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Master Thesis Financial Economics

"An Exploratory Analysis of the Relationship Between ESG Performance and Stock Performance during Financial Crises: A Case Study of the Russia-Ukraine War"

Preface and Acknowledgements

Undertaking this master's thesis for the Financial Economics program at the Erasmus School of Economics has been an intellectually enriching journey that has provided me with a deeper understanding of the complex world of finance and economics. I would like to express my gratitude to my thesis supervisor, Dr. Fabrizio Core for his guidance and support throughout this endeavor. Additionally, I extend my appreciation to my family and friends for their understanding, support, and valuable insights. Their encouragement and willingness to listen have been a source of strength, and I am thankful for their presence in my life. Finally, I want to acknowledge all the researchers and scholars whose works I have referenced in this thesis. Their contributions have shaped my understanding and inspired my own research. This thesis represents the culmination of my academic efforts, and I hope it contributes to the ongoing discourse in the field of financial economics. It has been a rewarding experience, and I am excited to share my findings with the academic community.

Abstract

This master's thesis delves into the complex relationship between Environmental, Social, and Governance (ESG) performance and stock performance, focusing on the context of the Russia-Ukraine conflict and its potential impact on financial markets. The research employs event study analysis and random effects models to analyze the immediate, short-term and long-term effects of companies' ESG scores on stock prices. The analysis uncovers evidence of a short-term negative effect of ESG scores on stock prices during the Russia-Ukraine conflict, particularly affecting companies with higher ESG scores, especially in the social pillar. Over time, the significance of ESG scores in driving stock prices diminishes, suggesting a potential overreaction in the short-term. However, the persistence of the social pillar's impact indicates its lasting influence, albeit becoming more restrained. The study's findings provide valuable insights into the nuanced relationship between ESG performance and stock market dynamics during times of crisis, highlighting the importance of comprehensive evaluations and cautious interpretations in investment decision-making. Ultimately, this research offers significant implications for investors, corporations, and policymakers, emphasizing the relevance of responsible corporate practices, especially in the face of geopolitical uncertainties.

Keywords: Event study, Random effects model, Social pillar.

JEL Classification: C23, G14 & O16.

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1. Introduction

In the realm of finance, conventional wisdom has it that shareholder maximization should be prioritized as the primary objective for businesses, emphasizing the pursuit of an optimal balance between risk and returns as described in one of the most classical papers of finance research literature by Markowitz (1952). However, a transformative movement has been challenging this traditional approach, placing increased importance on sustainability factors and stakeholder considerations while shifting away from a sole focus on financial metrics in decision-making processes.

This paradigm shift towards sustainable and stakeholder-centric finance has gained momentum in recent years, driven by the recognition that finance can be a force for positive change in society (Shiller, 2013). It has sparked the emergence of innovative financial instruments, such as social impact funds and benefit corporations, which aim to generate both financial returns and positive social or environmental outcomes. Acknowledging this shift, the Business Roundtable (BRT) released a revised statement on the purpose of a corporation in 2019, explicitly stating that businesses should serve multiple stakeholders, including customers, employees, communities, and suppliers, in addition to shareholders (Harrison et al., 2020). This stakeholder model, supported by numerous CEOs, has the potential of having a significant impact on corporate governance, incentive structures, and long-term strategies.

Consequently, portfolio management has evolved into a multidimensional operation that considers not only the conventional risk-return approach but also environmental, social, and governance (ESG) factors. Investors now recognize that their utility function includes societal values beyond financial gains (Bollen, 2007). The incorporation of sustainability aspects and impact investing in portfolio selection has gained traction, reflecting a departure from the sole pursuit of risk and returns. This instrumentalist view of finance encourages investors to balance financial goals with broader social and environmental objectives (Scholtens, 2017). Amidst these changes, there is a growing shift from short-term profit-seeking to long-term value creation among global institutions, governments, companies, and investors (Schoenmaker and Schramade, 2018). This transition highlights the need for comprehensive research to understand the implications and opportunities arising from this transformative shift.

The problem addressed in this paper lies in exploring the differential impact of geopolitical events on companies with high and low ESG scores. Traditional finance theories primarily focus on risk and financial returns, but the emergence of sustainable finance demands a deeper understanding

of the interplay between sustainability factors, stakeholder considerations, and market reactions during significant geopolitical events. This leads us to the following research question:

"To what extent do high ESG-rated companies engender differential stock market reactions compared to low ESG-rated companies following the Russia-Ukraine war announcement, and how does this effect evolve over time?"

The relationship between ESG and the financial performance of firms is currently a hot topic in investment management and academic research. Friede et al. (2015), combining the findings of about 2200 individual studies, find that roughly 90% of studies report a nonnegative ESG–Corporate Financial Performance relationship. More importantly, most studies report positive findings. Additionally, numerous studies find that socially responsible funds and stocks outperform their comparable non-responsible peers. ESG funds outperformed non-ESG funds based on annualized returns over the last three-, five- and 10-year periods (1). Moreover, evidence shows that firms with high social capital had higher stock returns than firms with low social capital during previous crises. During the 2008-2009 financial crisis, firms with high corporate social responsibility (CSR) had stock returns four to seven percentage points higher than low-CSR firms (Lins et al., 2017). Likewise, during the COVID-crisis in 2020, sustainable funds outperformed traditional peer funds and reduced investment risk, according to the Morgan Stanley Institute for Sustainable Investing (2021). The research analyzed more than 3,000 US mutual funds and ETFs, finding that sustainable equity funds outperformed non-ESG peer funds by a median return of 4.3 percent in 2020. Meanwhile, sustainable taxable bond funds over the same period outperformed their peers by a median return of 0.9 percent. The currently escalating Russia-Ukraine conflict and the corresponding sanctions of the rest of the world can create a next financial crisis. Are ESG stocks again a safe haven during this crisis? This thesis aims to explore and provide insights into the role of ESG stocks in times of economic uncertainty and geopolitical turmoil.

The research is structured as follows:
Chapter two provides a comprehensive theoretical foundation for understanding ESG factors and their implications. In chapter three and four, we describe the data used in our study and present the chosen methodologies—event study and fixed effects regression—to analyze the impact of ESG score on stock market reactions and performance. In chapter five, we discuss the empirical findings derived from our data analysis. In the final chapter, we draw conclusive remarks based on our research findings and address any limitations encountered during the study and provide a critical discussion of their impact on the results.

2. Literature Review

This literature review seeks to provide a comprehensive understanding of ESG investing, its potential implications on value creation, and its connection to stock returns, particularly in times of crisis.

2.1. ESG Definition

Socially responsible investing (SRI) has become an increasingly popular investment approach in recent years, with more investors seeking to align their investments with their values and beliefs. The principles of responsible investment aim to integrate ESG factors into investment decision-making processes and active ownership practices. SRI strategies typically avoid investing in companies that produce or sell addictive substances, such as alcohol and tobacco, and instead focus on investing in companies that are engaged in social justice, environmental sustainability, and alternative energy/clean technology efforts. Negative screening is a commonly used strategy in sustainable investing, which involves excluding firms that do not meet certain sustainability thresholds, such as emissions, from the investment universe.

Today, sustainable investing has diversified to encompass various types of investment approaches, gaining global prominence as a responsible investment strategy for conscientious investors. Rating agencies rate firms based on their ESG performance, and ESG scores are assigned to companies as a measurement for their environmental, social, and governance performance. A high ESG rating is achieved when a firm creates value for both stakeholders and society. High ESG stocks are considered stocks from companies in the top ESG-score segment, indicating excellent relative ESG performance and high transparency in reporting material ESG data publicly. The Principles for Responsible Investment (PRI) is the world's leading investor initiative for responsible investment, with around 3,100 signatories (asset owners, asset managers, and service providers) with $110 trillion in assets under management. The PRI defines responsible investing as the practice of incorporating ESG factors into investment decisions and active ownership practices.

2.2. ESG and Value Creation

Kim and Lyon (2015) note that the entire paradigm of environmental regulation is based on the idea that companies must be forced to make environmental improvements because they otherwise find them costly or unprofitable, and therefore do not take them if not forced to do so. Recent contributors to this field of research however disagree and see ESG activities as capable of increasing the company's value (e.g., Xie et al., 2019; Fatemi et al., 2018; Yoon et al., 2018; Fatemi et al., 2015). ESG links to value creation in five important ways, as displayed in appendix A: (1)

facilitating top-line growth, (2) reducing costs, (3) minimizing regulatory and legal interventions, (4) increasing employee productivity, and (5) optimizing investment and capital expenditures (McKinsey & Company, 2019). Note that these propositions do not apply/ or apply to the same degree to every company. Some propositions are more likely to arise in certain industries, sectors and geographies.

First, ESG activities can contribute to value creation by facilitating top-line growth. Companies that demonstrate strong ESG performance can attract customers who prioritize sustainability and responsible business practices. For example, a consumer goods company that uses environmentally friendly packaging may appeal to consumers who are concerned about the environmental impact of their purchases, leading to increased sales and revenue. Similarly, companies that prioritize social responsibility may attract customers who value ethical and sustainable business practices, thus increasing market share. ESG activities can also help to reduce costs. For example, companies that implement energy-efficient technologies or reduce waste can lower their operating expenses and improve their profit margins. In addition, companies that prioritize employee well-being may see reduced healthcare costs and increased productivity. Another benefit of ESG activities is the potential to minimize regulatory and legal interventions. By proactively addressing environmental and social issues, companies can avoid fines and penalties, as well as reputational damage that may result from non-compliance. ESG activities can also contribute to increased employee productivity. Companies that prioritize diversity, equity, and inclusion (DEI) initiatives may see improved employee satisfaction and retention, as well as enhanced innovation and creativity. For example, offering flexible work arrangements and promoting work-life balance can improve employee satisfaction and engagement. Similarly, companies that prioritize health and safety initiatives may see reduced absenteeism and companies that prioritize diversity and inclusion may experience higher employee retention and lower turnover rates. Finally, ESG activities can optimize investment and capital expenditures. Companies that prioritize sustainability may see increased access to capital from socially responsible investors, as well as reduced exposure to risk from climate change or other environmental or social issues.

