an overview of explementary papers that cited or analyzed the Ohlson O-Score and Shumway Model in order to demonstrate their importance within financial distress prediction models.

Model: Ohlson's O-Score

Authors	Title	Journal	Keywords
Begley et al. (1996)	Bankruptcy classification errors in the 1980s: An empirical analysis of Altman's and Ohlson's models	Review of Accounting Studies	Bankruptcy Prediction Models, Altman Z-Score, Ohlson O-Score
Berger et al. (1996)	Investor valuation of the abandonment option	Journal of Financial Economics	Abandonment Option, Exit, Valuation, Asset structure, Earnings forecast
Burgstahler et al. (1989)	Changes in the probability of bankruptcy and equity value	Journal of Accounting and Economics	Probability of Bankruptcy, Firm Value, Ohlson's Model
Dichev (1998)	Is the risk of bankruptcy a systematic risk?	Journal of Finance	Firm distress risk, Size, Book-to-Market, Ohlson O-Score
Griffin et al. (2002)	Book-to-market equity, distress risk, and stock returns	Journal of Finance	Book-to-market equity, Stock returns, Distress Risk, Ohlson's O-Score
Hillegeist et al. (2004)	Assessing the probability of bankruptcy	Review of Accounting Studies	Bankruptcy, Ohlson's Model, Altman's Model, Shumway Hazard Model
Lawrence et al. (2015)	The Use Of Ohlson's O-Score For Bankruptcy Prediction In Thailand	Journal of Applied Business Research	Bankruptcy, Prediction, Ohlson O-Score, Thailand
Najib et al. (2020)	Analysis of The Bankruptcy of Companies with Altman Model and Ohlson Model	Management Analysis Journal	Bankruptcy Prediction, Altman Z-Score, Ohlson O-Score, Indonesia
Pongsatat et al. (2004)	Bankruptcy Prediction for Large and Small Firms in Asia: A Comparison of Ohlson and Altman	Journal of Accounting and Corporate Governance	Bankruptcy, Ohlson's Model, Altman's Model
Subramanyam et al. (1996)	Going-concern status, earnings persistence, and informativeness of earnings	Contemporary Accounting Research	Earnings persistence, distress, Ohlson's Model
Waqas et al. (2018)	Predicting financial distress: Applicability of O-score and logit model for Pakistani firms	Business and Economic Horizons	Financial distress, Bankruptcy, Logit Regression, O-score Model, Financial Distress, Emerging Market, Pakistan
Xu et al. (2008)	Bankruptcy prediction: the case of Japanese listed companies	Review of Accounting Studies	Bankruptcy Prediction, Altman Z-Score, Ohlson O-Score, Option-Pricing-Theory

Appendix I (Table V) continued

Citation in literature of Ohlson O-Score and Shumway Model

The table gives an overview of explementary papers that cited or analyzed the Ohlson O-Score and Shumway Model in order to demonstrate their importance within financial distress prediction models.

Model: Shumway's Hazard Model

Authors	Title	Journal	Keywords
Abdullah et al. (2008)	Predicting corporate failure of Malaysia's listed companies: Comparing multiple discriminant analysis, logistic regression and the hazard model	International Research Journal of Finance and Economics	Bankruptcy, Multiple Discriminant Analysis, Logistic Regression, Shumway Hazard Model
Agarwal et al. (2014)	Are hazard models superior to traditional bankruptcy prediction approaches? A comprehensive test	Journal of Banking and Finance	Distress risk, Credit risk, Option pricing, Shumway Hazard model, Basel III
Chava et al. (2004)	Bankruptcy prediction with industry effects	Review of Finance	Capital Structure and Dividend Policy, Mergers, Acquisitions, Restructurings, and Divestitures
Cheng et al. (2010)	Predicting bankruptcy using the discrete-time semiparametric hazard model	Quantitative Finance	Discrete-time hazard model, Local likelihood, Out-of-sample error rate, Panel data, Semiparametric model
Cole et al. (2009)	Predicting bank failures using a simple dynamic hazard model	22nd Australasian Finance and Banking Conference	Bank, Bank Failure, Early Warning System, Failure Prediction, Forecasting, Shumway Hazard Model, Time-varying Covariates
Foster et al. (2013)	Loan defaults and hazard models for bankruptcy prediction	Managerial Auditing Journal	Loan default, Going-concern opinions, Shumway Hazard Model, Bankruptcy Prediction, Loans, Hazards, Bankruptcy
Hillegeist et al. 2004	Assessing the probability of bankruptcy	Review of Accounting Studies	Bankruptcy, Ohlson's Model, Altman's Model, Shumway Hazard Model
Kalak et al. (2016)	The effect of size on the failure probabilities of SMEs: An empirical study on the US market using discrete hazard model	International Review of Financial Analysis	SMEs, Bankruptcy, Size, Discrete-time duration-dependent hazard model
Molina (2002)	Predicting bank failures using a hazard model: the Venezuelan banking crisis	Emerging Markets Review	Bank failures, Shumway Hazard Model, Venezuelan banking crisis
Nam et al. (2008)	Bankruptcy prediction using a discrete-time duration model incorporating temporal and macroeconomic dependencies	Journal of Forecasting	Macroeconomy, Shumway Hazard Model, Bankruptcy
Sun (2007)	A re-evaluation of auditors' opinions versus statistical models in bankruptcy prediction	Review of Quantitative Finance and Accounting	Bankruptcy Prediction, Going-concern opinions, Financial Distress
Wu (2010)	A comparison of alternative bankruptcy prediction models	Journal of Contemporary Accounting and Economics	Bankruptcy Prediction Models

