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Environmental, Social, and Governance scores and their effect on financial distress risk

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ABSTRACT

This thesis investigates the impact of Environmental, Social, and Governance (ESG) scores on financial distress across various regions and sectors. Using Altman's Z-score as a proxy for financial distress, we analyze data from the Refinitiv Eikon database, covering companies in the EU, US, and Japan. The results indicate that the Environmental and Social pillars have a significant positive effect on financial distress, likely due to improved operational efficiency and stakeholder support. Our regional analysis reveals that ESG scores have a stronger impact in the EU than in Japan and the US, attributed to stricter ESG regulations. The healthcare sector exhibits a weaker association with ESG scores, suggesting sector-specific regulatory influences. Robustness checks using Grover G-score and instrumental variable regression confirm these findings. The implications for managers, investors, and regulators highlight the importance of emphasizing ESG factors to enhance corporate resilience against financial distress. Further research should consider a more detailed examination of ESG components and include privately held companies to expand the scope of analysis.

Keywords: ESG, Environmental Social Governance, financial distress risk, healthcare sector, European Union, Japan, United States

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Chapter 1: Introduction

Environmental, Social, and Governance (ESG) considerations have increasingly become a focal point for corporations, prompting a notable shift towards the integration of ESG factors into business strategies (Zhou et al., 2022; Chen, 2024). This trend is substantiated by initiatives such as the United Nations Global Compact, which offers both financial and non-financial incentives to companies, thereby shaping strategic management policies to prioritize sustainability and community development (Ortas et al., 2015). From a legislative perspective, the EU's Corporate Sustainability Reporting Directive (CSRD) mandates sustainability reporting for 50,000 companies, encompassing not only EU-based firms but also non-EU companies with subsidiaries operating within the EU or those listed on EU-regulated markets (KPMG, 2023). Furthermore, research indicates an increase in ESG-focused institutional investments, projected to surge by 84% to $33.9 trillion by 2026, representing 21.5% of assets under management (PwC, 2022). In light of the expanding legislative framework and rising investor interest, it is evident that companies must adopt ESG practices to navigate the evolving regulatory landscape effectively and capitalize on the growing allocation of capital by asset holders.

Incorporating and excelling in ESG criteria can significantly fortify a company's resilience, thereby ensuring its sustained performance and longevity (Jagyasi et al., 2023; Zumente et al., 2021). Conversely, inadequate ESG scores can expose firms to a myriad of risks. Companies that emit high levels of greenhouse gases and produce hazardous waste are more susceptible to financial penalties. On the other hand, those that invest in green supply chain initiatives and maintain transparency about their environmental practices tend to avoid such penalties (Habib et al., 2023). Additionally, adverse social perceptions and moral emotions triggered by corporate actions can lead to detrimental public responses, such as negative word of mouth, complaints, and boycotts (Xie et al., 2019). Furthermore, deficient corporate governance can impede a firm's capacity to effectively navigate external pressures and market fluctuations, thereby impairing its performance and adaptability (Rekha Pillai et al, 2017). Moreover, investors are increasingly reluctant to engage with industries characterized by poor ESG practices, affecting the informational milieu surrounding these companies and potentially curtailing their access to financing (Ferri et al., 2023). Consequently, robust ESG performance appears essential for preserving investor confidence, ensuring customer satisfaction, and avoiding regulatory fines.

The origin of ESG stems from the debate around Corporate Social Responsibility (CSR). Bowen (1953) was one of the first to define CSR, suggesting that it involves pursuing policies, making decisions, and following actions that are desirable in terms of the objectives and values of our society. Carroll (1979) expanded on Bowen's framework by outlining economic, legal, ethical, and philanthropic responsibilities, emphasizing the interconnectedness of profit generation and societal needs, with philanthropic responsibilities being voluntary roles. The exploration of CSR began with scholars and practitioners recognizing that companies' aims extend beyond profit-making to include social obligations and benefits to

society (Friede et al, 2015). In contrast, Friedman argued that the primary social responsibility of firms is to maximize profits and criticized unexpected CSR activities (Baron et al., 2005).

Currently, the significance of ESG scores continues to vary across regions. The European Union (EU) appears to be significantly ahead of regions such as the United States and Japan, primarily due to its robust regulatory framework (McKinsey, 2021). An illustrative example is the Corporate Sustainability Reporting Directive (CSRD), which mandates that companies within the EU provide comprehensive reports on ESG impacts to enhance transparency and foster sustainable business practices (EU Commission, 2022). Conversely, there is a gradual yet increasing emphasis on ESG in the United States. For instance, California has introduced legislation aimed at improving corporate transparency and accountability in ESG practices, including mandatory disclosures of greenhouse gas emissions by corporations operating in the state. This has met with substantial resistance from corporations due to the associated financial burden (Deloitte, 2024). While resistance towards ESG practices was initially observed primarily in North America, recent electoral successes of far-right parties in the European Union, combined with political instability from events such as COVID-19, the war in Ukraine, and conflicts in the Middle East, have led to an anti-ESG backlash that may reshape the future trajectory of ESG scores (Stewart, 2024). Given the volatile nature of opinions surrounding ESG, the following research questions emerge from an academic perspective:

What is the impact of ESG scores and their individual components on financial distress risk across different regions and sectors?

As the relationship between ESG scores and financial distress has been extensively addressed in previous research (e.g., Boubaker et al., 2020, Al-Hadi et al., 2017), this study aims to contribute academic relevance and originality by analyzing the effects of the environmental and social pillars, examining the impacts across different countries and sectors. This research employs the Altman's Z-score as a proxy for financial distress risk, a model deemed appropriate and utilized in prior studies exploring the relationship between ESG scores and financial distress (Boubaker et al., 2020). ESG scores will be sourced from the Refinitiv Eikon ESG scores database, while financial information will be obtained from the DataStream environment. The relationship will be examined using OLS regression, with analyses conducted in Python. This study hypothesizes and will demonstrate that there is a significant negative relationship between the environmental and social pillar scores and financial distress. Additionally, this study will reveal that ESG scores have a more substantial impact on financial distress risk in regions with more developed ESG regulations (EU) compared to regions with less developed ESG practices (such as the US and Japan). Furthermore, the research will find that while ESG scores significantly reduce financial distress risk in the healthcare sector, this effect is less pronounced compared to other sectors. The robustness of these findings will be validated through the introduction of a new proxy for financial distress risk, and the 2 stage-least squares regression. The G-score model will show that ESG scores, including individual environmental and social pillars, have a significant negative effect on financial distress risk, albeit to a smaller extent compared

to the Z-score model. This comprehensive analysis provides deeper insights into the nuanced impacts of ESG practices across different contexts and sectors.

Chapter 2: Literature Review

The purpose of this literature review is to provide a comprehensive understanding of the existing literature and discussions on the relationship between ESG scores and financial distress. The scope of this review encompasses the evolution of CSR concepts leading to the development of the ESG scoring system. The definition of ESG will be explored together with other relevant theories such as stakeholder theory and shareholder theory, and examine the relationship between ESG scores and financial performance, highlighting insights relevant to the link between ESG scores and financial distress risk. Additionally, this review will analyze the individual ESG pillars, reviewing existing findings on their relationships with financial performance. The review will also cover regional differences in ESG impact due to varying regulations and examine sector-specific research. Throughout the review, we will critically evaluate different models for predicting financial distress, focusing on how the Altman Z-score can be utilized to gain insights into the relationship between ESG scores and financial distress risk.

The EU Green Deal's Corporate Sustainability Reporting Directive (CSRD) proposed a clear sustainability reporting and assurance framework (Lin et al., 2022). The ESG framework helps companies identify and communicate to investors the material long-term risks they face from ESG-related issues, such as climate change, social responsibility, and corporate governance (Hilson, 2024). By integrating ESG factors into their decision-making processes, companies can enhance their transparency, accountability, and overall sustainability performance (Setiarini et al., 2023). Some studies argue that high ESG scores are linked to financial performance (Williams, 2022; Zhou et al., 2022; Duque-Grisales et al., 2019), and that financial performance may be linked to financial distress risk (Pindado et al., 2008, Mselmi et al., 2017). Financial distress may cause direct costs (e.g. legal costs) and indirect costs (e.g. increased borrowing costs), leading to diminished return on investments (Nance et al., 1993; Molina & Preve, 2012).

This study aims to critically analyze how ESG scores impact financial distress risks. The nature of this relationship is strongly influenced by the structured and quantifiable frameworks within which ESG scores are compiled. The ESG framework comprises three main components: environmental, social, and governance criteria that collectively assess a company's sustainability and ethical impact. The environmental component evaluates the company's environmental practices and impact, including resource consumption, waste production, pollution levels, and overall environmental footprint (Escrig-Olmedo et al., 2019). Social criteria evaluate company’s performance on labor practices, human rights, diversity and inclusion, community engagement, and product safety (Kocmanová & Šimberová, 2014). Governance criteria assess factors such as board diversity, executive compensation, shareholder rights, anti-corruption measures, and risk management practices (Gündoğdu et al., 2023). In understanding the definition of ESG scores, one might better grasp the interpretation of the effects ESG scores have on financial distress risk.

2.1 The rise of CSR that led to ESG scores

This study will concentrate on ESG scores, which are quantifiable metrics, rather than CSR, which tends to be discussed more qualitatively within business contexts. The quantifiable nature of ESG scores provides a systematic way to assess the relationship between sustainable practices and financial distress. By focusing on these measurable scores, this research aims to clearly identify and analyze how adherence to ESG criteria relates with a company's financial distress risk, offering a structured and objective method to explore the impact of sustainable business practices on financial outcomes.

To fully appreciate the significance of ESG scores in today's financial landscape, it is crucial to delve into the history of ESG principles. By studying the evolution of these principles, one can understand their current relevance and the role they play in assessing financial distress risk. This historical perspective illuminates how ESG criteria have emerged as essential indicators of corporate responsibility and sustainability. In recent years, the integration of ESG into academic discourse has emerged as a pivotal topic, reflecting a growing recognition of its significance in shaping scholarly research and institutional practices (Amin-Chaudhry et al., 2016).