2.3. Challenges and Limitations of ESG Investing

One of the primary challenges of ESG investing is the lack of standardization in the industry. There is no standard definition of what constitutes ESG factors, and different rating agencies and data providers use different criteria to evaluate companies' ESG performance. This lack of standardization can make it difficult for investors to compare companies' ESG performance accurately and to identify which companies are genuinely sustainable. Moreover, the lack of

standardization can result in confusion for investors, as different ESG ratings providers may assign different scores to the same company, leading to conflicting recommendations. One reason for this inconsistent score assignment is because ESG data collection is often done by third-party providers who use different methodologies, criteria, and sources of data. This can result in differences in data quality and accuracy, which can affect the ESG scores assigned to companies. Additionally, ESG information often relies on self-reported data from companies. This data may be subject to errors or manipulation, which can result in inaccurate assessments of companies' ESG performance. Moreover, data quality issues can be compounded by the lack of standardization in the industry, as different rating agencies may use different data sources or methodologies, leading to inconsistent results.

Greenwashing is another significant limitation of ESG investing, as it undermines the credibility of ESG data. Greenwashing refers to the practice of companies making misleading claims about their ESG performance, either intentionally or unintentionally. Some companies may use ESG marketing tactics to improve their public image, without making significant changes to their business practices, by making misleading or vague claims about their sustainability practices without providing specific details or measurable outcomes. For example, a company might claim to be committed to reducing its carbon footprint without providing any specifics about how it plans to achieve this goal. This can make it difficult for investors to identify genuinely sustainable companies and to make informed investment decisions.

Despite these challenges and limitations, ESG investing continues to gain popularity among investors. In recent years, several initiatives have emerged to address some of the challenges facing the industry. For example, the Sustainability Accounting Standards Board (SASB) has developed a set of industry-specific standards for ESG reporting, which can help improve standardization and data quality. The SASB standards provide guidelines for companies to report on financially material ESG factors, which are ESG issues that are likely to have a significant impact on a company's financial performance. The standards cover 77 industries and provide clear guidance on the ESG issues that are most relevant to each industry. By focusing on financially material ESG factors, the SASB standards aim to help investors make more informed investment decisions by providing them with relevant and reliable ESG information. In addition to the SASB, several organizations provide guidelines for ESG reporting. For instance, the Global Reporting Initiative (GRI) has developed a comprehensive set of principles for sustainability reporting. The GRI guidelines provide a framework for companies to report on their ESG performance, including their ESG strategy, management approach, and performance indicators. The GRI guidelines are widely recognized and used by companies around the world, making them a valuable tool for

investors looking to assess a company's ESG performance. Overall, while ESG investing faces several challenges and limitations, initiatives such as the SASB and GRI are working towards addressing these issues. By improving standardization, data quality, and transparency, these initiatives are helping to make ESG investing a more reliable and effective approach to investing.

2.4. Individual Elements

2.4.1. Environmental Aspect

Environmental criteria in sustainable investing encompass a comprehensive evaluation of a company's utilization of natural resources and its environmental impact across operations and supply chains. This involves assessing how efficiently the company uses resources as well as its efforts in resource management and conservation. Companies that implement sustainable resource management practices, such as water conservation and energy efficiency measures, are generally considered more environmentally responsible. Another critical component of Environmental criteria is examining the environmental impact of a company's operations. This involves assessing the emissions of greenhouse gases and other pollutants released into the environment as a result of the company's activities. Carbon emissions play a significant role in contributing to climate change, and companies are increasingly being evaluated based on their efforts to reduce their carbon footprint. Environmental criteria also extend beyond a company's direct operations to include their supply chains. Sustainable supply chain practices involve choosing suppliers that adhere to environmental standards and encouraging responsible sourcing of materials and components. According to Rosewicz (1990), customers prefer environmental orientated firms. In addition, Amato and Amato (2012) found that customers are willing to pay a premium for the environmental characteristics of products, as they provide satisfaction to the customer for contributing to the environment. Furthermore, entering some markets in the long term makes it necessary for companies to improve their environmental performance, thereby reducing exposure to large downside risks, such as sudden changes in environmental regulation (Jagannathan et al. 2018). Finally, Henisz & McGlinch (2019) add that companies with high environmental performance tend to reduce downside risks by having higher credit ratings and lower loan and credit default swap spreads.

2.4.2. Social Aspect

Social criteria in sustainable investing address the qualitative aspects of a company's impact on society and its relationships with various stakeholders in the communities where it conducts its business. These criteria encompass a wide range of factors that reflect how the company interacts with and contributes to society at large. This involves understanding how the company engages with employees, customers, suppliers, local communities, and other relevant stakeholders.

Companies with strong social criteria tend to prioritize ethical practices, fair labor policies, and positive community engagement. They actively seek to establish a reputation for being socially responsible and accountable for their actions. On the other hand, social criteria also encompass a company's weaknesses in addressing social trends, labor practices, and political issues. This means evaluating whether the company is adequately addressing social challenges and adapting to changing societal expectations. Companies that fail to meet social criteria may face reputational risks and encounter resistance from stakeholders who demand higher social standards. In support of social criteria, Deng et al. (2013) found that more socially responsible firms realize better post-merger long-term operating performance and positive long-term stock returns. Furthermore, Fatemi et al. (2018) points out that socially motivated activities can improve the management team's skills and the company's potential to attract qualified employees and satisfy the interests of non-owners (e.g., debtors, employees, customers, and regulators). Moreover, such activities can improve the reputation of the company and strengthen its interaction with its stakeholders (Branco & Rodrigues, 2006). On the other hand, conflicts of interest and diverging objectives can arise between different stakeholders within a company, particularly between management (agents) and shareholders (principals). In socially responsible firms, these agency problems can arise due to the pursuit of CSR activities. For example, Jensen (2001) argues that since it is impossible to maximize more than one dimension at a time, firm managers can lose focus on their core managerial responsibilities if they engage in time-consuming CSR activities. To support this, research by Di Giuli and Kostovetsky (2014) found that companies with an improvement in CSR ratings are associated with negative future stock returns and declines in return on assets (ROA), implying a destruction of shareholder value.

2.4.3. Governmental Aspect

Governance criteria in sustainable financing are the internal systems of practices, controls, and procedures your company adopts to govern itself, make effective decisions, comply with the law, and meet the needs of external stakeholders (Henisz et al., 2019). It encompasses the system of rules and principles guiding decision-making processes within the organization. An essential aspect of G is ensuring compliance with legal and regulatory requirements, as well as adhering to ethical standards and industry best practices. Companies with strong governance structures often demonstrate transparency and accountability in their operations, allowing stakeholders to have a clear understanding of the decision-making processes and the company's overall performance. Effective governance practices also consider the interests of external stakeholders, including customers, employees, investors, and the communities in which the company operates. In support of a good governance view as a guiding principle, Ferrel et al. (2016) found that companies with strong governance structures tend to display certain key characteristics. These include lower

levels of cash hoarding and capital spending, indicating a more efficient use of resources and a focus on strategic investments. Additionally, such firms have higher payout and leverage ratios, which may reflect a willingness to share profits with shareholders and efficiently manage debt. Moreover, a stronger pay-for-performance approach signals that the company aligns executive compensation with its overall performance, promoting accountability and aligning management's interests with those of shareholders. Good governance view states that socially responsible firms are usually also well-governed firms. In other words, proponents of this view argue that the maximization of shareholders' value could be aligned with other stakeholders' interests (Edmans, 2011).

2.5. ESG and Stock Returns

Khan et al. (2016) argues that ESG activities can increase firm value, as he finds that a strong ESG proposition correlates with higher equity returns. Moreover, Eccles et al. (2014) found that "high" ESG rated companies outperform "low" ESG rated companies in terms of stock market and financial performance. One possible explanation is that investors could react positively to the company's goodwill to the environment, thereby increasing interest in investing in the company (Falichin, 2011; Hersugondo et al., 2019). If investor interest increases, it will boost stock prices. As stock prices rise, it will bring prosperity to shareholders, which means increasing the company's value. Another reason for this is that companies that do not prioritize ESG aspects experience risks. For example, oil company Shell faces high costs due to environmental lawsuits for failing to transit away from fossil fuels. A high ESG score will reduce the likelihood of such incidents, indirectly suggesting that a company's investment in ESG will reduce stakeholder risk and thus increase returns (Pollard et al., 2018).

While ESG can be viewed as a mitigation, literature also presents ESG screening as a source of further idiosyncratic risk within a portfolio. ESG is seen as a preference for holding assets unrelated to returns (Fama & French, 2007). This generates unwanted regional, sectoral, and risk factor exposures, according to Alessandrini and Jondeau (2020). Additionally, sin stocks (i.e., firms involved in tobacco or weapons) have historically been shown to generate superior returns compared to other stocks (Hong and Kacperczyk, 2009). Similarly, Bolton and Kaperczyk (2021) found that companies with higher total carbon emissions generate higher returns, controlling for various return predictors, including size and book-to-market. Since ESG can therefore have an ambiguous effect on returns and risks, the resilience of the stock during the Russia-Ukraine war is analyzed, which is characterized by higher volatility and further exacerbating risk exposure.

2.6. Crises and Stock Returns

On 24 February 2022, Russia invaded Ukraine, in a major escalation of the Russo-Ukrainian conflict which began in 2014, thereby disrupting the entire world. Vladimir Putin unleashed the biggest war in Europe since World War Two, with the justification that modern, Western-leaning Ukraine was a constant threat to Russia. Russia's attacks have led to several global reactions, as this unprovoked and unjustified military aggression against Ukraine is seen as a direct attack on international freedom and democracy. The International Court of Justice ordered Russia to suspend military operations, and the Council of Europe expelled Russia. Furthermore, many countries imposed sanctions on Russia, which have affected both the economies of Russia and the world. These actions aim to hurt Russia, mostly financially, to force it to stop the war. However, these actions not only affect Russia, but also a huge part of the global economy through financial sanctions, commodity price changes and disruptions of the supply chain.