Appendix II (Table VI)

List of Variables

The table defines and explains all dependent, independent and control variables used in the regression.

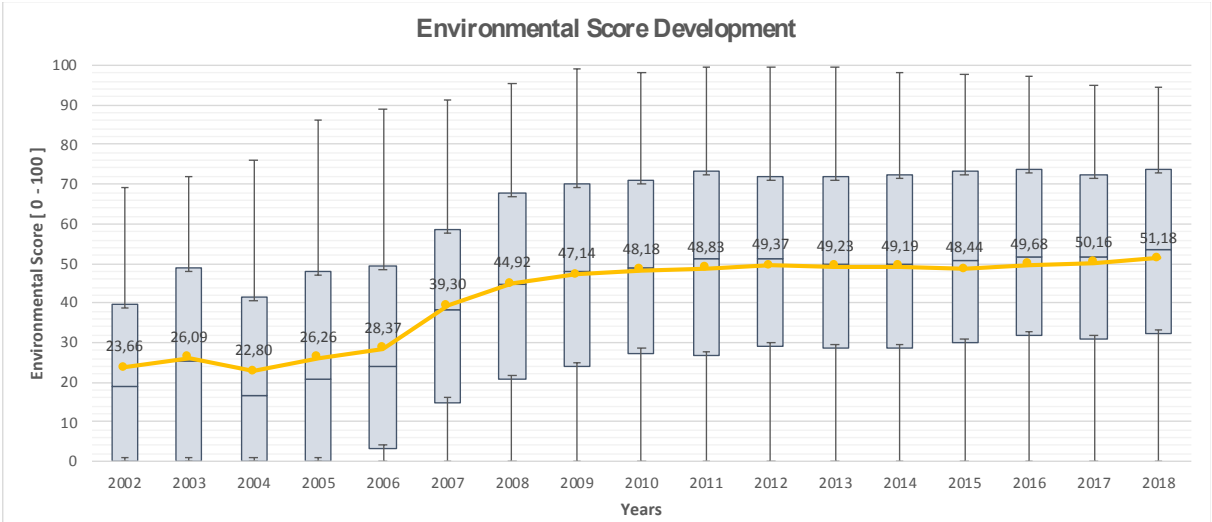
Variables	Definitions
Dependent Variables	
Altman Z (Multiple Discriminant Analysis)	Altman's (1968) Financial Distress measure to predict bankruptcy, calculated as (1.2*Working Capital / Total Assets + 1.4*Retained Earnings / Total Assets + 3.3*EBIT / Total Assets + 0.6*Market Value of Equity / Book Value of Total Liabilities + 0.99*Sales / Total Assets)
Ohlson O (Logit Model)	Ohlson's (1980) Financial Distress measure to predict bankruptcy, calculated as (-1,32 - 0,407*log (Total Assets) +6,03*Total Liabilities / Total Assets - 1,43*Working Capital / Total Assets + 0,076*Current Liabilities / Current Assets - 1,72*Total Liabilities Dummy - 2,37*Net Income / Total Assets - 1,83*Funds from Operations / Total Liabilities + 0,285*Net Loss Dummy - 0,521*(Net Income_t - Net Income_t-1 / |Net Income_t| + |Net Income_t-1|))
Ohlson O Probability of Bankruptcy	$P = (1 + \exp\{-\beta' X\})^{-1}$ where P is the probability of bankruptcy and X represents the variables listed. The logit function maps the value of beta'X to a probability bounded between 0 and 1.
Shumway (Hazard Model)	Shumway's (2001) Financial Distress measure to predict bankruptcy, calculated as (-13,303 - 1,982*Net Income / Total Assets +3,593*Total Liabilities / Total Assets - 0,467*Relative Size - 1,809*Excess Market Returns lagged + 5,791*Sigma lagged
Shumway (Calculation Idiosyncratic Risk)	$R_{it} - R_{ft} = \alpha_i + \beta_{iM}(R_{Mt} - R_{ft}) + \beta_{iS} SMB_t + \beta_{iH} HML_t + \beta_{iW} WML_t + \varepsilon_{it}$ R_{it} represents the return of company *i* for the day *t* and R_{ft} represents the risk-free rate of return on day *t*. $R_{Mt} - R_{ft}$ is the excess return on a value-weighted market portfolio for day *t*. SMB_t refers to the size factor calculated by the difference between high and low stocks. HML_t represents the book-to-market factor and is calculated by the difference between high and low book-to-market-ratio stocks. The WML_t represents the difference between winner and loser stocks. ε_{it} is the stochastic error term. The idiosyncratic risk is estimated by daily excess returns over the past 12 months using time-series regressions for each firm observation. The factors from the four-factor model were obtained from the Kenneth French website using Fama and French European three-factor and momentum data (French, 2020).
Shumway Probability of Bankruptcy	$P_{i,t} = (1 + exp\{-y_{i,t}\})^{-1}$ $y_{i,t} = \alpha + \beta' X_{i,t-1}$ where P is the probability of bankruptcy and X represents the variables listed. This is a logit model, but instead of treating each firm-year as an independent observation, all prior values of the independent variables for a particular firm are included in the information set.
Independent Variables	
ESG_combined	Score received for CSR performance
ENV	Score received for Environmental performance
SOS	Score received for Social Performance
CGS	Score received for Corporate Governance Performance