Around the turn of the millennium, a growing body of literature emerged focusing on the relationship between religion and corporate social responsibility (CSR) (Van Aaken et al., 2020). Early CSR research was a product of cataclysmic events experienced by scholars, particularly the labour conflicts of the 1930s and the uneasy labour peace that subsequently followed (Marens, 2008). Dodd (1932) argued that as people's views about what businesses contribute to society change, companies will start taking more responsibility for their employees, customers, and the community. In The Modern Corporation and Private Property (1932), Adolf Berle and Gardiner Means indirectly espoused a stakeholder theory of corporate governance by highlighting the separation of ownership and control. The book challenges the traditional understanding of private property within corporations, opening the door to considering a broader range of stakeholders, beyond just shareholders, who have an interest in the corporation's actions (Smith et al., 2019). CSR further emerged in the 1940s, and a new model, "consumer-driven corporate responsibility" (CDCR), was proposed to provide a more efficient understanding of CSR (Claydon et al., 2011). Bowen (1953) published a groundbreaking article that posed a fundamental question which continued to drive the CSR narrative: "What responsibilities to society may businessmen reasonably be expected to assume?" (Inoue & Lee, 2011). This question not only initiated the exploration of the ethical obligations of businesses but also set the stage for further research and discussions on the role of corporations in addressing societal needs. The influence of Bowen's work on CSR has been profound, with subsequent scholars and researchers building upon his foundational insights (Carroll, 1999; Gupta & Hodges, 2012). Later, Friedman (1970) contended that CSR could only be ethically justified if it directly served the financial interests of the corporation. According to Friedman, any actions undertaken under the guise of CSR that do not contribute to profit maximization cannot be considered genuine CSR. This sparked more debates about CSR. Firstly, Jensen and Meckling's (1976) "Agency Theory" has had a notable impact on the discourse surrounding CSR, particularly in relation to the role of stakeholders in corporate decision-making. The Agency Theory focuses

on the relationship between principals (shareholders) and agents (managers) in a corporation, emphasizing the potential conflicts of interest that may arise due to divergent objectives between these parties (Lockett et al., 2006).

The Agency Theory has diverse implications for CSR. It emphasizes aligning managerial actions with shareholder interests, often prioritizing profit maximization and shareholder value. This mirrors Friedman's (1970) belief that businesses' main responsibility is the generation of profit to increase shareholders' wealth. However, applying agency theory to CSR emphasizes that managers should address the interests of stakeholders beyond just shareholders. Employees, customers, communities, and the environment all contribute to a business's success and sustainability. Considering these interests in decision-making may foster long-term value creation and reduce agency conflicts (W. Schulze et al., 2001).

Secondly, the Shareholder Theory's criticism regarding CSR is based on the argument that expenses on CSR activities may conflict with the fiduciary responsibility of management towards shareholders. Shareholder theory posits that involvement in CSR activities can increase company costs without directly benefiting shareholders (Juniarti, 2020). This perspective implies that resources directed towards CSR initiatives could potentially result in misallocations and harm shareholders' interests (Chen, 2020). Furthermore, the shareholder expense view suggests that investing in unproductive CSR projects does not contribute to enhancing shareholder wealth (Cho et al., 2020).

In contrast to the Shareholder Theory, the Stakeholder Theory, as articulated by Freeman (1984), views CSR as an extension of effective corporate governance mechanisms aimed at resolving conflicts between managers and non-investing stakeholders (Jo & Harjoto, 2011). This perspective emphasizes that firms have relationships with a diverse range of stakeholders, including employees, competitors, consumers, environmental advocates, media, governments, and others. Executives are seen as representatives of these various stakeholders, playing a role in social and political processes and fostering coalitions among external stakeholders (Cai et al., 2011). The Stakeholder Theory underscores the idea that all stakeholders contribute to the creation of enterprise value, and the distribution of value among stakeholders should be based on their respective contributions (Wang et al., 2020).

The outcomes of these discussions are evident in contemporary prevailing models, which seek to ascertain the depth of various theories in the context of current models and optimal practices concerning CSR and ESG principles. Visser introduced the concept of CSR 2.0, which comprises four key elements: value creation, good governance, social contribution, and environmental integrity (Smida et al., 2011). This framework represents an evolution in the understanding and practice of CSR, emphasizing the importance of creating value for all stakeholders, promoting ethical business conduct, and ensuring environmental sustainability. CSR 2.0 goes beyond traditional philanthropic activities and integrates social and environmental considerations into the core business strategy, reflecting a more comprehensive and holistic approach to corporate responsibility (Smida et al., 2011). Overall, the literature supports the stakeholder theory perspective in CSR, indicating that the CSR 2.0 method, which emphasizes value creation, good

governance, social contribution, and environmental integrity, aligns well with the accepted principles of stakeholder theory in CSR practices.

While CSR is a subset of ESG, ESG encompasses a wider range of criteria that also include governance aspects (Seow, 2024). In 2006, the United Nations launched the Principles for Responsible Investment (PRI), which encouraged investors to integrate ESG factors into their investment processes. This initiative marked a significant milestone, promoting the idea that considering ESG factors could lead to better long-term investment outcomes and more sustainable business practices (Harvard Law School, 2022). ESG is closely linked to the 17 Sustainable Development Goals established by the United Nations, which aim to address critical social, environmental, and economic issues. ESG encompasses a broader and more structured framework that evaluates a company's performance across environmental, social, and governance dimensions (Cucari et al., 2017). ESG factors are increasingly integrated into investment decisions and corporate strategies, reflecting a shift towards more comprehensive and impactful sustainability practices in the business world (Cristea et al., 2022). Therefore, this study will focus on ESG scores due to their quantifiable nature, unlike CSR which is typically discussed qualitatively. Using ESG metrics will allow for a systematic assessment of the relationship between sustainable practices and financial distress, providing a clear and structured method to analyze how adherence to ESG standards impacts financial distress risk.

2.2 Financial Distress Risk

To fully grasp the importance of the relationship between ESG scores and financial distress, it is crucial to understand the definition and relevance of financial distress risk. The concept of financial distress has been extensively analyzed in recent years. Baldwin et al. (1983) defined financial distress as a firm's inability to meet its financial obligations, often due to debt covenant violations, which is often seen as the modern definition of bankruptcy (White et al., 2016). In contrast, Platt et al. (2006) distinguished financial distress because of operating decisions or external forces, while bankruptcy is a choice to protect assets from creditors. Kholisoh et al. (2020) focused on quantifying financial distress before bankruptcy, and Gupta et al. (2017) defined it as a firm reporting earnings less than financial expenses for two consecutive years, with a net worth/total debt ratio under one and negative net worth growth in the same period. Overall, financial distress involves a range of factors affecting a company's financial stability and solvency, reflecting its complex and multifaceted nature.

The causes of financial distress have been studied and attributed to both internal and external factors. Research by Gilson (1997) indicates that transaction costs and capital structure decisions significantly influence the financial distress experienced by firms. Companies with high debt-to-equity ratios face increased interest payments and debt servicing requirements, which can put considerable pressure on their financial resources (Udin et al., 2017). Profitability has been highlighted as a significant determinant of financial distress (Jaafar et al., 2018). Profitability is crucial for covering expenses, including debt obligations, and a lack of profitability can strain a company's financial position, increasing its susceptibility to financial distress (Kazemian et al., 2017). Moreover, external constraints on monetary policy and the

financial accelerator mechanism have been linked to financial distress (Gertler et al., 2007). Changes in monetary policy, such as interest rate adjustments, can impact borrowing costs for firms (Kazemian et al., 2017). Tightening monetary policy, which involves increasing interest rates, can lead to higher borrowing costs for companies, making it more challenging for them to service their debt obligations (Kordestani et al., 2011).

The costs of financial distress are imposed on firms both directly and indirectly. When a firm faces financial distress, it may incur direct legal costs associated with bankruptcy, reorganization, or liquidation (Nance et al., 1993). Additionally, firms in financial distress often resort to trade credit as a costly source of financing, leading to extra costs that can diminish their overall performance (Molina & Preve, 2012). The costs of financial distress are not limited to direct financial implications but also extend to increased costs for suppliers and debt, impacting the firm's profitability (Ikpesu, 2019). One of the significant indirect effects of financial distress on firms is the increased borrowing costs and reduced market demand due to the switching of key suppliers, employees, and customers (Farooq & Noor, 2021). Financial distress can also influence a firm's decision-making regarding risk management strategies. Firms facing significant costs of financial distress due to abnormally low cash flows may opt to hedge against market risks to mitigate the present value of financial distress (Chowdhry, 2016).

The prediction of financial distress is mostly done via accounting-based and market-based models. Accounting-based models rely on financial ratios and historical accounting data to assess a company's financial health and likelihood of distress (Colff & Vermaak, 2015). These models typically analyze metrics such as liquidity ratios, profitability ratios, leverage ratios, and efficiency ratios to evaluate the company's performance (Verónica et al., 2020). One of the foundational accounting-based models is Altman's (1968) Z-score. Altman's Z-score model uses a combination of five financial ratios to predict the probability of a company going bankrupt within two years, incorporating factors such as profitability, leverage, liquidity, and solvency (Altman, 1968). The Z-score model has seemingly increased in popularity over the years and is often chosen over other accounting-based models like Ohlson's (1980) O-score, Zmijewski's (1984) Zm-score, and Grover's G-score (2003), due to its higher accuracy (Winarso & Edison, 2019).

Market-based models incorporate market-driven variables such as stock prices, trading volumes, and market volatility to make predictions about financial distress (Tarazi et al., 2005). These models consider the reactions of investors and the overall market sentiment towards a company to gauge its financial stability (Sehgal et al., 2021). They assess how the market perceives the company's prospects and incorporate this sentiment into their predictions. The distinction between accounting-based and market-based models lies in their predictive accuracy and robustness. Accounting-based models are known for their reliability and ease of use in predicting financial distress based on historical financial data and established accounting principles (Wang et al., 2009). Accounting based models provide a solid framework for assessing a company's financial position over time (Zeng et al., 2020). In contrast, market-based models are considered more sensitive to market fluctuations and external shocks (Tarazi et al., 2005).