Another area where these global actions may have a negative effect is the stock market, as there is significant uncertainty about the future of the war, and the stock market hates uncertainty. Previous warfare had a negative effect on the stock market. The Dow Jones index, for example, plunged 6.31 percent following the invasion of Kuwait by Iraqi troops in 1990 (Foster and Earle, 2003). Correspondingly, the wake of the second war of the U.S.-led forces against Iraq lowered the stock markets around the world (Leigh, Wolfers, and Zitzewitz 2003). The prospect of a major diplomatic or armed contest creates uncertainty over the economic costs that can be attributed to the different war and peace scenarios that the international finance community develops. If the market expects a long war, traders will sell stocks and move to less risky alternatives (Schneider & Troeger, 2006). Similarly, the stock market, especially the stock market in areas close to Ukraine and Russia, could react negatively to the escalation of the Russia-Ukraine conflict. Moreover, Al-Rjoub and Azzam (2012) state that there is a negative impact on stock returns in times of financial crisis. As the escalation of the Russia-Ukraine conflict and the sanctions of the rest of the world can create a next financial crisis, this could also have a negative impact on the stock market. In general, firms that score high on ESG are resilient during turbulent times, in terms of both return and risk (Broadstock et al., 2021). To test if this is the case for the escalation of the Russia-Ukraine conflict, we formulate the following hypotheses:

Hypothesis 1:

H_0*: There is no significant difference in Cumulative Abnormal Returns between high and low rated ESG companies listed on the STOXX Europe 600 during the Russia-Ukraine war announcement.*

H_α*: High rated ESG companies listed on the STOXX Europe 600 exhibit significantly different Cumulative Abnormal Returns compared to low rated ESG companies during the Russia-Ukraine war announcement.*

The hypothesis aims to test whether there is a statistically significant difference, regardless of the direction, in the market reaction displayed by companies with high ESG scores compared to those with low ESG scores during the Russia-Ukraine announcement. We predict that companies with high ESG scores, due to their focus on sustainable practices and stakeholder considerations, are expected to demonstrate more favorable CARs during the Russia-Ukraine war announcement. These companies may possess strong risk management frameworks, engage in proactive risk mitigation strategies, and have built resilient business models that can adapt to such events. Consequently, they are anticipated to experience relatively smaller negative impacts, leading to more favorable CARs compared to companies with low ESG scores.

Thereafter, we shift our focus from the immediate market reaction to examine the short-term impact of the Russia-Ukraine conflict on European companies with high ESG ratings and companies with low ESG ratings. Specifically, we investigate the differences in stock returns around the Russia-Ukraine war announcement. To assess whether this is true, we propose the following hypothesis:

Hypothesis 2:

H_0*: There is no significant difference in the trend of resilience, as indicated by the trend in stock returns over time, between high and low ESG rated companies listed on the STOXX Europe 600 around the Russia-Ukraine war announcement.*

H_α*: High ESG rated companies listed on the STOXX Europe 600 exhibit a significantly different trend in resilience, as indicated by a significantly different trend in stock returns over time, compared to low rated ESG companies around the Russia-Ukraine war announcement.*

Hypothesis 2 complements Hypothesis 1 by providing insights into the dynamic nature of market reactions during the Russia-Ukraine conflict. By analyzing the trend of stock returns over time, specifically during the build-up phase and the escalation phase, we aim to understand how ESG scores may influence companies' short-term performance and market responses at critical stages of the conflict.

After analyzing the immediate market reactions and the short-term reactions during the Russia-Ukraine conflict, our attention shifts to Hypothesis 3, where we investigate the long-term trend of resilience displayed by companies in the post-event period.

Hypothesis 3:

H_0: There is no significant difference in the trend of resilience, as indicated by the trend in stock returns over time, between high and low ESG rated companies listed on the STOXX Europe 600 during the post-event period of the Russia-Ukraine war announcement.

H_α: High ESG rated companies listed on the STOXX Europe 600 exhibit a significantly different trend in resilience, as indicated by a significantly different trend in stock returns over time, compared to low ESG rated companies during the post-event period of the Russia-Ukraine war announcement.

This hypothesis aims to investigate whether there is a statistically significant difference, regardless of the direction, in the trend of resilience exhibited by companies with high ESG scores compared to those with low ESG scores during the post-event period of the Russia-Ukraine conflict. We predict that companies with high ESG scores, characterized by their sustainable practices and stakeholder focus, will display a more positive trend in resilience in response to the Russia-Ukraine war announcement. These companies are likely to have established effective governance structures, transparent reporting practices, and strong relationships with their stakeholders. By prioritizing sustainability and considering the interests of various stakeholders, they are better positioned to weather adverse market conditions resulting from geopolitical events. As a result, they are expected to recover more quickly and exhibit higher resilience compared to companies with low ESG scores. However, it is important to consider that the effect of ESG performance on stock performance may be influenced by various factors, including overall economic conditions and investor behavior. If the crisis leads to a general economic downturn, the focus on short-term financial performance may reduce the influence of ESG factors. For example, during the COVID-19 pandemic, many companies' financial performance was impacted negatively due to lockdowns, supply chain disruptions, and decreased consumer demand. As a result, investors may have become more concerned with short-term financial performance, such as revenue and earnings, and less concerned with ESG factors such as environmental impact or social responsibility. In such cases, the effect of ESG performance on stock performance may be reduced.

The hypotheses specifically focus on European companies listed on the SXXP index, which is assumed to represent the European stock market. Given the context of the conflict's impact on the

European market and the dependence of European companies on Russian energy and other relevant factors, the research aims to gain a deeper understanding of the interplay between ESG considerations, market reactions, and resilience during geopolitical events in the European market. The analysis of Cumulative Abnormal Returns will shed light on the immediate market response and potential differences between high and low ESG performing companies during the conflict's escalation. Additionally, by examining the trend of resilience over time, the study will explore whether the effect of ESG performance on stock performance changes as the short-term & post-event period unfolds. This will help assess the short- and long-term implications of ESG performance on market reactions and the adaptive capacity of companies during geopolitical uncertainties.

3. Data

In this section we will discuss the sample selection procedure and we will elaborate on the variables used.

3.1. Sample Selection

The sample selection process for this study involves a careful inclusion of companies listed on the SXXP index, representing 18 different European countries. The aim is to achieve a well-rounded representation of different market capitalizations and countries to ensure that the sample accurately reflects the European market landscape. This meticulous sampling approach enhances the reliability and validity of the study's findings, contributing to a more robust analysis of the research question. The 18 European countries included in the index are the United Kingdom (UK), France, Germany, Switzerland, Austria, Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Spain, Cyprus, and Sweden. These countries are geographically diverse and represent a significant portion of the European economy.

To gather the necessary data, we utilized reputable sources, namely Bloomberg and DataStream/Eikon. From these sources, we obtained a wide range of data, including daily price data, company-level control variables, country-level control variables, specific variables related to the Russia-Ukraine conflict, and ESG scores. By directly accessing these comprehensive datasets, we aimed to ensure the accuracy and relevance of the information used in our analysis. This rigorous data collection approach forms the foundation for a robust and insightful examination of the relationship between ESG performance and stock returns in the context of the European market landscape.

Despite our efforts, we encountered instances where certain financial data for companies within the SXXP index was missing. These missing values may result from a variety of factors, including discrepancies in data reporting or the unavailability of specific financial reports or accounting data. Therefore, certain countries were excluded from the final analysis, namely Cyprus, Luxembourg, and Switzerland. Additionally, the UK was excluded from the analysis due to the unavailability of data in euros, the local currency used for the analysis. Despite the presence of data in their respective local currencies, the study aimed to maintain uniformity and ensure comparability by focusing on companies denominated in the same currency. Without data available in euros, it was not possible to include the UK in the analysis, while maintaining the consistent currency framework necessary for accurate evaluations of stock returns.

To enhance the robustness of the analysis, we sought to incorporate multiple sources of ESG data. Specifically, we included only stocks in the sample that possessed both Eikon ESG Score and Bloomberg ESG Disclosure score. By considering various ESG metrics, the study aims to strengthen the reliability of the findings, following the approach recommended by Berg et al. (2020).

Additionally, the study employs quartiles based on companies' ESG scores to effectively categorize and compare their ESG performance. By categorizing companies into quartiles based on their ESG performance, the study can provide a more detailed and nuanced analysis of how different levels of ESG scores relate to stock market performance. It allows for an evaluation of whether companies with higher ESG performance, represented in the upper quartiles, exhibit different stock return patterns compared to those with lower ESG performance, represented in the lower quartiles.

By following this sample selection procedure, the study aims to obtain a representative and diverse sample of companies from a range of European countries. This ensures that the findings of the analysis are applicable to a broad spectrum of companies operating within the European market. Furthermore, our analysis included three phases to capture the dynamics of the Russia-Ukraine conflict: the war announcement date, 24 February 2022; the Escalation phase, consisting of the Build-up phase (from the time NATO put its troops on stand-by on 24 January to the day of the war announcement day) and Outbreak phase (from day of invasion to 8 March, the day after EU sanctions Russia & pledges to cut Russian gas imports by two-thirds before the end of the year) and a combination of the Escalation phase and the Continuation phase (24 January 2022 – 2 May 2023).

3.2. List of Variables

3.2.1. Firm-Specific Controls[1]

- Intangible assets to total assets ratio (Asset Ratio): The Asset Ratio can indicate a company's relative investments in intangible assets such as intellectual property and brand equity (Lev, 2001). Companies with higher levels of intangible assets may have a competitive advantage and better growth prospects, which can lead to higher returns (Lev & Sougiannis, 1996). As the total amount of intangible assets can vary greatly depending on the size of the company, we use a ratio instead of a raw value, in line with Lev (2001). Asset Ratio is retrieved from Bloomberg and calculated by dividing the total amount of intangible assets by total assets, as disclosed in the financial reports.
- Asset Turnover: Asset Turnover measures a company's ability to generate revenue from its assets. Higher Asset Turnover indicates better operational efficiency and more effective utilization of assets, which can lead to higher returns. Asset Turnover is retrieved from Bloomberg and calculated as Trailing 12M Net Sales / (Total Assets - Current Period + Total Assets - Prior Year Period) / 2).
- Cash & cash equivalents (C&CE): C&CE is an important determinant of returns as it allows companies to take advantage of investment opportunities and weather economic downturns. Companies with higher levels of cash reserves are better positioned to generate returns for their investors. C&CE is retrieved from Bloomberg and defined as cash in vaults and deposits in banks. The values for this variable are expressed in thousands.
- Company size: Size has been found to have significant explanatory power of returns, with smaller companies historically outperforming larger ones (Banz, 1981). This may be because smaller companies are often more nimble and able to adapt to changing market conditions. Following Martani & Khairurizka (2009), we use total assets as a proxy for company size. Additionally, following Fama & French (1992), we use market capitalization (Market Cap) as a proxy for company size. Market Cap is retrieved from Bloomberg and calculated as Shares Outstanding * Closing Price. The values for this variable are expressed in thousands.
- Debt ratio: Debt ratio is a measure of a company's financial leverage, which can impact its ability to generate returns. High levels of debt can restrict a company's flexibility and increase its financial risk, which can lead to lower returns (Miller & Modigliani, 1963). We compute the debt-ratio as total debt divided by total assets, in line with Jensen & Meckling

[1] Time-invariant variables. The values represent data as reported by companies on 31st December 2021. These variables remain constant throughout the analysis and reflect the information available at the specified reporting date.

(1976). Retrieved from Bloomberg and calculated by adding short-term and long-term debt and then dividing by the company's total assets.