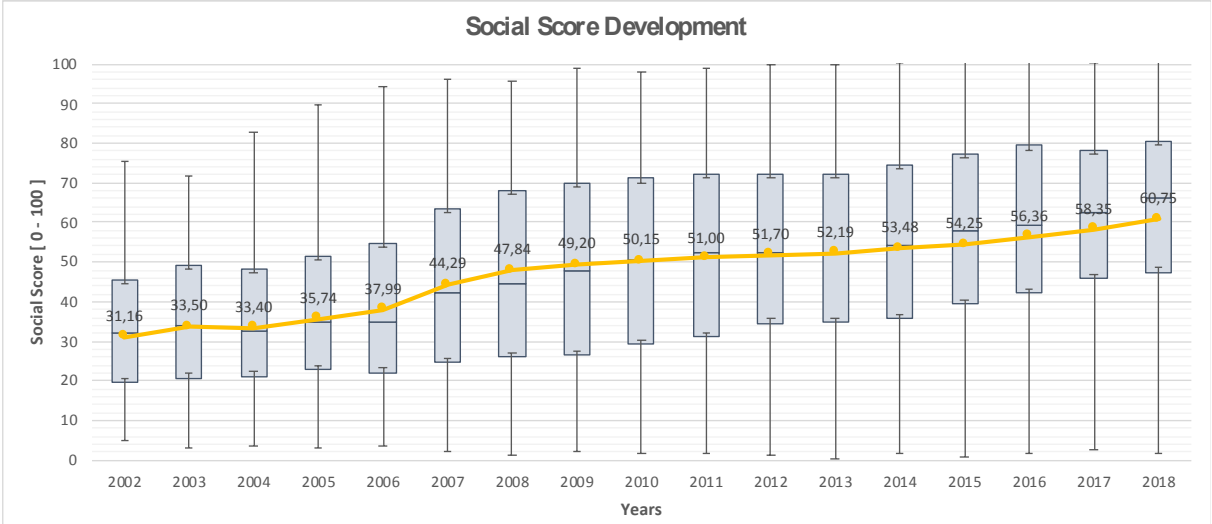
Control Variables

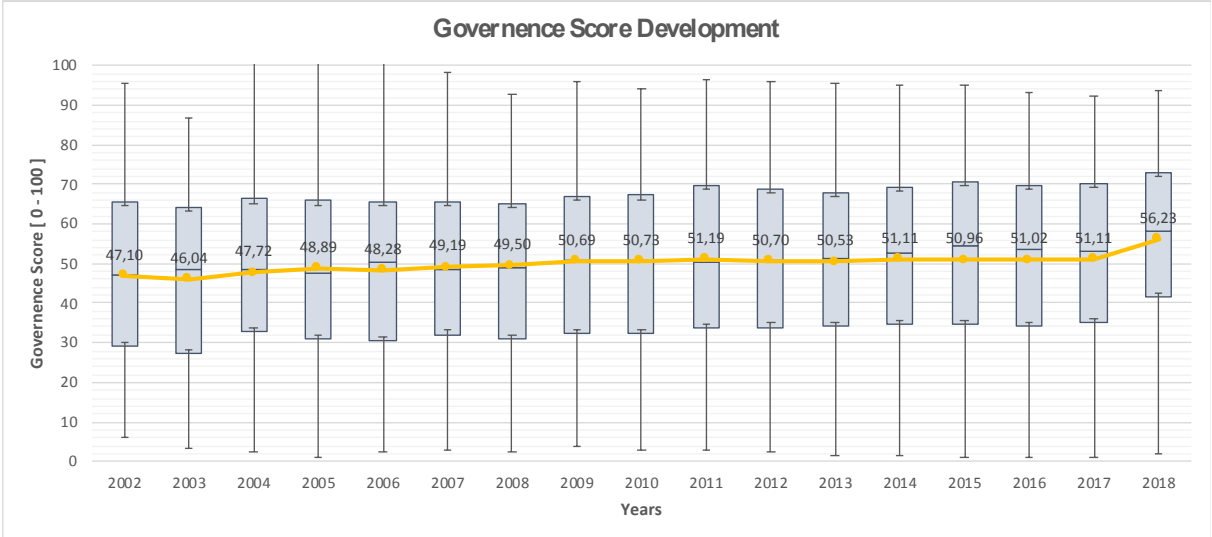
Firm Size	The logarithm of the Book Value of Total Assets
Leverage	Ratio of Total Debt (L-T+S-T) divided by Total Assets
R&D Exposure	Ratio of R&D expenses per Total Assets
Cash Holding	Calculated as the firm's cash holdings divided by Total Assets
Liquidity	Calculated as (Cash + Acc. Receivable / Current Liabilities)