Accounting models have found more popularity in the academic world due to their substantial impact on predicting financial distress compared to market-based and qualitative factors in an integrated model (Ninh et al., 2018; Xu et al., 2023). Nevertheless, incorporating accounting, market, and macroeconomic data into financial distress prediction models for publicly traded companies boosts both their accuracy and practical usefulness (Tinoco et al., 2013). Based on existing research, accounting models are considered reliable and lack the sensitivity issues often associated with market models (Wang et al., 2009; Tarazi et al., 2005). Therefore, this study will employ accounting-based models as a method to investigate the relationship between ESG scores and financial distress risk. This approach ensures that our measurements are both stable and credible.

2.3 ESG and Financial Performance

The relationship between ESG factors and financial performance has been extensively researched. Some studies suggest a positive correlation between a firm's ESG performance and its financial performance (Williams, 2022; Zhou et al., 2022; Duque-Grisales et al., 2019), while others have found conflicting results, indicating a negative impact of ESG activities on financial performance (Ademi & Klungseth, 2022). This discrepancy in findings highlights the complexity of the relationship between ESG and financial performance (Şeker & Güngör, 2022).

Research has shown that various factors can influence the relationship between ESG performance and financial performance. For example, firm size has been identified as a moderator in this relationship (Ahmad et al., 2021). Additionally, the materiality of ESG information and the specific ESG factors considered can impact the relationship between ESG and financial performance (Amel-Zadeh & Serafeim, 2018).

The conflicting results in the literature regarding the correlation between ESG and financial performance underscore the need for further research to better understand the nuances of this relationship (Almeyda & Darmansya, 2019). The mixed findings suggest that the impact of ESG on financial performance is multifaceted and context-dependent, requiring a more nuanced approach to analyzing the causal links between ESG factors and financial outcomes.

The causality conflicts between ESG and financial performance stem from the intricate nature of the relationship, influenced by various factors such as firm size, the materiality of ESG information, and the specific ESG factors considered. To navigate these diverse results and causality conflicts, we will further analyze the consistency in the results between ESG scores and financial distress. Research already has shown that there seems to be a relationship between financial performance and financial distress risk (Pindado et al., 2008) . Increased financial performance may decrease the likelihood of financial distress by improving the stability of the model used to estimate it (Pindado et al., 2008). Furthermore, increased financial performance might decrease the probability of financial distress by providing early warning signals of performance deterioration, allowing managers to take corrective actions and reduce distress risk (Mselmi et al., 2017).

2.4 ESG and Financial Distress

We will analyze the existing literature written about the effect ESG scores have on financial distress risk, to see where this research may contribute to the academic literature. This analysis will identify foundational theories to build upon and pinpoint opportunities to introduce original insights into the field. The Resource-Based View (RBV) theory posits that allocating resources to ESG initiatives can strengthen a firm's capabilities and assets, thereby enhancing operational efficiency and mitigating risks, which in turn can lead to a lower probability of financial distress (Ademi & Klungseth, 2022). This view implies that firms that emphasize ESG factors are more adept at handling challenges and lowering the risk of financial distress. It has been found that companies that actively engage in ESG practices are better equipped to manage risks, including those that could potentially lead to financial distress (Singh, 2023).

Moreover, studies have highlighted the role of ESG practices in enhancing resilience during crises and mitigating negative financial impacts (Amosh & Khatib, 2023). Compliance with ESG issues has been shown to help companies weather financial downturns and satisfy stakeholders, ultimately leading to financial gains (Broadstock et al., 2020). This indicates that ESG considerations can act as a protective mechanism against financial distress during economic downturns. Boubaker et al. (2020) demonstrated that improved ESG scores result in a decreased probability of financial distress and lower default risk, thereby enhancing financial stability and crisis resilience. Furthermore, Harymawan et al. (2021) conducted a study that focused on the role of ESG reporting in helping financially distressed firms achieve accelerated recovery and reduce the likelihood of bankruptcy.

Few studies have researched the impact of the environmental (E) and social (S) components on financial distress. The governance (G) component has been investigated by Hassan Al-Tamimi (2012) and Younas et al. (2021), who argue that sufficient corporate governance, together with business contract transparency, ethical standards, and legal and constitutional agreements, leads to a lower probability of financial distress. Conversely, inadequate corporate governance can increase opportunities for controlling shareholders to divert value from the firm for personal gain. This decline in corporate value heightens the likelihood of the company experiencing financial distress (La Porta et al., 2000; Johnson et al., 2000).

Although the impact of the environmental and social components on financial distress risk has not been thoroughly examined, the relationship between these components and their effect on financial performance has been a subject of ongoing debate. Research by Zhang et al. (2023) indicates a positive correlation between environmental disclosure and financial performance. This positive correlation can be attributed to the fact that environmental disclosure provides valuable information to stakeholders, including investors, about a company's commitment to environmental sustainability. Such transparency can enhance investor confidence, improve the company’s reputation, and attract investment, all of which contribute to better financial performance (Yu et al., 2018). Additionally, research conducted by Zahroh and Hersugondo (2021) on manufacturing firms listed in Indonesia demonstrated a positive and significant influence of environmental performance on financial outcomes. This finding suggests that companies that prioritize environmental performance may benefit from cost savings through efficient resource use and waste

reduction, leading to improved profitability (Zahroh and Hersugondo, 2021). Furthermore, Setiawan and Honesty's (2021) study revealed that environmental performance positively and significantly affects financial performance. Companies with strong environmental performance tend to receive favorable responses from stakeholders, including customers and investors, which can lead to increased financial performance in the long run (Setiawan and Honesty, 2021). By demonstrating a commitment to environmental sustainability, companies can build stronger relationships with stakeholders, reduce operational risks, and enhance their competitive advantage (Taliento et al., 2019). These findings may also provide insights into the relationship between environmental scores and financial distress risk. Companies with higher environmental scores may exhibit lower financial distress risk due to their sustainable and resilient business practices (Gangi et al., 2020). By mitigating environmental risks and improving operational efficiencies, these companies can achieve greater financial stability and reduce the likelihood of financial distress.

The relationship between the social component and financial performance has been a subject of ongoing debate. During the COVID-19 crisis, social factors were found to significantly impact systemic risk, emphasizing the importance of social considerations in financial performance (Eratalay & Ángel, 2022). Social factors, such as employee well-being, community engagement, and equitable business practices, can play a crucial role in a company's resilience and ability to navigate crises (Veer et al., 2021). Furthermore, Giannarakis et al. (2016) emphasized the beneficial impact of socially responsible initiatives on financial performance. This positive effect is attributed to several factors: socially responsible initiatives can improve operational efficiency by fostering a positive work environment and encouraging innovation. They also enhance a company's reputation, which can attract customers and investors who value ethical practices (Lewis et al., 2000). Strengthening stakeholder relationships through social responsibility can lead to greater loyalty and support, reducing risks and promoting long-term business sustainability (Bhattacharya et al., 2009). Additionally, Sharma (2024) investigated the relationship between Corporate Sustainability and Financial Performance in State-owned Enterprises in Indonesia, demonstrating that high social performance can result in favorable financial outcomes. By prioritizing social responsibility initiatives, these enterprises can enhance their reputation, build trust with stakeholders, and create a positive market image. These benefits can lead to increased customer loyalty, better employee retention, and more attractive investment opportunities, ultimately leading to improved financial performance (Reichheld et al., 1993). These findings also provide insights into the relationship between environmental scores and financial distress risk. Companies with strong social and environmental performance may exhibit lower financial distress risk due to their sustainable and resilient business practices (Boubaker et al., 2020). By addressing social and environmental concerns, these companies can reduce operational risks, improve stakeholder relations, and enhance their overall stability, reducing the likelihood of financial distress. Overall, the results show that higher ESG scores decrease financial distress and default risks (Boubaker et al, 2020), also during periods of crisis (Eratalay & Ángel, 2022). This demonstrates that a deeper analysis of this relationship can provide valuable insights for managers, investors, and regulators enabling them to enhance the financial stability of their (regulated) assets.

2.5 ESG regulations in the EU, US and Japan

The connection between ESG regulation and ESG scores is a crucial field of research, offering insights into how regulatory frameworks influence companies' environmental, social, and governance practices. Lubis & Rokhim (2021) emphasize that in developed countries, mandatory ESG disclosure for listed companies has resulted in a positive impact on their performance. To determine if ESG scores have a larger effect on financial distress in the EU compared to the US and Japan, it is essential to examine the regulatory environments and reporting standards for ESG factors in these regions.

The European Union (EU) has been a leader in ESG regulation, implementing the Corporate Sustainability Reporting Directive (CSRD) directives and guidelines that have significantly influenced reporting standards and potentially affected the financial stability of firms (Arif et al., 2021). The EU mandates disclosure of ESG matters in both traditional annual reports and standalone ESG reports and has established voluntary standards to help organizations measure, understand, and communicate their exposure to ESG risks and opportunities (Cicchiello et al., 2022). These comprehensive regulations may lead to a more pronounced impact of ESG scores on financial distress within the EU. However, research has found that the EU's stringent ESG standards, in place for some time, mean many companies already adhere to high levels of ESG practices, where incremental benefits of further improvements in ESG scores diminish (Eliwa et al., 2021; Guo et al., 2022).

In the United States, the regulatory framework for ESG reporting is undergoing significant changes, marked by legislative initiatives like the ESG Disclosure Simplification Act of 2021, which seeks to define and standardize ESG metrics for mandatory corporate reporting (Desai, 2023). Unlike the European Union, where ESG reporting has become more uniform and obligatory, US firms typically disclose ESG information on a voluntary basis, carefully considering the associated costs and benefits (Hoang, 2023). Investors in the EU might already expect high ESG standards due to regulatory requirements and market norms; therefore, a high ESG score might be less surprising or noteworthy, reducing its impact on financial performance (Billio et al., 2021). Conversely, ESG scoring could be more of a differentiator in regions with less developed ESG practices, such as Japan and the US. This differentiation can lead to increased investor trust, improved access to capital, and a lower probability of financial distress for companies with high ESG scores (Torre et al., 2020).