- Liabilities: Total liabilities provide insight into a company's financial risk. Higher levels of liabilities may increase the financial leverage of the company, making it more vulnerable to economic downturns or interest rate fluctuations. Retrieved from Bloomberg and calculated by summing all current and non-current liabilities.
- Price-to-Sales ratio (PS ratio): The PS ratio is a widely used valuation metric that can provide insights into a company's fundamental value and potential over- or undervaluation. The PS ratio measures the company's stock price relative to its revenue (sales) per share. Companies with low P/S ratios have historically shown higher returns (Lakonishok et al., 1994; Fama & French, 1998). Retrieved from Bloomberg.
- ROA: ROA is a measure of a company's operational efficiency and ability to generate profits from its assets. Companies with higher ROA are often more profitable and can generate higher returns for their investors (Banz, 1981).
- Sales growth: Sales growth measures the rate at which a company's revenue is increasing. Companies with high sales growth may be viewed as having better growth prospects, which can lead to higher returns (Lakonishok, et al., 1994). Retrieved from Bloomberg and defined as growth in revenue over the most recent trailing 12-month period, unaffected by currency fluctuations. The values for this variable are expressed in thousands.
- Trading volume (Volume): Trading volume is an important determinant of returns as it can impact a company's liquidity and marketability. Higher trading volume can indicate greater investor interest in a company, which can lead to higher returns (Eleswarapu & Reinganum, 1993). Retrieved from Bloomberg and defined as total number of shares traded on a security on the day of interest. The values for this variable are expressed in thousands.
- Industry effects: Industry is an important determinant of returns as different industries may have unique market conditions and growth prospects. Companies in high-growth sectors may generate higher returns than those in slower-growth sectors (Lakonishok, et al., 1994). By incorporating industry effects as dummy variables in regression, we can address the inherent differences between industries, ensuring that observed relationships between the dependent and explanatory variables remain untangled from industry-specific factors. This process is vital for obtaining reliable and unbiased estimates of the coefficients, preventing spurious correlations and misleading conclusions that may result from neglecting industry-specific effects.

3.2.2. Country-Specific Controls

- Macroeconomic indicators: Inflation and GDP growth can impact stock performance and may be particularly relevant during a time of geopolitical tension. To account for the influence of these macroeconomic factors, we retrieve the Consumer Price Index (CPI) and the Actual Individual Consumption (AIC) for the Euro Area from Eurostat. The CPI measures inflation by tracking the prices of a basket of goods and services commonly purchased by households in Europe. It provides valuable insights into the purchasing power of European consumers, which can impact overall economic growth and consumer spending, and ultimately affect stock performance. Additionally, the AIC reflects the final consumption expenditure of households, encompassing both goods and services, excluding costs associated with income redistribution and purchases made by nonprofit institutions serving households. By including this variable, we aim to capture the impact of consumer spending behavior on the overall economy and its subsequent effect on stock performance.
- Oil prices: The Russia-Ukraine conflict impacts global oil prices, which in turn could impact the stock performance of companies in industries related to oil and gas. Including a control variable for national oil prices could help account for this potential impact. In this study, we utilize the diesel price, excluding tax, in euros per kiloliter, retrieved from Eikon, as a proxy for oil prices.
- Political stability: The Russia-Ukraine conflict could impact the political stability of the countries involved, as well as in neighboring regions. This instability could lead to changes in government policies, regulations, and geopolitical relationships, all of which can impact the performance of companies listed on the SXXP index. To measure political stability, we retrieve the political stability score for each country from Eikon, a composite measure that combines several indicators related to political stability, including government stability, regulatory quality, rule of law, and corruption control.
- Distance to area of conflict: Geopolitical conflicts can disrupt trade, supply chains, and cross-border business activities, with countries located closer to the conflict zone experiencing more significant disruptions, affecting the financial performance of companies and potentially influencing their stock prices. We acknowledge Kyiv as the area of conflict, given its status as the political and cultural center of Ukraine and being the primary target during the Russia-Ukraine conflict. We assess the distance between Kyiv and the respective countries of domain by utilizing the online mapping service Google Maps, as it offers distance measurement functionalities. We simply enter the starting points, the capitals of the respective countries of domain, and destination point, Kyiv, into

the mapping tool, and it provides the estimated driving distance. The values for this variable are expressed in kilometers.

3.2.3. Common Controls

- Market volatility: During times of geopolitical tension, market volatility can increase, due to uncertainty and fear among investors, which can impact stock returns. Higher volatility can indicate higher risk and uncertainty, which can lead to lower returns (Fama & French, 1992). To account for the impact of market fluctuations on stock returns, we include the Euro Stoxx 50 Volatility Index (VSTOXX), retrieved from Eikon, which is often used as a benchmark for European market volatility.
- Commodity price fluctuations: The Russia-Ukraine conflict impacts the prices of various commodities, including energy, metals, agriculture, livestock, and precious metals. If the Russia-Ukraine conflict causes disruptions in the supply chain of a particular commodity, it could lead to a rise in the price of that commodity, which could then impact the profitability and stock returns of companies that rely on that commodity. We include the Bloomberg Commodity Euro Index, retrieved from Eikon, as a proxy to help account for any potential impact of commodity price fluctuations on stock performance.

3.2.4. Dependent Variable

- Stock Price: The dependent variable in this study is stock price, which reflects the perceived worth of an asset in the marketplace at a given point in time (Williams, 1938). The price of a company's share is determined by the forces of supply and demand in the stock market. Investors' perceptions and expectations about the company's future performance, growth prospects, profitability, and overall health influence their willingness to buy or sell the shares (Fama et al., 1969). As a result, the stock price reflects how investors collectively assess the value and potential of the company.

3.2.5. Independent Variables

- Eikon ESG score: Eikon ESG Score is a combination of an overall company score based on the self-reported information in the ESG dimensions (ESG Combined score) with an ESG Controversies overlay. Each pillar is given equal weight within the ESG Combined score. The ESG Controversies overlay assesses the company's exposure to ESG-related controversies and negative events as reported in global media. This overlay incorporates external data from media reports to identify instances where a company might face criticism or negative attention due to ESG-related issues, such as environmental violations, labor disputes, or governance controversies. The score ranges from 0 to 100.

- Bloomberg ESG Disclosure score: The Bloomberg ESG Disclosure score assesses a company's transparency and disclosure practices concerning its ESG performance. This score evaluates the extent to which a company provides relevant and comprehensive information on its ESG initiatives, risks, and performance to investors and stakeholders. The score ranges from 0 for companies that do not disclose any of the ESG data included in the score, to 100 for those that disclose every data point. ESG pillars are equally weighted within the overall ESG Disclosure Score, each topic within a pillar is equally weighted, and topic weights are allocated across fields related to the issue, with quantitative fields weighted more heavily than binary fields. A higher Bloomberg ESG Disclosure score indicates greater transparency and openness regarding ESG-related matters.

4. Methodology

The purpose of this methodology section is to present a detailed explanation of the fundamental components of event studies and random effects models. Thereafter, to ensure the reliability and validity of our results, we conduct rigorous robustness checks.

4.1. Statistical Models

4.1.1. Event Study

Event studies are widely used in finance research to analyze the immediate impact of specific events on stock prices. These studies rely on the assumption that stock prices rapidly and efficiently incorporate new information. We will conduct an event study to examine stock price movements during the critical period in the Russia-Ukraine conflict to gain insights into how the market absorbs and reacts to new information related to the event. The event is the day of the invasion, which took place on 24 February 2022. To conduct the event study, we will follow the established event study methodology. First, we will define the estimation window, which captures a period of past stock performance used to estimate normal returns in the absence of the event. In our analysis, we will use an estimation window of [-255; -55] days before the event window, as recommended by MacKinlay (1997). This window ensures that any stock price changes related to the event are excluded from the estimation of normal returns. Additionally, the chosen estimation window excludes the period directly affected by the COVID-19 pandemic. By doing so, we mitigate the potential distortion caused by the unique circumstances of the pandemic and its impact on stock returns. Thereafter we choose the event window, which includes the days surrounding the event of interest. We select a 7-day event window, with the event day positioned at the center. The use of relatively short event windows is motivated by their statistically desirable properties, as they are less susceptible to contamination by unrelated or extraneous events. Implicit in the

adoption of such short windows is the assumption that the market response to public information about a strategic event is quick, complete, and unbiased, based on the semi-strong form of the efficient market hypothesis (Fama, 1970; MacKinlay, 1997; McWilliams and Siegel, 1997). To enhance the robustness of our findings, we also incorporate additional event windows with different durations. Specifically, we implement a 3-day event window and an 11-day event window. By including these varying durations, we account for the potential influence of extraneous events or factors and aim to provide a more comprehensive analysis of the market reaction. Similarly, the analysis was performed using different percentiles to define the high and low ESG score groups (top 10%, bottom 10%).

The event study methodology we will employ is based on the seminal work of Brown and Warner (1985). This methodology utilizes the market model. Equation (1) represents the market model, which is commonly used to estimate the expected return of a security (R_{it}) based on its responsiveness to the market portfolio ($R_{m,t}$).

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i.t} \ (1)$$

Note that $i = company, t = times, m = market$

The market model suggests that the expected return of a security can be decomposed into three components:

- Alpha ($\boldsymbol{\breve{\alpha}_i}$): The alpha term represents the expected excess return of the security beyond what can be explained by the market return. It captures the security's abnormal return that is unrelated to its sensitivity to the market. A positive alpha suggests that the security has outperformed the expected return based on its beta, while a negative alpha indicates underperformance.
- Beta ($\breve{\beta}_i$): The beta coefficient measures the sensitivity of the security's returns to changes in the market return. It indicates the systematic risk of the security, representing how much the security's returns tend to move in relation to the overall market. A beta of 1 suggests that the security tends to move in line with the market, while a beta greater than 1 suggests higher sensitivity to market movements, and a beta less than 1 suggests lower sensitivity.
- Error term ($\varepsilon_{i.t}$): The error term represents the random or idiosyncratic component of the security's return that is not explained by the market return or the beta. It captures the factors specific to the security that are not accounted for by the market model. The error term includes company-specific events, news, or other factors that influence the security's return beyond its systematic relationship with the market.