Profitability	Ratio of Net Income per Total Assets
Region, Year, Industry	Dummy variables to control for Regional, Year and Industry effects

Appendix III (Figure 4)

Distribution of the individual pillar scores of ESG throughout the years

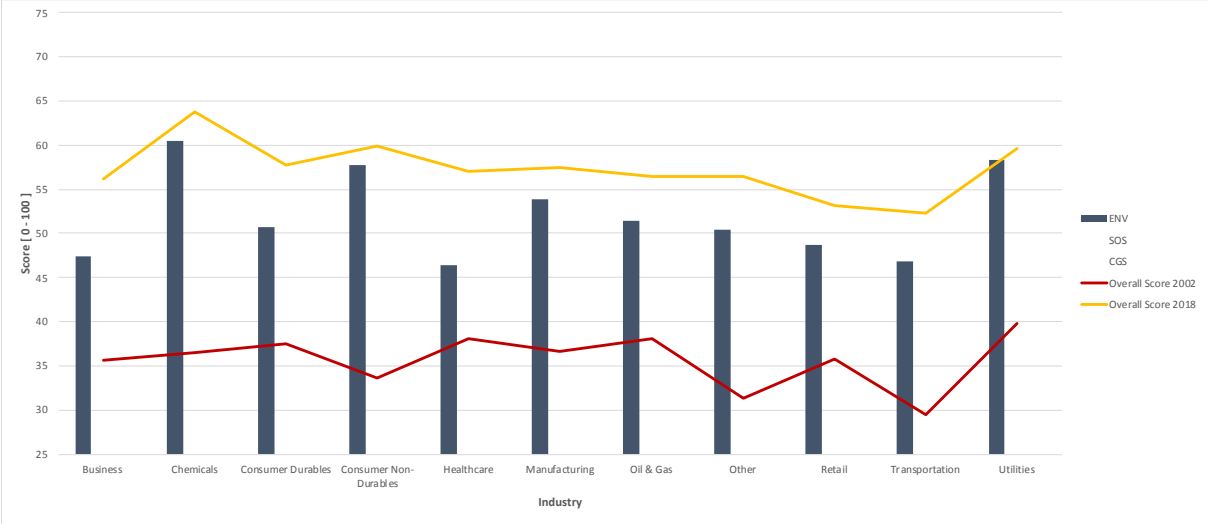






Appendix IV (Figure 5)

Distribution of ESG scores in 2018 across all industries



Appendix V (Table VII)