In Japan, the regulatory framework for ESG reporting is also evolving. The government has introduced codes of conduct for data and ESG rating providers to ensure the reliability and comparability of ESG information (Ermokhin, 2023). These initiatives are designed to improve the quality and consistency of ESG reporting, aligning Japan with global trends toward more rigorous ESG disclosure practices. Furthermore, the influence of various stakeholders, including regulators, NGOs, and community groups, on ESG governance and reporting practices, especially in industries such as automotive, is increasingly acknowledged (Yeh, 2023). These evolving regulations and stakeholder influences might contribute to a different degree of impact of ESG scores on financial distress in Japan compared to the EU and the US. There appears to be a gap in the literature regarding whether ESG scores have a higher effect on financial

distress in regions with developed ESG practices (EU) compared to regions with less evolved ESG practices (The US and Japan). Assessing the differences in the effects of ESG scores on financial distress across regions can significantly enhance asset owners' ability to mitigate financial distress risks. By understanding these regional variations, asset owners can adjust their weighting of ESG scores accordingly, optimizing their investment strategies based on the distinct impacts observed in different regions.

2.6 Healthcare sector

To further enhance the originality of this research, we will conduct an in-depth examination within the sectorial context, particularly focusing on healthcare companies. This sector is often scrutinized for its ethical practices, patient care standards, and environmental impact, making ESG considerations particularly pertinent (Thongpattram, 2021; Consolandi, 2020). Kalia & Aggarwal (2022) identified a significant relationship between high ESG scores, individual ESG pillars, and financial performance for healthcare companies. Additionally, research by Kalia et al. (2022) found that ESG activities positively impact the performance of healthcare firms in developed economies. Candio (2024) also established a significant positive relationship between ESG scores and the financial performance of healthcare companies.

Given that financial performance is often linked to financial distress (Pindado et al., 2008; Mselmi et al., 2017), it is plausible to hypothesize a relationship between ESG scores and financial distress in the healthcare sector. There seems to be no research performed that has analyzed the effects of ESG scores on financial distress in healthcare companies compared to other less regulated sectors. Understanding this relationship is crucial for grasping the significance of ESG scores in mitigating financial distress across different industries.

Chapter 3: Hypothesis

There are two significant gaps that need to be addressed to form a better understanding of the causal relationship between ESG scores and financial distress risk. Firstly, studies on the relationship between ESG scores and financial distress risk fall short in analyzing the impact of each ESG component on financial distress (Ademi & Klungseth, 2022; Singh, 2023). However, the impact of the governance pillar appears to be covered in some literature (Al-Tamimi, 2012; Younas et al., 2021). Studies by Zhang et al. (2023), Zahroh and Hersugondo (2021), and Setiawan and Honesty (2021) demonstrate that high environmental scores provide valuable information to stakeholders, leading to increased investor confidence and financial performance. Similarly, findings by Eratalay & Ángel (2022), Giannarakis et al. (2016), and Sharma (2024) highlight the significant impact of social responsibility initiatives on financial performance, showing that these practices improve operational efficiency, enhance reputation, and strengthen stakeholder relationships. Given the relationship between financial performance and financial distress (Balasubramanian et al., 2019), the following hypothesis is expected to be accepted:

H1: High scores on the environmental and social pillars have a negative effect on the risk of financial distress.

While Lubis & Rokhim (2021) emphasize that in developed countries, mandatory ESG disclosure for listed companies has resulted in a positive impact on their performance, the relationship between ESG scores and their effect on relationships seems to be a new topic of research. The EU seems to be further in deploying ESG practices into the environment compared to the US and Japan (McKinsey, 2021). As The EU mandates disclosure of ESG matters in both traditional annual reports and standalone ESG reports, one may say that the effect of ESG scores on financial distress risk will be higher in the EU, and therefore the following hypotheses will be accepted:

H2: ESG scores have a significantly higher impact on reducing financial distress risk in the EU compared to the regions with less developed ESG practices (Japan and US).

The relationship between ESG scores and financial performance in the healthcare sector has been well-documented in recent studies (Kalia & Aggarwal, 2022; Kalia et al., 2022). Building upon this established research, this study aims to further investigate how ESG scores influence the risk of financial distress within the healthcare sector. Given the recognized link between financial performance and financial distress (Pindado et al., 2008; Mselmi et al., 2017), and that ESG scores might have a higher effect on healthcare companies because of the ethical nature of the sector (Thongpattram, 2021; Consolandi, 2020), one may say that the following two hypotheses will hold:

H3: Higher ESG scores are significantly associated with a lower probability of financial distress for healthcare companies.

H4: The negative effect of ESG on financial distress risk is higher for the healthcare sector compared to other sectors.

Chapter 4: Data and Methodology

4.1 Sample and Data Collection

In this study, we utilize the Refinitiv Eikon Database to gather ESG scores from countries in the EU, the US, and Japan. Our analysis spans from 2004 to 2023, enabling us to examine long-term trends and developments. Refinitiv Eikon is a widely recognized source of ESG data for academic research (Citterio et al., 2023; Pulino et al., 2022; Shakil, 2021), covering close to 16,000 global companies across 76 countries, with a history dating back to 2002. The information is based on publicly available sources, including company websites, annual reports, and corporate social responsibility reports (Refinitiv, 2024). Other popular databases utilized in academic research include Bloomberg ESG scores (Junius et al., 2020; Almubarak et al., 2023), often praised for the integration of Bloomberg's financial data. Furthermore, the MSCI ESG ratings are also widely used for academic research (Boubaker et al., 2020; Halid et al., 2023), although they have limited coverage with ESG scores for about 2,900 companies (MSCI, 2024). Given the integration of financial data provided by Refinitiv DataStream and the extensive dataset with a wide range of ESG metrics, we have chosen the Refinitiv Eikon ESG Scores Database for this study. The corresponding financial data for all the companies was subsequently retrieved using the Refinitiv DataStream database. This financial data was matched to companies through their respective ISIN codes, identified during the earlier search in the ESG database. Each sample unit in our dataset represents a financial year, encompassing comprehensive ESG and financial data.

The financial, energy and utility sector are excluded as they are subject on more regulation than other sectors (Gholami et al., 2022; Makridou et al., 2023; Seker and Güngör, 2022). In contrast, sectors such as manufacturing may be less heavily regulated, making them potentially more suitable for research on the relationship between ESG scores and financial distress (Buallay, 2019). Each data point comprises a single company year for which complete ESG and financial data were available; observations with incomplete data were excluded.

Table 1 presents a comprehensive overview of the distribution of companies within the Global Industry Classification Standard (GICS) sectors over several years. At the highest aggregation level, the table reveals that the industrial sector holds the largest share, accounting for 29.83% of the sample, followed closely by consumer discretionary at 24.41%, and technology at 12.67%. These three sectors combined make up over two-thirds of the total, highlighting their significant influence and the concentration of business activities within these domains.

Over the span of nearly two decades, from 2004 to 2022, there is a clear trend of increasing representation in the more recent years, suggesting an expansion and a greater inclusion of companies ESG scores in the dataset. The peak year of inclusion is 2022, with 2,872 companies, which constitutes 12.18% of the total. This is closely followed by 2021 and 2020, with 2,751 and 2,503 companies, respectively. This increasing trend might reflect a growing focus on ESG reporting. Examining the geographical distribution, the United States dominates the panel with 11,341 companies, representing

Table 1 Sample overview

Country			**Year**		
Country*	Number	Percentage	Year	Number	Percentage
US	11,341	48.11	2022	2,872	12.18
Japan	5,242	22.24	2021	2,751	11.67
Germany	1,412	5.99	2020	2,503	10.62
France	1,307	5.54	2019	2,104	8.93
Sweden	1,251	5.31	2018	1,826	7.75
Finland	456	1.93	2017	1,535	6.51
Spain	418	1.77	2016	1,333	5.66
Netherlands	410	1.74	2015	1,158	4.91
Italy	392	1.66	2014	916	3.89
Denmark	373	1.58	2012	850	3.61
Belgium	314	1.33	2011	799	3.39
Austria	195	0.83	2010	754	3.20
Poland	143	0.61	2009	695	2.95
Ireland	105	0.45	2013	641	2.72
Portugal	96	0.41	2023	627	2.66
Luxembourg	54	0.23	2008	610	2.59
Malta	15	0.06	2007	529	2.24
UK	15	0.06	2006	416	1.76
Ukraine	11	0.05	2005	389	1.65
Romania	9	0.04	2004	263	1.12
Switzerland	7	0.03	**Sector**		
Greece	3	0.01	Industry	Number	Percentage
Cyprus	2	0.01	Industrials	7,031	29.83
			Consumer Discrtn.	5,754	24.41
			Technology	2,987	12.67
			Health Care	2,324	9.86
			Basic Materials	2,265	9.61
			Consumer Staples	1,969	8.35
			Telecom	845	3.58
			Real Estate	396	1.68

Note: The table shows how the 23,571 company years are distributed across the country, year, and sector. The largest 15 EU economies from the year 2023 are incorporated. Data from 2004 – 2023 is incorporated. The sector is classified at the GICS level, where the sectors utilities, financials and energy are excluded.

48.11% of the total. Japan follows as a distant second with 5,242 companies (22.24%), and Germany stands third with 1,412 companies (5.99%). Overall, the table provides a detailed snapshot of the global economic structure as captured by the GICS sector codes, highlighting dominant sectors and countries while also indicating trends over time. This data is pivotal for understanding market dynamics, economic concentration, and the evolution of industrial activities across different regions and sectors.

4.2 Financial Distress – Dependent Variable

The Altman Z-score model, developed by Edward I. Altman in 1968, is a widely recognized tool for predicting the likelihood of companies facing financial distress or bankruptcy (Machek, 2014). Over the years, the Z-score model has gained popularity for its predictive accuracy, often preferred over other accounting-based models such as Ohlson's (1980) O-score, Zmijewski's (1984) Zm-score, and Grover's (2003) G-score (Winarso & Edison, 2019). An accounting-based model is utilized to avoid the sensitivity to market fluctuations and external shocks that can affect market-based models (Tarazi et al., 2005). Furthermore, the Z-score model's simplicity and ease of use make it a popular choice among analysts and researchers for testing the financial stability of companies (Rusman, 2021). Thus, the Altman Z-score model will support this research on identifying the relationship between ESG scores and financial distress.