The estimation of alpha $(\breve{\boldsymbol{\alpha}}_{\boldsymbol{i}})$ and beta $(\breve{\beta}_i)$ coefficients for each security using the DataStream/Eikon- Event-Study tool allows for the estimation of the security's expected return based on its relationship with the market return. Equation (2) allows us to calculate abnormal returns (ARi,t) using the market model:

$$AR_{i,t} = R_{i,t} - (\breve{\boldsymbol{\alpha}}_{\boldsymbol{i}+} \breve{\beta}_i R_{m,t}) \quad (2)$$

Note that $i = company, t = times, m = market$

It compares the actual stock return (R_{it}) on a specific day within the event window with the predicted normal return. The predicted normal return is determined by incorporating the estimated alpha $(\breve{\boldsymbol{\alpha}}_{\boldsymbol{i}})$ and beta $(\breve{\beta}_i)$ coefficients along with the return of the reference market $(R_{m,t})$, which is the SXXP 600 index in this case. By multiplying the beta coefficient with the return of the reference market, we estimate the portion of the security's return that is related to general market movements. Subtracting the predicted normal return from the actual stock return gives us the abnormal return, which represents the deviation of the stock's performance from what would be expected based on its relationship with the SXXP 600 index. The abnormal return captures the portion of the stock's return that cannot be attributed to general market movements and may reflect company-specific events or factors. Finally, the CARs are calculated by summing the abnormal returns observed during the event window:

$$CAR_{i,t} = AR_{i,t} \sum_{t=T_1}^{T_2} AR_{i,t} \quad (3)$$

Note that $i = company, t = times,$

To determine the statistical significance of the difference in CARs between the highest and lowest quartiles, we conduct the two-sample t-test. Additionally, we perform Welch's t-test, as it accounts for the presence of unequal variances between the two groups being compared. By accounting for this heterogeneity, it provides more accurate results compared to the standard t-test, ensuring the validity of the conclusions drawn from the analysis. We determine whether there is a statistically significant difference in CARs between the highest and lowest quartiles by either accepting or rejecting the notions.

4.1.2. Panel Data Regression Models

After observing the direct impact of high and low ESG performance on stock returns during the event study, the next step is to investigate whether this effect persists, changes, or diminishes over

time (short- & long-term). To analyze the effect of high/low ESG performance, a panel data regression model will be employed, utilizing either fixed effects or random effects estimation. The fixed effects model incorporates individual-specific fixed effects to account for time-invariant heterogeneity among companies. By controlling for unobservable factors that remain constant over time, this model allows us to assess the persistent effect of ESG performance on stock returns over an extended period. On the other hand, the random effects model considers both time-varying and time-invariant heterogeneity, allowing for variations in the effect of ESG performance on stock returns across different time periods.

To determine which model is more appropriate, a Hausman test will be conducted. The Hausman test compares the coefficients from the fixed effects and random effects models and tests the null hypothesis that the individual-specific effects are uncorrelated with the independent variables. If the null hypothesis is rejected, indicating a significant correlation between the individual-specific effects and the independent variables, the fixed effects model will be preferred as it provides more efficient estimates. The analysis will include multiple time periods, namely the escalation phase and the total effect (escalation & continuation phase). This allows for a comprehensive examination of the short- & long-term relationship between ESG performance and stock returns during different stages of the Russia-Ukraine conflict.

The overall panel data regression models are specified as follows:

$$P_{i,t} = \alpha + \beta_1 ESG_{Eikon} + \beta_2 AssetRatio + \beta_3 AssetTurnover + \beta_4 CCE + \beta_5 DebtRatio + \beta_6 Liabilities + \beta_7 PSRatio + \beta_8 ROA + \beta_9 SalesGrowth + \beta_{10} Size + \beta_{11} Volume + \beta_{12} D_{IndustryEffects} + \beta_{13} AIC + \beta_{14} CPI + \beta_{15} Distance + \beta_{16} OilPrice + \beta_{17} Political\ Stability + \beta_{18} CommodityIndex + \beta_{19} MarketVolatility + \varepsilon_{i,t} \quad (1)$$

i: denotes company, t: denotes time.

$$P_{i,t} = \alpha + \beta_1 ESG_{Bloomberg} + \beta_2 AssetRatio + \beta_3 AssetTurnover + \beta_4 CCE + \beta_5 DebtRatio + \beta_6 Liabilities + \beta_7 PSRatio + \beta_8 ROA + \beta_9 SalesGrowth + \beta_{10} Size + \beta_{11} Volume + \beta_{12} D_{IndustryEffects} + \beta_{13} AIC + \beta_{14} CPI + \beta_{15} Distance + \beta_{16} OilPrice + \beta_{17} Political\ Stability + \beta_{18} CommodityIndex + \beta_{19} MarketVolatility + \varepsilon_{i,t} \quad (2)$$

i: denotes company, t: denotes time.

$$P_{i,t} = \alpha + \beta_1 ESGCombined_{Eikon} + \beta_2 ESGControversies_{Eikon} + \beta_3 AssetRatio + \beta_4 AssetTurnover + \beta_5 CCE + \beta_6 DebtRatio + \beta_7 Liabilities + \beta_8 PSRatio + \beta_9 ROA + \beta_{10} SalesGrowth + \beta_{11} Size + \beta_{12} Volume + \beta_{13} D_{IndustryEffects} + \beta_{14} AIC + \beta_{15} CPI +$$

$\beta_{16}Distance + \beta_{17}OilPrice + \beta_{18}Political\ Stability + \beta_{19}CommodityIndex +$
$\beta_{20}MarketVolatility + \varepsilon_{i,t}$ (3)

i: denotes company, t: denotes time.

$P_{i,t} = \alpha + \beta_1 ESGEnvPillar_{Eikon} + \beta_2 ESGGovPillar_{Eikon} + \beta_3 ESGSocPillar_{Eikon} +$
$\beta_4 ESGControversies_{Eikon} + \beta_5 AssetRatio + \beta_6 AssetTurnover + \beta_7 CCE + \beta_8 DebtRatio +$
$\beta_9 Liabilities + \beta_{10} PSRatio + \beta_{11} ROA + \beta_{12} SalesGrowth + \beta_{13} Size + \beta_{14} Volume +$
$\beta_{15} D_{IndustryEffects} + \beta_{16} AIC + \beta_{17} CPI + \beta_{18} Distance + \beta_{19} OilPrice +$
$\beta_{20} Political\ Stability + \beta_{21} CommodityIndex + \beta_{22} MarketVolatility + \varepsilon_{i,t}$ (4)

i: denotes company, t: denotes time.

The coefficients of the variables of interest capture the relationship between ESG score and stock returns. A positive and statistically significant coefficient suggests that companies experience a higher return when their ESG score increases. The model also considers control variables to control for other factors that may influence stock returns, namely firm-specific characteristics, industry effects, and macroeconomic conditions.

The panel data regression models, with the variables of interest divided into quartiles, are specified as follows:

$P_{i,t} = \alpha + \beta_1 D_{q4Eikon} + \beta_2 D_{q3Eikon} + \beta_3 D_{q2Eikon} + \beta_4 AssetRatio + \beta_5 AssetTurnover +$
$\beta_6 CCE + \beta_7 DebtRatio + \beta_8 Liabilities + \beta_9 PSRatio + \beta_{10} ROA + \beta_{11} SalesGrowth + \beta_{12} Size +$
$\beta_{13} Volume + \beta_{14} D_{IndustryEffects} + \beta_{15} AIC + \beta_{16} CPI + \beta_{17} Distance + \beta_{18} OilPrice +$
$\beta_{19} Political\ Stability + \beta_{20} CommodityIndex + \beta_{21} MarketVolatility + \varepsilon_{i,t}$ (5)

i: denotes company, t: denotes time.

$P_{i,t} = \alpha + \beta_1 D_{q4Bloomberg} + \beta_2 D_{q3Bloomberg} + \beta_3 D_{q2Bloomberg} + \beta_4 AssetRatio +$
$\beta_5 AssetTurnover + \beta_6 CCE + \beta_7 DebtRatio + \beta_8 Liabilities + \beta_9 PSRatio + \beta_{10} ROA +$
$\beta_{11} SalesGrowth + \beta_{12} Size + \beta_{13} Volume + \beta_{14} D_{IndustryEffects} + \beta_{15} AIC + \beta_{16} CPI +$
$\beta_{17} Distance + \beta_{18} OilPrice + \beta_{19} Political\ Stability + \beta_{20} CommodityIndex +$
$\beta_{21} MarketVolatility + \varepsilon_{i,t}$ (6)

i: denotes company, t: denotes time.

$$P_{i,t} = \alpha + \beta_1 D_{q4CombinedEikon} + \beta_2 D_{q3CombinedEikon} + \beta_3 D_{q2CombinedEikon} + \beta_4 D_{q4ControversiesEikon} + \beta_5 D_{q3ControversiesEikon} + \beta_6 D_{q2ControversiesEikon} + \beta_7 AssetRatio + \beta_8 AssetTurnover + \beta_9 CCE + \beta_{10} DebtRatio + \beta_{11} Liabilities + \beta_{12} PSRatio + \beta_{13} ROA + \beta_{14} SalesGrowth + \beta_{15} Size + \beta_{16} Volume + \beta_{17} D_{IndustryEffects} + \beta_{18} AIC + \beta_{19} CPI + \beta_{20} Distance + \beta_{21} OilPrice + \beta_{22} Political\ Stability + \beta_{23} CommodityIndex + \beta_{24} MarketVolatility + \varepsilon_{i,t} \quad (7)$$

i: denotes company, t: denotes time.

$$P_{i,t} = \alpha + \beta_1 D_{q4EnvPillarEikon} + \beta_2 D_{q3EnvPillarEikon} + \beta_3 D_{q2EnvPillarEikon} + \beta_4 D_{q4GovPillarEikon} + \beta_5 D_{q3GovPillarEikon} + \beta_6 D_{q2GovPillarEikon} + \beta_7 D_{q4SocPillarEikon} + \beta_8 D_{q3SocPillarEikon} + \beta_9 D_{q2SocPillarEikon} + \beta_{10} D_{q4ControversiesEikon} + \beta_{11} D_{q3ControversiesEikon} + \beta_{12} D_{q2ControversiesEikon} + \beta_{13} AssetRatio + \beta_{14} AssetTurnover + \beta_{15} CCE + \beta_{16} DebtRatio + \beta_{17} Liabilities + \beta_{18} PSRatio + \beta_{19} ROA + \beta_{20} SalesGrowth + \beta_{21} Size + \beta_{22} Volume + \beta_{23} D_{IndustryEffects} + \beta_{24} AIC + \beta_{25} CPI + \beta_{26} Distance + \beta_{27} OilPrice + \beta_{28} Political\ Stability + \beta_{29} CommodityIndex + \beta_{30} MarketVolatility + \varepsilon_{i,t} \quad (8)$$

i: denotes company, t: denotes time.

The coefficients of the variable of interest capture the relationship between the respective ESG quartiles (high, medium-high, and medium-low) and stock returns. A positive and statistically significant coefficient suggests that companies in the high, medium-high, or medium-low ESG quartiles exhibit higher stock returns compared to the reference group (low ESG quartile). The model also considers control variables to control for other factors that may influence stock returns, namely firm-specific characteristics, industry effects, and macroeconomic conditions.