Correlation Matrix I

The table outlines the correlation matrix between ESG, ESG dimensions and control variables employed. The sample comprises 9171 firms over the period from 2002 to 2018.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) ESG_combined	1,00												
(2) ENS	0,88	1,00											
(3) SOS	0,88	0,74	1,00										
(4) CGS	0,69	0,37	0,39	1,00									
(5) Firm Size	0,51	0,50	0,46	0,29	1,00								
(6) Leverage	0,08	0,08	0,09	0,02	0,17	1,00							
(7) R&D Exposure	-0,01	-0,01	0,00	0,00	-0,10	-0,15	1,00						
(8) Cash Holding	-0,11	-0,13	-0,09	-0,06	-0,27	-0,23	0,24	1,00					
(9) Liquidity	-0,15	-0,18	-0,13	-0,05	-0,17	-0,20	0,16	0,42	1,00				
(10) Profitability	-0,03	-0,04	-0,03	-0,01	-0,09	-0,16	-0,17	0,05	0,02	1,00			
(11) Altman Z	-0,11	-0,13	-0,13	-0,01	-0,31	-0,20	-0,02	0,18	0,14	0,46	1,00		
(12) Ohlson O	-0,11	-0,10	-0,08	-0,09	-0,23	0,40	0,13	0,13	-0,04	-0,34	-0,05	1,00	
(13) Shumway	-0,09	-0,08	-0,08	-0,07	-0,12	0,19	0,06	0,08	0,02	-0,20	-0,04	0,35	1,00

Correlation Matrix II

The table outlines the correlation matrix between ESG, ESG dimensions and the European Regions. The sample comprises 9171 firms over the period from 2002 to 2018.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ESG_combined	1,00							
(2) ENS	0,88	1,00						
(3) SOS	0,88	0,74	1,00					
(4) CGS	0,69	0,37	0,39	1,00				
(5) Eastern Europe	-0,07	-0,06	-0,09	-0,02	1,00			
(6) Northern Europe	-0,09	-0,13	-0,12	0,04	-0,15	1,00		
(7) Southern Europe	0,05	0,04	0,08	0,00	-0,06	-0,34	1,00	
(8) Western Europe	0,09	0,13	0,10	-0,03	-0,12	-0,72	-0,28	1,00

Table VII continued

Correlation Matrix III

The table outlines the correlation matrix between ESG, ESG dimensions and European countries employed. The sample comprises 9171 firms over the period from 2002 to 2018.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
(1) ESG_combined	1,00																							
(2) ENS	0,88	1,00																						
(3) SOS	0,88	0,74	1,00																					
(4) CGS	0,69	0,37	0,39	1,00																				
(5) Austria	0,00	0,01	-0,02	0,01	1,00																			
(6) Belgium	-0,03	-0,01	-0,04	-0,02	-0,02	1,00																		
(7) Czech Republic	-0,02	-0,03	-0,03	0,01	-0,01	-0,01	1,00																	
(8) Denmark	-0,03	-0,03	-0,03	0,00	-0,02	-0,03	-0,01	1,00																
(9) Finland	0,03	0,06	0,02	0,00	-0,02	-0,03	-0,01	-0,02	1,00															
(10) France	0,11	0,16	0,12	-0,01	-0,04	-0,05	-0,02	-0,05	-0,05	1,00														
(11) Germany	0,03	0,05	0,04	-0,02	-0,04	-0,06	-0,02	-0,05	-0,05	-0,11	1,00													
(12) Greece	-0,09	-0,09	-0,09	-0,03	-0,02	-0,02	-0,01	-0,02	-0,02	-0,04	-0,04	1,00												
(13) Hungary	0,02	0,02	0,02	0,01	-0,01	-0,01	0,00	-0,01	-0,01	-0,02	-0,02	-0,01	1,00											
(14) Ireland	-0,03	-0,04	-0,05	0,03	-0,01	-0,02	-0,01	-0,02	-0,02	-0,04	-0,04	-0,02	-0,01	1,00										
(15) Italy	0,05	0,02	0,06	0,04	-0,03	-0,04	-0,02	-0,04	-0,04	-0,07	-0,08	-0,03	-0,01	-0,03	1,00									
(16) Netherlands	0,06	0,04	0,09	0,03	-0,03	-0,03	-0,01	-0,03	-0,03	-0,07	-0,07	-0,03	-0,01	-0,02	-0,05	1,00								
(17) Norway	-0,03	-0,02	-0,03	-0,04	-0,02	-0,03	-0,01	-0,02	-0,02	-0,05	-0,05	-0,02	-0,01	-0,02	-0,04	-0,03	1,00							
(18) Poland	-0,08	-0,07	-0,09	-0,03	-0,02	-0,03	-0,01	-0,03	-0,03	-0,06	-0,06	-0,02	-0,01	-0,02	-0,04	-0,04	-0,03	1,00						
(19) Portugal	0,02	0,02	0,02	0,00	-0,01	-0,02	-0,01	-0,01	-0,01	-0,03	-0,03	-0,01	-0,01	-0,01	-0,02	-0,02	-0,01	-0,02	1,00					
(20) Russia	-0,03	-0,03	-0,04	0,01	0,00	-0,01	0,00	0,00	0,00	-0,01	-0,01	0,00	0,00	0,00	-0,01	-0,01	0,00	-0,01	0,00	1,00				
(21) Spain	0,08	0,09	0,13	-0,03	-0,03	-0,04	-0,01	-0,03	-0,03	-0,07	-0,07	-0,03	-0,01	-0,03	-0,05	-0,04	-0,03	-0,04	-0,02	-0,01	1,00			
(22) Sweden	0,02	0,01	0,04	0,00	-0,03	-0,04	-0,02	-0,04	-0,04	-0,08	-0,08	-0,03	-0,02	-0,03	-0,06	-0,05	-0,04	-0,04	-0,02	-0,01	-0,05	1,00		
(23) Switzerland	-0,04	-0,04	-0,03	-0,03	-0,03	-0,04	-0,02	-0,04	-0,04	-0,08	-0,08	-0,03	-0,02	-0,03	-0,06	-0,05	-0,04	-0,05	-0,02	-0,01	-0,05	-0,06	1,00	
(24) United Kingdom	-0,10	-0,14	-0,12	0,05	-0,09	-0,12	-0,05	-0,11	-0,11	-0,22	-0,23	-0,09	-0,04	-0,08	-0,16	-0,14	-0,11	-0,13	-0,06	-0,02	-0,15	-0,17	-0,18	1,00