One of the key features of the Altman Z-score model is its ability to provide a quantitative assessment of a company's financial condition based on a combination of profitability, leverage, liquidity, solvency, and efficiency ratios (Matturungan et al., 2017). By analyzing these financial metrics, the Z-score model generates a score that categorizes companies into different risk zones, indicating their likelihood of facing financial distress (Soloski, 2013). The Z-score is calculated using the following formula, with an explanation of each component provided to enhance clarity:

$$Z - score = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$$

1. Working Capital / Total Assets (X1): This ratio measures liquidity. A higher ratio indicates better short-term financial health, as it signifies that the company possesses more current assets relative to its total assets.
2. Retained Earnings / Total Assets (X2): This ratio measures accumulated profitability over time. Higher retained earnings relative to total assets suggest that a company has been consistently profitable and is retaining its earnings for reinvestment in the business, indicating strong financial health.
3. Earnings Before Interest and Taxes (EBIT) / Total Assets (X3): This ratio measures operating efficiency and profitability. It indicates how effectively the company is generating earnings from its assets before accounting for interest and taxes.
4. Market Value of Equity / Total Liabilities (X4): This ratio measures leverage by comparing the market value of the company's equity to its total liabilities. A higher ratio indicates that the company's equity value is significantly higher than its debt, suggesting lower financial risk.
5. Sales / Total Assets (X5): This ratio measures asset turnover. It indicates how efficiently the company is using its assets to generate sales. Higher sales relative to total assets suggests better asset utilization.

The Z-score is used to classify the company into the safe, grey and distress zone. A Z-score of higher than 3 indicates that the company has a low probability of financial distress in the next two years and therefore is considered to be in the safe zone. Any Z-score between 1.8 and 3 indicates a moderate risk of financial distress in the next two years but should be monitored closely and therefore is located in the grey

zone. A Z-score below 1.8 indicates that a company is in the distress zone and is at high risk of financial distress in the next two years. To summarize, the lower the Z-score the higher the changes of financial distress within the next two years.

4.3 Independent Variables

The Refinitiv Eikon ESG scores are collected by approximately 700 analysts who gather ESG information from company reports, regulatory filings, and news articles. These scores are based on 186 relevant data points out of over 630 possible ESG metrics (Refinitiv, 2024). The metrics are grouped into ten categories reflecting different ESG aspects, such as emissions, human rights, and management. The importance of each ESG category varies by industry. To account for this, a materiality matrix assigns weights to each category based on its relevance to the industry. For example, emissions might carry more weight in the industrial sector than in the financial sector. The category scores are aggregated to form three pillar scores: environmental (*ENV*), social (*SOC*), and governance (*GOV*). Each category's weight within a pillar score depends on its industry-specific materiality. The pillar scores are then combined to form an overall ESG (*ESG*) score. For ease of comparison and interpretation, the ESG scores are converted into percentile ranks ranging from 0 to 100. The percentile rank indicates a company's performance relative to its peers.

Furthermore, additional dependent variables are utilized for a comparative analysis between regions and sectors. As we would like to analyze the impact ESG scores have across regions with developed ESG practices and less developed ESG practices, we have created a variable for the EU and labeled as the Developed region (*DEV*). To gain insights about the effects ESG scores have in different sectors, we similarly have created an variable for the healthcare sector (*HC*). Via these two methods we may utilize a regression in which an interaction term is introduced to gain insights about the relationship between ESG scores and financial distress for different regions and sectors.

4.4 Control Variables

Firm-specific characteristic can influence a company's performance, risk profile and likelihood of financial distress. Therefore, this paper will include control variables that account for other factors influencing financial distress. Earlier research done between the relationship of ESG scores and financial distress has also performed regression for financial distress based guided by multiple control variables (Boubaker et al, 2020; Almubarak et al, 2023; Habib, 2023; Citterio and King, 2022). From earlier research done about the relationship of ESG and financial distress, this research includes the following control variables:

1. Return on Assets (ROA): This measures a firm's profitability relative to its assets calculated by dividing net income by total assets. A higher ROA indicates better profitability and lowers financial distress risk (Heikal et al., 2014).

$$ROA = Net\ Income / Total\ Assets$$

2. Firm Size (SIZE): Size is defined as the natural logarithm of total assets. Larger firms generally have tend to take on more risk through as they have easier access to debt, increasing the risk of financial distress (Corvino et al., 2019).

$$SIZE = ln(Total\ Assets)$$

3. Leverage (LEV): Leverage is the natural logarithm of a firm's total debt to total assets. High leverage increases risk due to higher debt obligations, increasing the probability of financial distress (Bowman et al., 1980).

$$LEV = ln(Total\ Debt / Total\ Assets)$$

4. Market-to-Book Ratio (MTB): MTB reflects market value of equity divided by book value of equity. MTB reflects market perceptions and growth potential, with higher ratios indicating lower distress risk (Anugrahani & Setiawan, 2020).

$$MTB = Market\ Value\ of\ Equity / Book\ Value\ of\ Equity$$

5. Liquidity (SLACK): Slack refers to the firm's cash and cash equivalents as a proportion of its total assets. The presence of slack has been correlated with enhanced firm adaptability, indicating lower financial distress risk (Rau et al., 2020).

$$SLACK = Cash\ and\ Cash\ Equivalents / Total\ Assets$$

6. Current ratio (Current): The Current ratio is a liquidity ratio that measures a company's ability to pay off its short-term liabilities with its short term-assets. Firms with better liquidity are generally at lower risk of financial distress (Minari, 2024).

$$Current\ Ratio = Current\ Assets / Current\ Liabilities$$

To summarize, control variables are included in this paper to help analyzing the relationship between ESG scores and financial distress accounting for the impact of profitability, liquidity, size, leverage and age. The financial data is retrieved from Rifintiv Datastream.

4.5 Descriptive Statistics

In financial analysis, extreme observations can introduce bias and errors in regression analysis (Brownen-Trinh, 2019). For handling outliers in our sample, we use the Winsorization technique. Winsorization is a statistical technique used to address outliers in a dataset by replacing extreme values with less extreme values. Winsorization has been recognized as an effective solution to address biases and errors and helps improve the significance of the model (Gilbert, 1988; Nicklin and Plonsky, 2020). Therefore, we Winsorized the data at the 2.5^{th} and 97.5^{th} percentiles.

Table 2 presents the summary statistics of the variables used in the research exploring the relationship between ESG scores and financial distress. The variables include *Z-score, ESG score (ESG),*

Governance Pillar (GOV), Environmental Pillar (ENV), Social Pillar (SOC), Size (SIZE), Leverage (*LEV*)*, Slack* (*SLACK*)*, Return on Assets* (*ROA*)*, Market-to-Book* (*MTB*)*, and Current Ratio* (*CUR*). Each variable is summarized with measures of central tendency (mean, median), dispersion (standard deviation), and range (minimum, maximum), along with the number of observations (N).

The *Z-score* shows a mean value of 3.83, suggesting that on average, the firms in the sample are in the "safe zone" and have a lower probability of financial in the next two years. The standard deviation of 2.62 indicates considerable variability in the probability of financial health among the firms. The overall ESG Score averages at 50.01, with the Governance Pillar holding the highest mean at 51.9 followed by the Social Pillar at 51.03 and the Environmental Pillar scoring relatively far from the middle at 45.32. For Total Assets, we took the natural logarithm as this reduces the weight that extreme values of the dependent variables might attach to the estimation procedure in a regression analysis (Burbridge et al, 1988).

Table 2 Summary statistics sample

Variables	**Mean**	**Median**	**Sd**	**Min**	**Max**	**N**
Z-score	3.39	2.64	2.80	-0.04	13.94	23571
ESG	50.12	50.49	19.59	2.49	95.18	23571
ENV	45.56	46.27	26.85	0.03	99.10	23571
SOC	51.13	51.13	23.22	0.26	98.47	23571
GOV	51.92	53.23	22.11	0.10	99.43	23,571
SIZE	$2.74e^{8}$	$7.90e^{6}$	$6.86e^{8}$	$1.90e^{5}$	$3.32e^{10}$	23,571
LEV	0.14	0.09	0.06	0.02	0.30	23,571
SLACK	0.12	0.09	0.10	0.01	0.43	23,571
ROA	5.34	5.26	7.41	-17.96	22.70	23,571
CUR	4.37	2.16	54.85	-969.43	6480.15	23,571
MTB	1.97	1.59	1.28	0.55	6.66	23,571

Note: The tables present summary statistics for the entire sample, consisting of 23,571 firm-year observations from 2004–2023 with full financial and ESG data. The unadjusted Size measure is shown in the table while the natural logarithm (LN) of the size and leverage variable has been used in the regressions to normalize the distribution and reduce skewness, providing a more accurate representation of firm size across sectors.

Tables 8, 9, and 10 present the summary statistics for different regions, highlighting the overall ESG performance where the EU (54.98) distinctly surpasses the US (48.06) and Japan (48.09). This superior performance can be attributed to the EU's more developed ESG regulations (Arif et al., 2021; Cicchiello et al., 2022). Specifically, in the Environmental Pillar, the EU (52.47) and Japan (51.72) significantly outperform the US (38.46). Additionally, a notable disparity is observed in the Social Pillar scores, with the EU scoring 59.1, the US 50.27, and Japan 42.39. In contrast, the differences in Governance Pillar scores among these regions appear to be less significant.