We will run all models twice, to answer both the second and third hypothesis. The second hypothesis examines the short-term impact of ESG scores on stock returns during the period from 24 January to 8 March 2022. This sample period corresponds to the short-term effect of the Russia-Ukraine conflict announcement, providing an opportunity to explore how companies' ESG performance influences their stock returns during this crucial and volatile period. On the other hand, the third hypothesis investigates the long-term impact of ESG scores on stock returns from 24 January 2022 to 2 May 2023. This extended sample period allows for the observation of stock market reactions to the Russia-Ukraine conflict over an extended duration, offering insights into the sustained effects of ESG performance on companies' stock returns in the post-event period.

4.2. Robustness Checks

4.2.1. Outliers

Outliers in a dataset are extreme values that deviate significantly from the overall pattern of the data. These extreme values can distort statistical analysis, leading to biased estimates and unreliable results. To identify and handle outliers in our dataset, we utilize the Winsorization technique. Winsorization is an effective method for dealing with outliers by replacing extreme values with less extreme, yet plausible, values. For price & firm-specific variables, we apply 5% Winsorization, meaning that the top 5% highest values and the bottom 5% lowest values are replaced with the values at the 95th and 5th percentiles, respectively. Similarly, for country-specific and universal variables, we use 2% Winsorization, replacing values beyond the top 2% and below the bottom 2% with the values at the 98th and 2nd percentiles, respectively. This approach allows us to retain the integrity of the dataset while reducing the undue influence of extreme observations. By mitigating the impact of outliers, we can obtain more accurate and trustworthy insights, facilitating a deeper understanding of the relationships between variables and drawing more reliable conclusions from our research.

4.2.2. Multicollinearity

Multicollinearity occurs when one or more independent variables in a multivariate regression equation are highly correlated with each other. This can lead to inflated standard errors and unstable coefficient estimates, which may result in misleading interpretations of the regression results (Allen, 1997). To assess whether multicollinearity exists in our dataset, we construct correlation matrices (see Appendices B & C). The correlation matrix shows the Pearson correlation coefficient between our independent variables and control variables, with statistical significance indicated by $p \leq 0.05$. It is important to note that statistical significance does not necessarily indicate the strength of the correlation but rather the probability of observing such a strength by chance (Akolgu, 2018). The correlation coefficient can vary between -1 and +1, where a positive value indicates a positive correlation, a negative value indicates a negative correlation, and values closer to -1 or +1 suggest a stronger relationship. By examining the correlation matrix, we can gain insights into the degree of correlation between our variables. If we find high correlations between independent variables, it may indicate the presence of multicollinearity, and we will need to take appropriate measures to address it in our regression analysis to ensure the validity of our results. Upon analyzing the correlation matrix, we have identified the presence of multicollinearity issues among several variables in our dataset, namely "Cash & Cash Equivalents," "Total Liabilities," and "Total Assets." The high correlation between these variables can be attributed to the relationship between Total Liabilities & Equity and Total Assets. Total Liabilities & Equity is equal to Total Assets, as it represents the sources of funding for the company's assets.

It comprises the company's debts (liabilities) and the owner's equity. As a result, both "Total Liabilities" and "Total Assets" are components of Total Liabilities & Equity, leading to a highly positive correlation between them. Additionally, since "C&CE" is a part of "Total Assets," it naturally exhibits a high positive correlation with Total Assets. To address the issue of multicollinearity and avoid potential biases in our analysis, we have made the decision to remove the variables "Total Assets" & “Total Liabilities” from our dataset. This decision was made considering that the dataset already includes variables such as "Asset Turnover" and "Debt/Assets Ratio," which effectively capture critical aspects of a company's financial health and performance. By excluding "Total Assets" & “Total Liabilities” we aim to prevent potential biases and enhance the accuracy of our findings while still retaining important financial indicators for our analysis.

5. Empirical results

In this section we will first present the results of the event study and discuss the implications of the results for hypothesis 1. Thereafter, we move to the results of the random effects models study and delve into the implications of these results for hypotheses 2 and 3. Additionally, we summarize the effects of the key variables of interest.

5.1. Event Study

The event study analysis was designed to evaluate the significance of differences in CAR between companies with high ESG scores and those with low ESG scores in response to the Russia-Ukraine conflict. Descriptive statistics of the event studies can be found in Appendices D & E. To investigate these differences, independent sample t-tests were conducted, as presented in tables A & B. The independent sample t-tests reveal statistically significant differences in CAR between the top 25% and lowest 25% Eikon ESG score group ($t = -3.842$; $p < 0.05$). Additionally, we find statistically significant differences in CAR between the top 10% and bottom 10% group ($t = -0.963$; $p < 0.05$). Importantly, the differences in CAR for the Bloomberg ESG score were also statistically significant for both the 25% ($t = -1.658$; $p < 0.05$) and 10% ($t = -2.783$; $p < 0.05$) comparisons, indicating the robustness of the observed effect. These results suggest that the impact of the war announcement on companies within the SXXP 600 index did significantly vary between the highest and bottom ESG-score-based groups. On average, companies in the highest ESG-score based group experienced more negative CAR than companies in the bottom ESG-score based group, ceteris paribus. Furthermore, the results from the Welch test, as presented in Appendices F & G, confirm the robustness of our findings. The significant differences in Cumulative Abnormal Returns (CAR) between the highest and lowest ESG-score-based groups persist when accounting for unequal

variance. This strengthens the evidence supporting a meaningful association between ESG scores and CAR during the war announcement.

The study also employs alternative event windows, [-1, +1] days and [-5, +5] days, to ensure the robustness of the findings. A statistically significant difference in CAR is found between the top 10% and lowest 10% Eikon ESG score groups for the [-1, +1] and [-5, +5] days event window. The Mean Return Difference is statistically significant and negative for all three event windows, suggesting that the negative impact of the war announcement on companies within the SXXP 600 index is higher for the high ESG-score-based group than for the low ESG-score-based group. On average, companies in the highest ESG-score based group experienced more negative CAR than companies in the bottom ESG-score based group, ceteris paribus.

Contrary, when considering the Bloomberg ESG Disclosure Score sample, a statistically significant positive difference in CAR is found between the top 25% and lowest 25% ESG score groups for the [-1, +1] days event window. However, as the Mean Return Difference variable changes sign, the observed difference might be sensitive to the chosen event window, indicating the need for caution in interpreting the results. Short-term event windows are namely more susceptible to market volatility and noise. Random fluctuations in the stock market during these short periods could heavily influence the observed CAR differences.

In conclusion, the study's analysis has yielded both statistically significant and inconclusive results regarding the significant difference in stock returns between companies with high ESG scores and those with low ESG scores during the specified event window. While the significant findings provide evidence for a meaningful association between ESG scores and CAR for both percentile cutoffs, the observed sensitivity to the event window highlights the need for caution in drawing definitive conclusions.

5.2. Panel Data Regression Models

Firstly, a Hausman test is conducted to determine whether a fixed effects or random effects model is more appropriate for the analysis. The p-value is 1.000, indicating that there is no evidence to reject the null hypothesis. In other words, there is no evidence to suggest that the coefficients estimated by the random effects model are different from those estimated by the fixed effects model. As a result, we can conclude that both models are equally appropriate for the analysis. We prefer the random effects model over the fixed effects model, due to the substantial number of time-invariant variables in the regression. Descriptive statistics of the random effects models can be found in Appendices H & I.

Table C shows the results of the random effects model for the short-term period, around the war announcement. The results reveal a statistically significant negative impact of ESG score on stock prices ($p < 0.10$). On average, when a company's Eikon ESG score increases by one point, she experiences a decline in stock prices of 46 Eurocents, ceteris paribus. Since the Bloomberg ESG score is also statistically significant (47 Eurocents; $p < 0.10$), it indicates the robustness of the observed effect. Additionally, we find a statistically significant effect of Controversies Score on stock price. On average, when a company's Controversies score increases by one point, she experiences an increase in stock prices of 26 Eurocents, ceteris paribus. The results in table C suggest that companies with better ESG performance (higher ESG scores & lower Controversies scores) tend to have lower stock prices in the short-term around the war announcement.

Further analysis, by dividing the variables of interest into quartiles, indicates that the effect is not uniform across quartiles, as shown in Table D. Instead, the variation in the effect is primarily driven by the differences between the highest and lowest quartiles. On average, companies being in the highest Eikon ESG score group, compared to companies being in the lowest Eikon ESG score group, experience a price that is 25.71 Euros lower, ceteris paribus. Additionally, we find that, on average, companies being in the highest Combined ESG score group, compared to companies being in the lowest Combined ESG score group, experience a price that is 32.57 Euros lower, ceteris paribus. Accordingly, on average, companies being in the second highest Combined ESG score group, compared to companies being in the lowest Combined ESG score group, experience a price that is 21.39 Euros lower, ceteris paribus. Likewise, on average, companies being in the second lowest Combined ESG score group, compared to companies being in the lowest Combined ESG score group, experience a price that is 18.94 Euros lower, ceteris paribus. Furthermore, on average, companies being in the highest Social Pillar group, compared to companies being in the lowest Social Pillar group, experience a price that is 15.31 Euros lower, ceteris paribus. The results in Table D imply that the variation in the effect of ESG score on stock price is primarily driven by the differences between the highest and lowest quartiles, whilst also present between the other quartiles and the lowest quartile. Since the social score pillar is statistically significant, it indicates that the observed effect is predominantly due to the social pillar of the ESG score.

Table E shows the results of the random effects model for the long-term period, during the post-event period of the Russia-Ukraine war announcement. The results reveal a statistically significant negative impact of ESG score on stock prices ($p < 0.10$). On average, when a company's Eikon ESG score increases by one point, she experiences a decline in stock prices of 38 Eurocents, ceteris paribus. Since the Bloomberg ESG score is also statistically significant (41 Eurocents; $p <$

0.10), it indicates the robustness of the observed effect. The results in Table E convey that the effect of ESG scores on stock prices diminishes but persists over the long-term, indicating an initial overreaction by investors to ESG-related information in the short-term. As time progresses, the market adjusts and incorporates these factors more accurately, resulting in a moderated impact on stock prices in the long run.