Appendix VI (Table VIII)

Regression Results (ESG combined)

This table represents OLS coefficients from the regressions of Altman Z, Ohlson O and Shumway on the ESG combined score over the period of 2002-2018. Region, Year and Industry dummies are present in all regressions. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	Altman Z	Ohlson O	Shumway
ESG_combined	0,068	-0,0002***	-0,0005***
	(0,1119)	(0)	(0,0001)
Firm Size	-16,4826***	-0,0066***	-0,0055***
	(1,5295)	(0,0005)	(0,0008)
Leverage	-71,0483***	0,2105***	0,1959***
	(18,5163)	(0,0177)	(0,0193)
R&D Exposure	203,045	0,2616***	0,1788***
	(226,766)	(0,043)	(0,0663)
Cash Holding	230,5969***	0,1929***	0,1858***
	(51,8318)	(0,0205)	(0,0304)
Liquidity	18,4776***	-0,0036***	-0,0003
	(5,836)	(0,0012)	(0,0017)
Profitability	818,3232***	-0,1695***	-0,1879***
	(167,4427)	(0,0277)	(0,0405)
Observations	9171	9171	9171
R-Squared	0,379	0,442	0,167
Region FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Appendix VII (Table IX)

Regression Results (ESB sub-scores)

This table represents OLS coefficients from the regressions of Altman Z, Ohlson O and Shumway on the individual pillars of the ESG score over the period of 2002-2018. Region, Year and Industry dummies are present in all regressions. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	Altman Z	Ohlson O	Shumway
ENV	0,2781***	-0,0001***	-0,0001
	(0,0921)	(0)	(0,0001)
SOS	-0,246*	0,00002	-0,0003***
	(0,1312)	(0)	(0,0001)
CGS	0,4819***	-0,00002	-0,0001
	(0,1159)	(0)	(0,0001)
Firm Size	-30,4131***	-0,0066***	-0,0055***
	(1,7978)	(0,0005)	(0,0008)
Leverage	-80,8755***	0,2101***	0,1962***
	(18,9157)	(0,0176)	(0,0194)
R&D Exposure	108,0513	0,2626***	0,1788***
	(229,5758)	(0,0429)	(0,0665)
Cash Holding	179,1673***	0,1922***	0,1853***
	(51,2349)	(0,0204)	(0,0305)
Liquidity	14,5247**	-0,0038***	-0,0005
	(5,7257)	(0,0012)	(0,0017)
Profitability	794,069***	-0,1697***	-0,1878***
	(167,5235)	(0,0277)	(0,0405)
Observations	9171	9171	9171
R-Squared	0,379	0,442	0,167
Region FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Appendix VIII (Table X)

Regression Results (Environmentally sensitive Industries)