4.6 Empirical analysis

This research will explore the impact of ESG scores on financial distress risk using the Ordinary Least Squares (OLS) regression method. The regressions will be performed by Python, with Altman's Z-score as the dependent variable and ESG pillar scores as independent variables alongside control variables. Additionally,

dummy variables are incorporated for sectors (*Industry_d*), years (*Year_d*), and countries (*Country_d*) in the regression model. According to Salkever et al. (1976), adding dummy variables can enhance the accuracy of predictions, prediction error variances, and confidence intervals, and will help control for variations across different industries, time periods, and geographic regions. To test the relationship between the environmental and social pillar on financial distress risk we will test the following hypothesis, where *i* and *t*, represent firm and year:

$$Z - score_{i,t} = \beta_0 + \beta_{1-4} ESG\ (pillar)_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 LEV_{i,t} + \beta_7 SLACK_{i,t} + \beta_8 ROA_{i,t} + \beta_9 MTB_{i,t} + \beta_{10} CURRENT + \beta_{11-17} Sector\_d_{i,t} + \beta_{18-36} Year\_d_{i,t} + \beta_{37-55} Country\_d_{i,t} + \epsilon_{i,t}$$

To test the second hypotheses, an additional variable that categorizes regions into Developed (EU) and Less Developed (US and Japan) is created. This classification support the examination of the impact of ESG scores across these different regions by looking at the interaction between ESG scores and developed environments. This research is solely on ESG scores, excluding the individual pillars. Country dummies are excluded in this regression to address multicollinearity issues between the interaction term and country dummy variables. By incorporating this new variable, the effects of ESG scores in different regions can be analyzed. The regression model for testing Hypotheses 2 is:

$$Z - score_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 DEV\_d_{i,t} + \beta_3 ESG_{i,t} \times DEV\_d_{i,t} + \beta_{4-9} Control\ Variables + \beta_{10-24} Dummy\ Variables_{i,t} + \epsilon_{i,t}$$

To test the third and fourth hypothesis, a new variable for the healthcare sector (*HC*) is created to examine the interaction between the healthcare sector and ESG scores. Sector dummies are excluded in this regression to address multicollinearity issues between the interaction term and sector dummy variables. This supports the analysis of the differential effects of ESG scores on financial distress risk within the healthcare sector compared to non-healthcare sectors. The regression model for testing this interaction is as follows:

$$Z - score_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 HC\_d_{i,t} + \beta_3 ESG_{i,t} \times HC\_d_{i,t} + \beta_{4-9} Control\ Variables + \beta_{10-42} Dummy\ Variables_{i,t} + \epsilon_{i,t}$$

Chapter 5 Results

5.1 ESG Scores and Pillars

Table 3 Regression results – ESG, Environmental, Social and Governance pillar on Z-score

	Z-score			
Variables	**1 (ESG)**	**2 (ENV)**	**3 (SOC)**	**4 (GOV)**
ESG	0.011***			
	(0.001)			
ENV		0.006***		
		(0.001)		
SOC			0.009***	
			(0.001)	
GOV				0.004***
				(0.001)
SIZE	-0.246***	-0.227***	-0.238***	-0.178***
	(0.012)	(0.012)	(0.011)	(0.010)
LEV	-1.053***	-1.071***	-1.039***	-1.053***
	(0.022)	(0.022)	(0.022)	(0.022)
SLACK	3.085***	3.139***	3.057***	3.178***
	(0.015)	(0.015)	(0.015)	(0.015)
ROA	0.166***	0.167***	0.167***	0.168***
	(0.002)	(0.002)	(0.002)	(0.002)
MTB	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
CUR	0.862***	0.857***	0.863***	0.853***
	(0.012)	(0.012)	(0.012)	(0.012)
Const	2.778***	2.686***	2.756***	2.015***
	(0.025)	(0.025)	(0.025)	(0.024)
Industry dummy	Yes	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes
Adjusted R-squared	0.520	0.519	0.520	0.517
Observations	23,571	23,571	23,571	23,571

Note: this table presents the OLS regression of ESG scores, Environmental Pillar, Social Pillar, and Governance Pillar on financial distress risk (Z-score). A higher Z-score indicates a lower probability of financial distress. The regression includes controls for country and year effects. Standard errors are shown in parentheses, with significance levels at 10%, 5%, and 1% indicated by *, **, and ***, respectively.

Table 3 presents the outcomes of four separate Ordinary Least Squares (OLS) regressions where the dependent variable is the Z-score, the metric used to measure financial distress. A higher Z-score denotes a lower probability of financial distress. The independent variables in these regressions are the ESG scores and their individual components: Environmental Pillar (*ENV*), Social Pillar (*SOC*), and Governance Pillar (*GOV*). Each model controls for size (*SIZE*), leverage (*LEV*), slack (*SLACK*), return on assets (*ROA*), market-to-book ratio (MTB), and current ratio (CUR), and includes dummy variables to account for the effect of industries, year, and country.

In Model 1, the coefficient for ESG scores is 0.011, which is positive and highly significant ($p < 0.01$). This indicates that higher ESG scores are associated with higher Z-scores, signifying a lower

probability of financial distress. In Model 2, the coefficient for the Environmental Pillar score is observed to be 0.006, a positive value that is statistically significant. This finding indicates that higher environmental scores are associated with increased Z-scores, signifying lower financial distress risk. This outcome accepts the first hypothesis (H1), which was excepted to be accepted based on prior research demonstrating a positive relationship between high environmental scores and financial performance (Zhang et al., 2023; Zahroh and Hersugondo, 2021). The underlying reasons for this association may be attributed to improvements in operational efficiency and overall financial health. Enhancing environmental performance can lead to reduced production costs through better operational efficiency and more productive use of resources (Kalash, 2021). Consequently, this reduction in costs can translate into improved financial performance and a decrease in financial distress levels (Kalash, 2021). Additionally, strong environmental performance, when combined with robust financial fundamentals, may provide a protective buffer against financial distress (Farooq et al., 2021; Das, 2022). In conclusion, the positive and significant coefficient for the Environmental Pillar score in Model 2 supports the notion that superior environmental performance contributes to enhanced financial stability. This relationship underscores the importance of integrating environmental strategies into corporate practices to achieve better financial outcomes and mitigate financial distress risks.

In Model 3, the coefficient for the Social Pillar score is 0.009, a positive value that is highly significant. This finding suggests that higher social scores correlate with increased Z-scores, indicating a lower probability of financial distress. From these results we can accept hypothesis 1, was expected to be accepted based on previous research demonstrating a positive relationship between high social scores and financial performance (Eratalay & Ángel, 2022; Giannarakis et al., 2016; Sharma, 2024). One plausible explanation for this relationship is that companies with superior social responsibility practices may garner increased support from their stakeholders. This stakeholder support can facilitate easier access to additional funding. Enhanced access to funding, in turn, helps companies avoid financial distress, thereby exerting a positive influence of corporate social responsibility on financial stability (Wardana, 2023). In conclusion, the positive and significant coefficient for the Social Pillar score in Model 2 substantiates the hypothesis that robust social responsibility practices contribute to improved financial stability. This relationship highlights the importance of integrating social strategies into corporate practices to reduce financial distress risk.

As indicated in previous literature, ESG scores and the Governance Pillar have demonstrated a negative significant effect on financial distress (Al-Tamimi, 2012; Younas et al., 2021). However, our focus is on testing Hypothesis 1, which posits that high ESG scores in the Environmental and Social Pillars significantly reduce the risk of financial distress.

From the regression results, it is evident that both the Environmental and Social Pillars exert a positive and significant effect on the Z-score. Therefore, based on the results of table 3 hypothesis 1 can be accepted, which suggests that high scores in these pillars are associated with a lower probability of financial distress.

5.2 EU vs. Japan and the US

Table 4 Regression results - Developed countries vs. Less Developed countries

Variables	Z-score
DEV	-0.200**
	(0.085)
ESG	0.028***
	(0.071)
ESG x DEV	0.034**
	(0.001)
SIZE	-0.081***
	(0.002)
LEV	-0.456***
	(0.053)
SLACK	5.249***
	(0.257)
ROA	0.165***
	(0.030)
MTB	0.000
	(0.000)
CUR	0.885***
	(0.012)
Const	1.578***
	(0.173)
Year dummies	Yes
Sector dummies	Yes
Country dummies	No
Adjusted R-squared	0.50
Observations	23,571

Note: This table presents the OLS regression of ESG scores on financial distress risk, distinguishing between regions with Developed ESG practices (EU) and companies with Less Developed ESG practices (Japan and US). The interaction term is set to 1 for the Developed region. A higher Z-score indicates a lower probability of financial distress. The regression includes controls for country and year effects. Standard errors are shown in parentheses, with significance levels at 10%, 5%, and 1% indicated by *, **, and ***, respectively.

Table 4 presents the interaction term (ESG x DEV), highlighting the differential effect of ESG scores on financial distress between developed regions (EU) and less developed regions (Japan and the US). The positive coefficient of the interaction term (0.034), which is statistically significant, indicates that ESG scores have a more pronounced impact on financial distress in developed regions, resulting in higher Z-scores. Country dummies were excluded due to multicollinearity with the *DEV* variable. These results can be attributed to differences in regulatory environments and investor sentiment. The EU's strong emphasis on ESG rules leads to higher scrutiny and disclosure requirements, resulting in a more direct link between ESG scores and financial distress compared to regions with less stringent regulations like the US or Japan (Cicchiello et al., 2022). Additionally, European investors' growing interest in ESG considerations and sustainable investing practices amplifies the impact of ESG scores on financial distress, as companies failing to meet ESG expectations could face greater scrutiny and financial repercussions (Wanday & Zein, 2022). In conclusion, the second hypothesis might be accepted as the significant interaction term between ESG scores

and developed regions suggests that the beneficial effects of ESG scores on reducing financial distress are more pronounced in the EU. This outcome highlights the importance of regional regulatory frameworks and investor preferences in shaping financial outcomes associated with ESG performance.