Further analysis, by dividing the variables of interest into quartiles, indicates that the effect is not uniform across quartiles, as shown in Table F. On average, companies being in the highest ESG score group, compared to companies being in the lowest ESG score group, experience a price that is 19.91 Euros lower, ceteris paribus. Additionally, we find that, on average, companies being in the highest Combined ESG score group, compared to companies being in the lowest Combined ESG score group, experience a price that is 23.98 Euros lower, ceteris paribus. Accordingly, on average, companies being in the second highest Combined ESG score group, compared to companies being in the lowest Combined ESG score group, experience a price that is 22.41 Euros lower, ceteris paribus. Likewise, on average, companies being in the second lowest Combined ESG score group, compared to companies being in the lowest Combined ESG score group, experience a price that is 19.33 Euros lower, ceteris paribus. Furthermore, on average, companies being in the highest Social Pillar group, compared to companies being in the lowest Social Pillar group, experience a price that is 12.71 Euros lower, ceteris paribus. The results in Table F suggest that the variation in the long-term effect of ESG score on stock price is not primarily driven by the differences between the highest and lowest quartiles. This indicates that extreme ESG scores have a more pronounced effect in the short-term, but their impact gradually moderates over time. Additionally, the difference between the second and third quartiles compared to the lowest quartile remains moderately consistent across both short-term and long-term analyses. This indicates that the middle range of ESG scores may have a more stable and consistent influence on stock prices over time. Additionally, over the long-term, the impact of the social pillar on stock prices persists but diminishes. This indicates that the social pillar continues to influence stock prices, but its influence becomes more restrained over time. During war time or periods of heightened market uncertainty (short-term), there may be an underemphasis on the social pillar of the ESG score. This can lead to a negative effect on stock prices for companies with better social performance. Stock prices may experience short-term downward pressure, particularly for firms excelling in social responsibility, as investors' immediate focus may be on other aspects of the stock, such as revenue and profitability.

Additionally, the results for our control variables generally align with the predictions and expectations outlined in the variable list section, which bolsters the validity of our random effects

model. However, we observed notable exceptions for two variables: "Volume" and "Size." Contrary to the initially anticipated positive relationship, the "Volume" variable displayed an opposite sign, revealing that higher trading volume is associated with lower stock prices. Similarly, the variable "Size" demonstrated an opposite direction from what was expected. Instead of a negative correlation with stock price, as hypothesized, the results indicate a positive association. These unexpected findings require further investigation to understand the underlying drivers and potential implications for the model's interpretation.

To conclude, In the short-term, variations in ESG scores significantly influence stock prices, primarily driven by the differences between the highest and lowest quartiles, with the social pillar playing a prominent role. Companies with better social performance, especially those in the highest quartile, may experience short-term stock price declines, potentially due to overreactions during periods of market uncertainty like war announcements. However, over the long-term, the effect of ESG scores on stock prices diminishes, suggesting that extreme ESG scores have a more pronounced impact in the short-term. Notably, the middle range of ESG scores maintains a consistent influence on stock prices over time. Despite the diminishing effect, the impact of the social pillar within the highest and lowest quartiles persists in the long run, albeit becoming more restrained. During short-term market uncertainty, there may be an underemphasis on the social pillar, leading to short-term stock price declines for companies excelling in social responsibility within these quartiles.

6. Conclusion & Discussion

6.1. Conclusion

Based on the event study analysis, the findings suggest that there is evidence of an immediate negative effect of ESG scores on stock prices during the Russia-Ukraine conflict. On average, companies in the highest ESG-score based quartile experienced more negative Cumulative Abnormal Returns (CAR) compared to companies in the bottom ESG-score based quartile, all else being equal. The statistically significant findings provide evidence of a meaningful association between ESG scores and CAR for both percentile cutoffs. However, the observed sensitivity to the event window underscores the importance of exercising caution when drawing definitive conclusions. The event study highlights the need for further research and careful consideration of the event window duration to better understand the nuanced relationship between ESG scores and stock returns in response to geopolitical events.

Moreover, the random effects model analysis indicates that in the short-term, variations in ESG scores significantly influence stock prices, with the differences between the highest and lowest

quartiles playing a prominent role, especially driven by the social pillar. Companies with better social performance, particularly those in the highest quartile, may experience short-term stock price declines, possibly due to overreactions during periods of market uncertainty like war announcements. However, over the long-term, the effect of ESG scores on stock prices diminishes, suggesting that extreme ESG scores have a more pronounced impact in the short-term. Notably, the middle range of ESG scores maintains a consistent influence on stock prices over time. Despite the diminishing effect, the impact of the social pillar within the highest and lowest quartiles persists in the long run, albeit becoming more restrained. During short-term market uncertainty, there may be an underemphasis on the social pillar, leading to short-term stock price declines for companies excelling in social responsibility within these quartiles.

In conclusion, the combined findings of the event study analysis and the random effects model demonstrate the complex and dynamic relationship between ESG scores and stock prices during the Russia-Ukraine conflict. The immediate negative effect of ESG scores in the short-term, driven by differences between the highest and lowest quartiles, suggests investors' initial sensitivity to ESG-related information. However, over the long-term, this impact diminishes, highlighting the evolving nature of market reactions to ESG considerations. The persistence of the social pillar's influence in the long run underscores its lasting impact, even as other factors come into play. Overall, these results provide valuable insights into the short and long-term dynamics of ESG scores' influence on stock prices, emphasizing the importance of comprehensive evaluations and cautious interpretations in investment decision-making.

6.2. Discussion & Limitations

6.2.1. Discussion

This research makes a valuable contribution to the existing literature as it explores the relationship between ESG performance and stock prices, enriching the field of sustainable finance and corporate social responsibility. By examining how ESG performance impacts stock prices, this study provides crucial insights for investors, policymakers, and corporate decision-makers, shedding light on the financial implications of sustainable business practices. The study's findings carry practical implications, underscoring the importance of comprehensive risk assessments by companies that incorporate both financial and non-financial factors, including ESG performance. By considering a broader range of indicators, companies can better understand their overall risk exposure and make informed decisions to enhance their long-term financial stability. Additionally, from an economic perspective, the research provides valuable empirical evidence that informs investment strategies and risk management approaches, especially during periods of geopolitical

uncertainty. Investors can utilize this knowledge to make more informed decisions, allocating resources effectively and navigating market fluctuations with greater foresight.

Furthermore, this research adds novelty to the literature, inspiring innovative investigations in sustainable finance and corporate social responsibility. A promising future avenue involves examining the long-term financial performance of companies with robust ESG practices that face lower stock prices. Delving into these contrasting dynamics, researchers can reveal whether such companies exhibit greater resilience and sustainable growth over extended periods. Sector-specific analysis offers another compelling direction, providing a nuanced perspective on the interplay between ESG performance and stock prices within diverse industries. By scrutinizing relationships within each sector, researchers can identify how business models, complexities, and stakeholder expectations influence ESG's impact on financial performance. Moreover, a promising direction for future research lies in conducting cross-country comparisons, which can reveal captivating insights into the multifaceted influence of cultural, regulatory, and market differences on the integration of sustainable practices globally. Understanding how distinct values and norms shape companies' ESG approaches, and their financial outcomes advances responsible practices on a broader scale.

6.2.2. Limitations

This study is subject several limitations. The presence of reverse causality is an important consideration that limits the ability to establish a clear direction of influence between ESG performance and stock prices. The observation that companies with higher stock prices may prioritize short-term financial gains and shareholder value over long-term sustainable practices suggests the possibility that stock prices could be driving decisions regarding ESG initiatives, rather than the other way around.

Another notable limitation of this study pertains to the composition of the bottom ESG score based quartiles, where approximately 30% of the companies included are of Swedish origin. Despite controlling for country-specific factors, this significant representation of Swedish firms may still introduce the potential for biased effects on the observed relationship between ESG performance and stock prices and limit the generalizability of the findings beyond the Swedish market. Moreover, the study's generalizability is further constrained by the specific time period and geographical scope of the data used. Variations in market conditions, investor sentiments, and regulatory environments across different time frames and regions can impact the relationships observed between ESG performance and stock prices. Therefore, caution is necessary when

extending the findings to other contexts, and further research with diverse samples is warranted to enhance the study's generalizability.

Finally, due to perfect collinearity among the control variables 'C&CE', 'Total Liabilities', and 'Total Assets', we could only include the 'C&CE' variable in our regressions while omitting the others. However, this selection introduces a potential concern about omitted variable bias, as the excluded variables may still influence the dependent variable. This limitation could impact the overall robustness and accuracy of our regression analysis, and it is essential to acknowledge this constraint in interpreting the results.

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Tables

Table 1. Two-sample t-test based on Eikon Score

	Comparison	Mean Return Diff.	t-value	p-value
Event Window				
(-1:1)	Top 25% - Bottom 25%	-.000	-.056	.955
	Top 10% - Bottom 10%	-.014	-1.812	.074*
(-3:3)	Top 25% Bottom 25%	-.045	-3.842	.002***
	Top 10% Bottom 10%	-.067	-.963	.000***
(-5:5)	Top 25% Bottom 25%	-.021	-1.353	.178
	Top 10% Bottom 10%	-.037	-2.014	.048**

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Table 2. Two-sample t-test based on Bloomberg Score

	Comparison	Mean Return Diff.	t-value	p-value
Event Window				
(-1:1)	Top 25% - Bottom 25%	.015	1.768	.079*
	Top 10% - Bottom 10%	.068	.017	.946
(-3:3)	Top 25% Bottom 25%	-.028	-1.658	.099*
	Top 10% Bottom 10%	-.054	-2.783	.007***
(-5:5)	Top 25% Bottom 25%	-.000	-.025	.980
	Top 10% Bottom 10%	-.004	-.168	.868

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Table 3. Random effects regressions, short-term

	(1)	(2)	(3)	(4)
Variable of Interest				
Bloomberg Score	-.467*			
Eikon Score		-.460*		
Combined Score			-.395	
Controversies Score			.256*	.114
Env. Pillar				-.152
Gov. Pillar				-.012
Soc. Pillar				-.214
Firm-Specifics				
Asset Turnover	.812	.211	.991	.917
C&CE	.644	.622	.565	.529
Debt ratio	-.258	-.263*	-.294	-.281
Asset ratio	.359*	.338*	.349*	.365*
PS ratio	-1.986**	-2.024**	1.815*	1.778*
ROA	2.457***	2.356***	2.349***	2.365***
Sales Growth	.009	.015	.011	.008
Size	1.063***	1.064***	1.096***	1.098***
Volume	.012***	.012***	.012***	.012***
Industry-effects	*Yes*	*Yes*	*Yes*	*Yes*
Country-Specifics				
AIC	1.283***	1.420***	1.359***	1.399***
CPI	.172	.212	.151	.140
Distance	.023***	.024***	.023***	.023***
Political Stability	29.562**	29.623**	31.338**	31.451**
Oil Price	-.004**	-.005**	-.004**	-.004**
Universals				
Market Volatility	-.109***	-.109***	-.109***	-.109***
Commodity Index	-.052***	-.052***	-.052***	-.052***
Cons	136.034	130.853	119.103	126.653
N	9889	9889	9889	9889
Prob > Chi2	.000	.000	.000	.000