This table represents OLS coefficients from the regressions of Altman Z, Ohlson O and Shumway on the ESG combined score, for two subsamples of environmentally sensitive industries and otherwise, over the period of 2002-2018. (S) represents environmentally sensitive industries, while (NS) non-environmentally sensitive industries, respectively. Region, Year and Industry dummies are present in all regressions. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	(1) Altman Z (S)	(2) Altman Z (NS)	(3) Ohlson O (S)	(4) Ohlson O (NS)	(5) Shumway (S)	(6) Shumway (NS)
ESG_combined	0,737***	0,1449	-0,0002*	-0,0001***	-0,0005**	-0,0004***
	(0,2008)	(0,1253)	(0,0001)	(0)	(0,0002)	(0,0001)
Firm Size	-31,3957***	-14,4216***	-0,0086***	-0,0077***	-0,0102***	-0,0051***
	(2,4553)	(1,7242)	(0,0008)	(0,0006)	(0,0022)	(0,001)
Leverage	-209,4737***	-61,3611***	0,1063***	0,2499***	0,2148***	0,1843***
	(22,5514)	(20,3614)	(0,0156)	(0,0209)	(0,0415)	(0,0241)
R&D Exposure	-1392,2345***	375,8369	0,1165***	0,2421***	0,3148*	0,1698**
	(196,0205)	(272,7708)	(0,041)	(0,0436)	(0,181)	(0,0691)
Cash Holding	120,8911	333,3818***	0,0411***	0,2596***	0,1221***	0,2136***
	(85,1013)	(66,1914)	(0,0109)	(0,0278)	(0,041)	(0,0408)
Liquidity	22,2781***	14,196*	-0,0038***	-0,0051**	-0,0001	-0,0009
	(8,5182)	(8,4045)	(0,0007)	(0,0021)	(0,0023)	(0,0027)
Profitability	199,7648***	971,8651***	-0,1514***	-0,186***	-0,232	-0,1748***
	(75,0843)	(198,9477)	(0,048)	(0,0332)	(0,1845)	(0,0358)
Observations	3333	5838	3333	5838	3333	5838
R-Squared	0,223	0,456	0,275	0,488	0,110	0,178
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Appendix IX (Table XI)

Robustness (Lagged)

This table represents OLS coefficients from the regressions of Altman Z and Ohlson O on the ESG combined score over the period of 2002-2018, where data for the bankruptcy models is lagged by one year. Region, Year and Industry dummies are present in all regressions. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	Altman Z	Ohlson O
ESG_combined	0,1085	-0,0002***
	(0,1239)	(0)
Firm Size	-14,8072***	-0,0069***
	(1,5756)	(0,0005)
Leverage	-56,6212***	0,1939***
	(19,7534)	(0,0176)
R&D Exposure	172,9599	0,3231***
	(226,4177)	(0,07)
Cash Holding	235,4162***	0,1762***
	(49,8908)	(0,0226)
Liquidity	19,7538**	-0,0037**
	(7,8422)	(0,0015)
Profitability	762,2134***	-0,032
	(168,982)	(0,0278)
Observations	9162	9162
R-Squared	0,315	0,350
Region dummies	Yes	Yes
Year dummies	Yes	Yes
Industry dummies	Yes	Yes

Appendix X (Table XII)

Robustness (Financial Crisis)

This table represents OLS coefficients from the regressions of Altman Z, Ohlson O and Shumway on the ESG combined score over the period of 2002-2018, where data is divided into two subsamples of periods of crisis and non-crisis. (C) represents the crisis period from 2008-2010, while (NC) non-crisis period, respectively. Region, Year and Industry dummies are present in all regressions. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	(1) Altman Z (C)	(2) Altman Z (NC)	(3) Ohlson O (C)	(4) Ohlson O (NC)	(5) Shumway (C)	(6) Shumway (NC)
ESG_combined	0,2002	0,4955***	-0,0001	-0,000001**	-0,0007***	-0,0003**
	(0,1909)	(0,1325)	(0,0001)	(0)	(0,0003)	(0,0001)
Firm Size	-10,5725***	-33,7153***	-0,0051***	-0,0134***	-0,0033	-0,0115***
	(2,6976)	(2,2014)	(0,001)	(0,0008)	(0,0026)	(0,0014)
Leverage	-51,2782***	-87,4196***	0,2175***	0,2041***	0,2477***	0,1764***
	(17,1094)	(22,5341)	(0,046)	(0,0193)	(0,044)	(0,0216)
R&D Exposure	-146,6365	149,9675	0,0448	0,2497***	0,258	0,1273*
	(150,4088)	(270,4743)	(0,0882)	(0,0435)	(0,1994)	(0,071)
Cash Holding	277,1604*	163,7299***	0,2055***	0,1645***	0,1248	0,176***
	(147,8336)	(56,8929)	(0,0543)	(0,0211)	(0,08)	(0,0323)
Liquidity	48,224	12,249**	0	-0,0055***	0,0059	-0,0022
	(37,7331)	(5,1084)	(0,0041)	(0,0013)	(0,0069)	(0,0018)
Profitability	493,9958***	823,5189***	-0,1325**	-0,182***	-0,3443***	-0,1825***
	(175,504)	(182,0759)	(0,063)	(0,0295)	(0,1009)	(0,0432)
Observations	1619	7552	1619	7552	1619	7552
R-Squared	0,287	0,362	0,499	0,385	0,201	0,126
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes

Appendix XI (Table XIII)

Robustness (Financial Distress)

This table represents OLS coefficients from the regressions of Altman Z, Ohlson O and Shumway on the ESG combined score over the period of 2002-2018, where data is divided into two subsamples of financially distressed and non-distressed firms. (D) represents companies with a Z-Score < 1,81, while (ND) non-distressed companies, respectively. Region, Year and Industry dummies are present in all regressions. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	(1) Altman Z (D)	(2) Altman Z (ND)	(3) Ohlson O (D)	(4) Ohlson O (ND)	(5) Shumway (D)	(6) Shumway (ND)
ESG_combined	0,0411	0,17	-0,0005***	-0,000053**	-0,0007***	-0,0003***
	(0,0258)	(0,1644)	(0,0001)	(0)	(0,0003)	(0,0001)
Firm Size	0,3118**	-19,7715***	-0,0048***	-0,0058***	-0,0072***	-0,0049***
	(0,1283)	(1,7142)	(0,0009)	(0,0005)	(0,0025)	(0,0008)
Leverage	2,1184	-157,0099***	0,2571***	0,193***	0,2914***	0,1326***
	(2,5183)	(18,863)	(0,0344)	(0,0221)	(0,0395)	(0,0236)
R&D Exposure	-71,9359*	-320,4222***	-0,0787	0,1517***	-0,0337	0,0986*
	(37,7654)	(89,6549)	(0,1259)	(0,0329)	(0,2302)	(0,0505)
Cash Holding	-21,8383**	162,5491***	0,3488***	0,1405***	0,2345*	0,1487***
	(8,994)	(57,5847)	(0,0568)	(0,019)	(0,1211)	(0,031)
Liquidity	0,1184	23,2921***	-0,0262***	-0,0019	0,0002	0,0006
	(1,7536)	(6,289)	(0,0071)	(0,0012)	(0,0149)	(0,0016)
Profitability	4,4717	1037,7149***	-0,4469***	-0,1106***	-0,4093***	-0,1018**
	(7,4908)	(208,0839)	(0,0634)	(0,0316)	(0,1017)	(0,0463)
Observations	2098	7073	2098	7073	2098	7073
R-Squared	0,166	0,438	0,619	0,378	0,300	0,104
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Appendix XII (Table XIV)

First Stage IV Analysis

This table represents OLS coefficients from the regression of the ESG combined score on the overall ESG Industry Mean score over the period of 2002-2018. Region and Year dummies are present in the regression. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	ESG_combined
ESG Industry Mean	-0,6449***
	(0,0414)
Firm Size	5,397***
	(0,102)
Leverage	-2,5927**
	(1,0141)
R&D Exposure	27,0298***
	(5,8546)
Cash Holding	-7,5198***
	(2,2425)
Liquidity	-1,6712***
	(0,2139)
Profitability	4,0494***
	(1,3691)
Observations	9171
R-Squared	0,907
Region FE	Yes
Year FE	Yes
Industry FE	No
F-Test	94,19

Appendix XIII (Table XV)

Second Stage IV Analysis

This table represents OLS coefficients from the regressions of Altman Z, Ohlson O and Shumway on the ESG combined score* over the period of 2002-2018. Region, Year and Industry dummies are present in all regressions. The robust standard errors are given in parentheses. The symbols ***, ** and * represent the significance level at 1%, 5% and 10%, respectively.

VARIABLES	Altman Z	Ohlson O	Shumway
ESG_combined*	0,1914	-0,0055***	-0,0057***
	(0,3491)	(0,0003)	(0,0007)
Firm Size	-14,2939***	0,0166***	0,0172***
	(2,4816)	(0,0014)	(0,0028)
Leverage	-71,8423***	0,191***	0,177***
	(19,2842)	(0,0177)	(0,0196)
R&D Exposure	194,1966	0,3657***	0,2845***
	(227,369)	(0,0418)	(0,0649)
Cash Holding	270,4973***	0,1275***	0,1196***
	(52,3306)	(0,0194)	(0,0301)
Liquidity	19,736***	-0,0146***	-0,011***
	(5,838)	(0,0014)	(0,0022)
Profitability	811,7057***	-0,1588***	-0,1771***
	(166,9473)	(0,0267)	(0,0401)
Observations	9171	9171	9171
R-Squared	0,373	0,391	0,128
Region FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Appendix XIV (Table XVI)

List of other Files submitted

The Python Code as well as the Excel Data File is available and was submitted as two separate files. The Python Code was provided in PDF format.

File Name:

Data Thesis FINAL.xlsx

DataSet_152419070_FINAL.pdf