5.3 Healthcare Sector

Table 5 Regression results – Healthcare interaction term

Variables	Z-score	Z-score
HC	0.578***	0.741***
	(0.030)	(0.007)
ESG Score	0.01106***	0.0111***
	(0.001)	(0.001)
ESG Score x HC		-0.006***
		(0.002)
SIZE	-0.248***	-0.245***
	(0.012)	(0.001)
LEV	-0.360***	-1.055***
	(0.076)	(0.022)
SLACK	3.114***	3.074***
	(0.152)	(0.015)
ROA	0.167***	0.167***
	(0.002)	(0.002)
MTB	0.001***	0.001***
	(0.000)	(0.002)
CUR	0.856***	0.861***
	(0.012)	(0.012)
Const	2.869***	2.735***
	(0.025)	(0.025)
Industry dummies	No	No
Country dummies	Yes	Yes
Year dummies	Yes	Yes
Adjusted R-squared	0.519	0.521
Observations	23,571	23,571

Note: This table presents the OLS regression of ESG scores on financial distress risk, distinguishing between the Healthcare sector and other sectors. The interaction term is set to 1 for the Healthcare sector. A higher Z-score indicates a lower probability of financial distress. The regression includes controls for country and year effects. Standard errors are shown in parentheses, with significance levels at 10%, 5%, and 1% indicated by *, **, and ***, respectively.

The regression analyses presented in Table 5 offer critical insights into the factors influencing the Z-score and the differential impacts observed with the inclusion or exclusion of interaction terms. In the first model without the interaction term, the coefficient for the healthcare sector is 0.578, indicating a somewhat reduced impact on the Z-score. In the second model incorporating the interaction term, the coefficient for the healthcare sector (HC) is 0.741, suggesting that being in the healthcare sector is associated with an increase of 0.741 in the Z-score, holding the ESG at zero. This discrepancy seemingly implies that the influence of the healthcare sector is slightly underestimated in the model lacking the interaction between ESG score and the healthcare sector.

Moreover, the ESG score exhibits a coefficient of 0.0111 in the interaction model, compared to 0.0106 in the non-interaction model, hinting at a slight underestimation of ESG score impact when the interaction term is omitted. The interaction term itself has a coefficient of -0.006, indicating that the positive effect of ESG score on the Z-score is marginally diminished for healthcare companies. From these results, we can accept Hypothesis 3 but reject Hypothesis 4. This rejection may be attributed to the regulatory environment and core focus of healthcare companies. The healthcare sector operates under stringent regulations prioritizing patient care and safety, which might supersede ESG considerations, thereby lessening the impact of ESG scores on financial distress (Kalia & Aggarwal, 2022). Additionally, healthcare companies often emphasize medical outcomes and patient well-being over ESG initiatives, potentially reducing the direct influence of ESG scores on financial distress (Gkliatis, 2023).

The inclusion of the interaction term reveals that the effect of being in the healthcare sector is more nuanced and slightly greater than when the interaction term is not included. Furthermore, the impact of ESG scores on the Z-score is slightly underestimated when the interaction term is excluded. The interaction term thus provides a more detailed understanding of how ESG scores might differentially affect firms within the healthcare sector.

5.4 Robustness check – Grovers G-score

To ensure the robustness of our results, we will employ alternative proxies for assessing the risk of financial distress. Our primary analysis utilizes the Altman Z-score, where Environmental, Social, and Governance (ESG) scores and their components exhibit a negative relationship with financial distress risk. The Grover G-score Model, developed by Jeffrey S. Grover in 2001, represents an evolution and reevaluation of the Altman Z-score model (Sari, 2013). This model demonstrates a high level of accuracy in predicting financial distress (Grover et al., 2019; Martini et al., 2023; Susanti et al., 2021). Empirical research indicates that the G-score model may outperform the Altman Z-score and Springate models in predicting financial distress (Gupita et al., 2020; Lestari et al., 2021). Nevertheless, some studies contend that the Altman Z-score model retains the highest accuracy (Primasari et al., 2018; Saputri et al., 2020).

We will conduct the regression analysis used to test Hypothesis 1. Instead of utilizing the Z-score as the dependent variable, we will incorporate the G-score as the independent variable in the regression. The Grover G-score is an accounting-based model and is represented as follows:

$$G - score = 1.65X1 + 3.404X2 - 0.016X3 + 0.057$$

The G-score is a comprehensive index used to evaluate a company's financial health, where a G-score less than -0.02 indicates financial distress, a score between -0.02 and 0.01 suggests a gray area, and a score greater than 0.01 signifies a healthy company. The components of the G-score are calculated as follows: X1 is the ratio of working capital to total assets (*Working Capital / Total Assets*), X2 is the ratio of earnings before interest and taxes to total assets (*EBIT / Total Assets*), and X3 is the ratio of net income to total assets (*Net Income / Total Assets*).

Table 6 presents the results of four OLS regressions where the dependent variable is the G-score, which measures financial distress risk, with a higher G-score indicating a lower probability of financial distress. Each column represents a different regression model using different independent variables related to ESG (Environmental, Social, and Governance) scores and other control variables. In Model 1, the overall ESG score (*ESG*) coefficient is 0.001 (p-value < 0.01) indicating a statistically significant positive relationship between the ESG score and the G-score. In Model 2, the environmental pillar (*ENV*) score coefficient is 0.001 (p-value < 0.01) indicating a statistically significant positive relationship with the G-score. In Model 3, the social pillar (*SOC*) score coefficient is 0.001 (p-value < 0.01) showing a significant positive relationship with the G-score. In Model 4, the governance pillar (*GOV*) score coefficient is 0.000 indicating a statistically significant but very small positive relationship with the G-score. To ensure the validity of the G-score model, given that both the G-score and Z-score are accounting-based models, it is essential to examine the correlation between them as a robustness check. The Pearson correlation coefficient between the G-score and the Z-score is 0.56, indicating a moderate positive linear relationship between the two models. As both models show a positive relationship between higher ESG scores and the Z-score and have moderate correlation one might say that our findings are robust based on the G-score model.

5.5 Robustness Check - 2SLS Regression Model

This research addresses the issue of endogeneity in our analysis, as the results in Table 3 might be influenced by reverse causality. Reverse causality may occur because firms with lower financial distress risk might have more resources to invest in their ESG practices, thereby achieving higher ESG scores. To account for this potential endogeneity, we employ a two-stage least squares (2SLS) regression approach. In the SLS model, we use the industry median of overall ESG scores and the individual pillar scores as instrumental variables. This choice is based on the rationale that firms often align their ESG practices with those prevalent in their sector, following the lead of their competitors in ESG initiatives (Jiraporn et al., 2014). ESG practices and norms are likely to vary significantly between sectors due to differences in regulatory environments, stakeholder expectations, and industry-specific standards (Babouker et al., 2020). By using the industry median ESG and pillar scores as instruments, we aim to capture the sector- level influences on firm-specific ESG practices. This approach helps us isolate the exogenous variation in ESG scores attributable to sector norms, thereby providing a more accurate assessment of the impact of ESG practices on financial distress risk.

For validation of the selection of the sector median scores, we performed the F-test and the Durbin-Wu-Hausman test. The F-statistic is well above 10, indicating indicates a robust correlation between the instrumental variables and the exposure, minimizing the risk of weak instrumental variable bias (Yang, 2023). The results confirm that our instruments are strong, ensuring the reliability of our 2SLS regression results. The Durbin-Wu-Hausman test is essential for verifying the presence of

Table 6 – Regression results G-score model

	G-score			
Variables	**1 (ESG)**	**2 (ENV)**	**3 (SOC)**	**4 (GOV)**
ESG	0.001***			
	(0.000)			
ENV		0.001***		
		(0.000)		
SOC			0.001***	
			(0.001)	
GOV				0.000***
				(0.001)
SIZE	-0.023***	-0.022***	-0.023***	-0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
LEV	-0.183***	-0.184***	-0.183***	-0.187***
	(0.008)	(0.008)	(0.008)	(0.008)
SLACK	0.508***	0.512***	0.504***	0.514***
	(0.014)	(0.014)	(0.014)	(0.014)
ROA	0.039***	0.039***	0.039***	0.039***
	(0.000)	(0.000)	(0.000)	(0.000)
MTB	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
CUR	0.154***	0.153***	0.154***	0.153***
	(0.001)	(0.001)	(0.001)	(0.001)
Const	0.404***	0.402***	2.756***	2.015***
	(0.024)	(0.024)	(0.025)	(0.024)
Industry dummy	Yes	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes
Adjusted R-squared	0.80	0.81	0.80	0.81
Observations	24,552	24,552	24,552	24,552

Note: this table presents the OLS regression of ESG scores, Environmental Pillar, Social Pillar, and Governance Pillar on financial distress risk (G-score). A higher G-score indicates a lower probability of financial distress. The regression includes controls for country and year effects. Standard errors are shown in parentheses, with significance levels at 10%, 5%, and 1% indicated by *, **, and ***, respectively.

endogeneity in our model. It helps determine whether the instrumental variables effectively address endogeneity concerns by comparing the instrumental variables model with the original second-stage model (Jouber, 2019).

In Table 14, the first stage probit model results are presented. The significant coefficient for Sector Median ESG is positive, suggesting that companies in industries with higher median ESG scores are more likely to have higher ESG scores themselves. To account for the selection bias, as our sample is not randomly selected but only includes those companies which do have ESG scores, the lambda (Invers Mill Ratio) is included (Spiess, 2017). Including lambda may lead to a better-specified model that accounts for the underlying data generation process more accurately (Junus et al., 2022). As illustrated in Table 7, the significant lambda coefficient indicates that the selection process in the first stage probit model is non-random and influences the dependent variable. By incorporating lambda into the second stage regression, we correct for this non-random selection bias. This correction enhances the accuracy and validity of the results,

ensuring that the estimated relationships between the independent variables and the dependent variable are more reliable and unbiased.

The results in Table 7 and 14 validate the selection of instrumental variables and show that the negative relationship between ESG and pillar scores remains robust even after accounting for endogeneity. This suggests that reverse causality may not account for the negative relationship observed between ESG scores, pillar scores, and financial distress. The test results indicate that the instrumental variables significantly improve the model, confirming the validity of using sector median ESG and pillar scores as instruments.

Table 7 – Regression second stage (2SLS)

	Z-score			
Variables	**1 (ESG)**	**2 (ENV)**	**3 (SOC)**	**4 (GOV)**
ESG	0.073***			
	(0.012)			
ENV		0.0977***		
		(0.008)		
SOC			0.085***	
			(0.005)	
GOV				0.590***
				(0.064)
Lambda	0.401***	0.532***	0.094***	3.875***
	(0.099)	(0.094)	(0.006)	(0.600)
SIZE	-0.667***	0.949***	-0.813***	-4.672***
	(0.095)	(0.088)	(0.040)	(0.104)
LEV	-4.503***	-5.648***	-4.406***	-4.000***
	(0.105)	(0.099)	(0.083)	(0.889)
SLACK	1.821***	2.547***	1.087***	-0.069***
	(0.171)	(0.142)	(0.157)	(1.604)
ROA	0.143***	0.164***	0.141***	0.178
	(0.002)	(0.002)	(0.02)	(0.019)
MTB	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.002)
CUR	0.774***	0.664***	0.802***	0.073***
	(0.012)	(0.013)	(0.012)	(0.131)
Const	8.632***	-9.413 ***	10.601***	-55.987***
	(1.056)	(1.056)	(0.025)	(0.024)
Industry dummy	No	No	No	No
Country dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes
F-test	232.5	233.8	218.5	212.5
Durbin-Wu-Hasan	48.83	50.89	51.07	48.27
Adjusted R-squared	0.57	0.57	0.58	0.57
Observations	23,571	23,571	23,571	23,571

Chapter 6: Conclusion

This study analyzed the impact of ESG scores and their individual components on financial distress across various regions and sectors. Using the Altman Z-score as a proxy for financial distress, we regressed total ESG scores and individual pillars. Our data from the Refinitiv Eikon database included companies from the EU, US, and Japan with complete financial and ESG data. The results show that both the Environmental and Social Pillars have a positive and significant effect on the Z-score, indicating a lower probability of financial distress. This supports the hypothesis that superior environmental and social practices enhance operational efficiency and stakeholder support, reducing financial distress risk. Additionally, the study found that ESG scores have a more substantial impact in the EU compared to the US and Japan, likely due to the EU's stringent ESG regulations. Surprisingly, ESG scores in the healthcare sector had a lesser impact on financial distress than expected, possibly due to the sector's regulatory focus on patient care and safety.

This research provides different implications for investors, managers and regulators. The findings suggest that emphasizing environmental and social aspects can make companies more resilient to financial distress. Managers should integrate robust ESG practices to enhance operational efficiency and stakeholder trust. Evaluating companies based on ESG scores can protect investments from financial distress risks. Investors should consider regional differences, giving more weight to ESG scores in regions with developed ESG regulations, and recognize that ESG scores in the healthcare sector might be less indicative of financial distress risk. The evidence supports that stringent ESG regulations can lower financial distress risk. Regulators in less developed regions should consider adopting more comprehensive ESG frameworks to foster corporate sustainability and resilience.

This study has several limitations. First, the analysis could have delved deeper into each ESG pillar's subcategories for more granular insights. Second, the focus was on publicly traded companies due to data availability, excluding privately held firms. Future research could explore these areas and include more robustness checks using market-based financial distress models to complement the accounting-based approach used here.

In conclusion, this paper provides valuable insights for managers, investors, and regulators on the importance of ESG practices in mitigating financial distress risk, while suggesting avenues for further research to expand on these findings.

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APPENDIX

Table 8 Summary Statistics EU

Variables EU	**Mean**	**Median**	**Sd**	**Min**	**Max**	**N**
Z-score	2.77	2.23	2.34	-0.04	13.94	6,988
ESG	54.98	56.46	19.20	2.80	95.18	6,988
ENV	52.47	54.58	25.18	0.05	99.05	6,988
SOC	59.10	61.75	22.68	0.96	98.47	6,988
GOV	50.72	51.46	22.37	1.07	98.56	6,988
SIZE	$2.03e^{7}$	$5.17e^{6}$	$4.68e^{7}$	$1.90e^{5}$	$6.48e^{8}$	6,988
LEV	0.12	0.10	0.07	0.02	0.29	6,988
SLACK	0.10	0.07	0.09	0.01	0.43	6,988
ROA	5.39	5.26	6.86	-17.96	22.70	6,988
MTB	3.12	2.18	6.50	-90.76	374.63	6,988
CUR	1.57	1.33	0.93	0.55	6.66	6,988

Table 9 Summary Statistics US

Variables US	**Mean**	**Median**	**Sd**	**Min**	**Max**	**N**
Z-score	3.90	3.15	3.15	-0.04	13.94	1,1341
ESG	48.06	46.89	19.22	5.50	95.16	1,1341
ENV	38.46	35.40	26.47	0.03	98.55	1,1341
SOC	50.27	49.20	21.87	0.66	98.26	1,1341
GOV	53.24	55.15	21.69	1.34	99.43	1,1341
SIZE	$1.58e^{7}$	$3.85e^{6}$	$4.97e^{7}$	$1.90e^{5}$	$2.37e^{9}$	1,1341
LEV	0.14	0.11	0.05	0.03	0.30	1,1341
SLACK	0.12	0.08	0.11	0.01	0.43	1,1341
ROA	5.86	6.38	8.67	-17.96	22.70	1,1341
MTB	6.32	2.72	78.85	-969.43	6480.15	1,1341
CUR	2.22	1.79	1.43	0.55	6.66	1,1341

Table 10 Summary Statistics Japan

Variables JP	**Mean**	**Median**	**Sd**	**Min**	**Max**	**N**
Z-score	3.11	2.49	2.35	-0.04	13.94	5,242
ESG	48.09	49.62	19.76	2.49	92.46	5,242
ENV	51.72	55.16	25.89	0.09	99.10	5,242
SOC	42.39	42.43	23.26	0.26	95.05	5,242
GOV	50.64	51.30	22.50	0.10	98.20	5,242
SIZE	$1.17e^{9}$	$7.36e^{8}$	$1.03e^{9}$	$1.73e^{7}$	$3.32e^{9}$	5,242
LEV	0.11	0.08	0.04	0.03	0.26	5,242
SLACK	0.13	0.11	0.10	0.01	0.43	5,242
ROA	4.16	3.82	4.39	-17.96	22.70	5,242
MTB	1.82	1.37	2.22	-8.67	55.27	5,242
CUR	1.98	1.63	1.19	0.55	6.66	5,242

Table 11 Summary statistics Healthcare Sector

Variables HC	**Mean**	**Median**	**Sd**	**Min**	**Max**	**N**
Z-score	4.68	3.34	3.96	-0.04	13.94	2,324
ESG	52.73	52.64	18.67	5.98	92.75	2,324
ENV	42.08	40.83	25.84	0.11	95.48	2,324
SOC	57.40	58.05	23.30	1.58	97.69	2,324
GOV	52.93	54.55	21.46	2.00	96.00	2,324
SIZE	$1.42e^{8}$	$6.55e^{6}$	$4.26e^{8}$	$1.90e^{5}$	$3.32e^{9}$	2,324
LEV	0.07	0.06	0.04	0.03	0.21	2,324
SLACK	0.14	0.10	0.12	0.01	0.43	2,324
ROA	4.23	5.68	10.45	-17.96	22.70	2,324
MTB	5.97	3.22	60.47	-90.76	2895.99	2,324
CUR	2.71	2.12	1.73	0.55	6.66	2,324

Table 12 – Pearson correlation table

Variables	Z-score	ESG	ENV	GOV	SOC	SIZE	LEV	SLACK	ROA	MTB	CURRENT
Z-score	1.000										
ESG	-0.065***	1.000									
ENV	-0.122***	0.837***	1.000								
GOV	0.014**	0.667***	0.351***	1.000							
SOC	-0.046***	0.888***	0.677***	0.389***	1.000						
SIZE	-0.149***	0.268***	0.414***	0.139***	0.114***	1.000					
LEV	-0.065***	0.054	0.049	0.020	0.060	-0.009***	1.000				
SLACK	0.335***	-0.118***	-0.141***	-0.069***	-0.091***	-0.092***	-0.040	1.000			
ROA	0.445***	0.112***	0.078***	0.098***	0.104***	0.013***	-0.019	-0.023***	1.000		
MTB	0.029***	-0.003	-0.013**	-0.002	0.004	-0.024**	-0.005	0.023***	0.022***	1.000	
CURRENT	0.516***	-0.216***	-0.238***	-0.070***	-0.198***	-0.186***	-0.057***	0.461***	0.014**	-0.002	1.000

Note: In the table are the Pearson correlations for all the variables used in the regression, with significance levels at 10%, 5%, and 1% indicated by *, **, and ***, respectively.

Table 13 – Regression results first stage (2SLS)

Variables	1 (ESG)	2 (ENV)	3 (SOC)	4 (GOV)
Sector Median ESG	0.385***			
	(0.038)			
Sector Median ENV		0.301***		
		(0.028)		
Sector Median SOC			0.778***	
			(0.034)	
Sector Median GOV				0.599***
				(0.064)
SIZE	-7.949***	10.511***	8.526***	-4.672***
	(0.075)	(0.101)	(0.088)	(0.104)
LEV	-6.125***	-7.647***	-6.363***	-4.001***
	(0.645)	(0.872)	(0.759)	(0.104)
SLACK	9.044***	4.695***	13.659***	-0.069
	(1.167)	(0.003)	(1.372)	(0.889)
ROA	0.137***	0.110***	0.154***	0.178***
	(0.014)	(0.019)	(0.016)	(0.019)
MTB	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
CUR	0.732***	0.657***	-1.210***	-0.073
	(0.001)	(0.127)	(0.112)	(0.131)
Const	-101.42***	-137.79***	-129.877***	-55.987**
	(2.582)	(2.844)	(2.683)	(0.024)
Industry dummy	No	No	No	No
Country dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes
Adjusted R-squared	0.40	0.42	0.40	0.11
Observations	23,571	23,571	23,571	23,571

Table 14 – First stage probit model (ESG Score)

Variables	Z-score
Sector Median ESG	0.035***
	(0.004)
SIZE	0.574***
	(0.008)
LEV	-0.424***
	(0.060)
SLACK	0.426***
	(0.110)
ROA	0.011***
	(0.001)
MTB	0.000
	(0.000)
CUR	-0.045***
	(0.009)
Const	2.869***
	(0.025)
Industry dummies	No
Country dummies	Yes
Year dummies	Yes
Pseudo R-squared	0.251
Observations	23,571