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Table 4. Random effects regressions, short-term quartiles

	(5)	(6)	(7)	(8)
Variable of Interest				
Bloomberg q4	-7.220			
Bloomberg q3	-4.240			
Bloomberg q2	-4.139			
Eikon q4		-24.709**		
Eikon q3		-12.768		
Eikon q2		-11.254		
Combined q4			-32.567**	
Combined q3			-21.391**	
Combined q2			-18.936**	
Controversies q4			*(Omitted)*	*(Omitted)*
Controversies q3			*(Omitted)*	*(Omitted)*
Controversies q2			26.589**	11.989
Env. Pillar q4				.196
Env. Pillar q3				-7.810
Env. Pillar q2				-5.324
Gov. Pillar q4				-4.654
Gov. Pillar q3				-6.094
Gov. Pillar q2				-10.336
Soc. Pillar q4				-15.310**
Soc. Pillar q3				-1.078
Soc. Pillar q2				-9.809
Firm-Specifics				
Asset Turnover	.766	.710	1.475	1.001
C&CE	.612	.560	.569	.538
Debt ratio	-.323	-.277	-.324	-.328
Asset ratio	.356*	.374**	.352*	.328*
PS ratio	-2.290**	-2.044**	-1.734*	-1.707
ROA	2.479***	2.334***	2.402***	2.414***
Sales Growth	.016	.014	.042	.021
Size	1.022***	1.059***	1.084***	1.084***
Volume	.013***	.012***	.012***	.012***
Industry-effects	*Yes*	*Yes*	*Yes*	*Yes*
Country-Specifics				
AIC	1.165**	1.426***	1.367***	1.417***
CPI	.168	.231	.156	.233
Distance	.020**	.024***	.025***	.023***
Political Stability	30.431**	28.940**	31.099**	28.492**
Oil Price	-.004***	-.004***	-.004***	-.004***
Universals				
Market Volatility	-.109***	-.109***	-.109***	-.109***
Commodity Index	-.052***	-.052***	-.052***	-.052***
cons	137.367	105.491	103.703	97.962
N	9889	9889	9889	9889
Prob > Chi2	.000	.000	.000	.000

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Table 5. Random effects regressions, long-term

	(1)	(2)	(3)	(4)
Variable of Interest				
Bloomberg Score	-.413*			
Eikon Score		-.376*		
Combined Score			-.409	
Controversies Score			.216	.070
Env. Pillar				-.123
Gov. Pillar				-.067
Soc. Pillar				-.217
Firm-Specifics				
Asset Turnover	5.699	4.894	5.657	5.420
C&CE	.693	.678	.647	.610
Debt ratio	-.271	-.270	-.292	-.283
Asset ratio	.357*	.342**	.344**	.358**
PS ratio	-2.002**	-1.975**	-1.878*	-1.862*
ROA	2.049***	1.944***	1.950***	1.948***
Sales Growth	.045	.023	.022	.019
Size	1.012***	1.022***	1.034***	1.032***
Volume	.013***	.013***	.013***	.013***
Industry-effects	*Yes*	*Yes*	*Yes*	*Yes*
Country-Specifics				
AIC	1.127**	1.270**	1.214**	1.258**
CPI	.184	.226	.179	.159
Distance	.021***	.022***	.022***	.021***
Political Stability	25.519**	25.606**	26.746**	27.290**
Oil Price	-.004***	-.004***	-.004***	-.004***
Universals				
Market Volatility	-.007	-.007	-.007	-.007
Commodity Index	-.035***	-.035***	-.035***	-.035***
cons	123.359	121.778	108.572	119.497
N	112,926	112,926	112,926	112,926
Prob > Chi2	.000	.000	.000	.000

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Table 6. Random effects regressions, long-term quartiles

	(1)	(2)	(3)	(4)
Variable of Interest				
Bloomberg q4	-7.563			
Bloomberg q3	3.782			
Bloomberg q2	3.871			
Eikon q4		-19.907**		
Eikon q3		-10.124		
Eikon q2		-7.719		
Combined q4			-23.983**	
Combined q3			-22.413**	
Combined q2			-19.329**	
Controversies q4			*(Omitted)*	*(Omitted)*
Controversies q3			*(Omitted)*	*(Omitted)*
Controversies q2			24.018**	9.181
Env. Pillar q4				2.736
Env. Pillar q3				-3.812
Env. Pillar q2				-5.766
Gov. Pillar q4				-9.549
Gov. Pillar q3				-6.582
Gov. Pillar q2				-7.593
Soc. Pillar q4				-12.709**
Soc. Pillar q3				-2.863
Soc. Pillar q2				-9.053
Firm-Specifics				
Asset Turnover	6.264	5.782	6.297	6.305
C&CE	.656	.620	.654	.639
Debt ratio	-.321	-.288	-.320	-.317
Asset ratio	.363**	.382**	.348**	.328*
PS ratio	-2.230**	-1.982**	-1.761*	-1.687*
ROA	2.081***	1.970***	2.005***	2.025***
Sales Growth	.024	.025	.011	.010
Size	.979***	1.027***	1.026***	1.032***
Volume	.013***	.012***	.013***	.012***
Industry-effects	*Yes*	*Yes*	*Yes*	*Yes*
Country-Specifics				
AIC	1.021**	1.240**	1.219**	1.284**
CPI	.182	.244	.182	.254
Distance	.018**	.022***	.023***	.022***
Political Stability	26.500**	24.821**	26.714**	24.575*
Oil Price	-.004***	-.004***	-.004***	-.004***
Universals				
Market Volatility	.007	.007	.007	.007
Commodity Index	-.035***	-.035***	-.035***	-.035***
cons	127.723	97.752	93.890	89.776
N	112926	112926	112926	112926
Prob > Chi2	.000	.000	.000	.000

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Appendices

Appendix A. Five ways ESG links to cash flow

	Strong ESG proposition (examples)	**Weak ESG proposition (examples)**
Top-line Growth	Attract B2B and B2C customers with more sustainable products. Achieve better access to resources through stronger community and government relations.	Lose customers through poor sustainability practices (e.g., human rights, supply chain) or a perception of unsustainable/unsafe products. Lose access to resources (including from operational shutdowns) as a result of poor community and labor relations.
Cost reductions	Lower energy consumption. Reduce water intake.	Generate unnecessary waste and pay correspondingly higher waste-disposal costs. Expend more in packaging costs.
Regulatory and legal interventions	Achieve greater strategic freedom through deregulation. Earn subsidies and government support.	Suffer restrictions on advertising and point of sale. Incur fines, penalties, and enforcement actions.
Productivity uplift	Boost employee motivation. Attract talent through greater social credibility.	Deal with "social stigma," which restricts talent pool. Lose talent as a result of weak purpose.
Investment and asset optimization	Enhance investment returns by better allocating capital for the long term (e.g., more sustainable plant and equipment). Avoid investments that may not pay off because of longer-term environmental issues.	Suffer stranded assets as a result of premature write-downs. Fall behind competitors that have invested to be less "energy hungry".

Note. Cited from "ESG Framework", by McKinsey & Company, 2019

Appendix B. Pairwise Correlations, Firm-specific Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Price	1.000														
(2) Eikon Score	-0.101*	1.000													
(3) Bloomberg Score	-0.081*	0.749*	1.000												
(4) Assets Ratio	-0.061*	-0.011	-0.054*	1.000											
(5) Asset Turnover	0.092*	-0.042*	-0.069*	0.140*	1.000										
(6) C&CE	-0.044*	0.169*	0.070*	-0.231*	-0.248*	1.000									
(7) Debt Ratio	-0.082*	0.151*	0.215*	0.143*	-0.180*	0.062*	1.000								
(8) Size	0.253*	0.215*	0.207*	0.073*	-0.049*	0.103*	-0.066*	1.000							
(9) PS ratio	0.109*	-0.392*	-0.382*	-0.024*	-0.215*	-0.125*	-0.100*	0.126*	1.000						
(10) ROA	0.210*	-0.261*	-0.181*	0.045*	0.308*	-0.174*	-0.250*	0.189*	0.372*	1.000					
(11) Sales Growth	-0.008	-0.059*	-0.059*	0.078*	0.045*	-0.047*	-0.123*	-0.011	0.046*	0.020*	1.000				
(12) Total Assets	-0.048*	0.216*	0.118*	-0.256*	-0.291*	0.935*	0.042*	0.155*	-0.156*	-0.208*	-0.030*	1.000			
(13) Total Liabilities	-0.052*	0.202*	0.102*	-0.258*	-0.285*	0.940*	0.039*	0.129*	-0.148*	-0.206*	-0.029*	0.999*	1.000		
(14) Volume	-0.081*	0.209*	0.203*	-0.098*	-0.160*	0.194*	0.117*	0.041*	-0.117*	-0.093*	-0.030*	0.311*	0.303*	1.000	
(15) Industry Effects	-0.063*	-0.092*	-0.128*	-0.457*	-0.537*	0.250*	0.067*	-0.113*	0.191*	-0.121*	0.012	0.306*	0.308*	0.113*	1.000

**** p<0.01, ** p<0.05, * p<0.1*

Appendix C. Pairwise Correlations, Country-specific & Universal Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Price	1.000									
(2) Eikon Score	-0.101*	1.000								
(3) Bloomberg Score	-0.081*	0.749*	1.000							
(4) AIC	0.033*	-0.001	-0.170*	1.000						
(5) CPI	-0.075*	-0.207*	-0.190*	0.353*	1.000					
(6) Distance	-0.045*	0.189*	0.254*	-0.357*	-0.225*	1.000				
(7) Political Stability	-0.040*	-0.301*	-0.201*	-0.088*	0.447*	-0.240*	1.000			
(8) Oil Price	-0.104*	-0.239*	-0.238*	0.208*	0.300*	-0.415*	0.406*	1.000		
(9) Market Volatility	-0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.273*	1.000	
(10) Commodity Index	-0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.323*	0.469*	1.000

**** p<0.01, ** p<0.05, * p<0.1*

Appendix D. Descriptive Statistics Event Study, based on Eikon Score

	Group	N	Mean Return	Std. Error	Minimum	Maximum
Event Window						
(-1:1)	Top 25%	79	-.006	.005	-.107	.095
	Bottom 25%	80	-.005	.006	-.378	.104
	Top 10%	31	-.007	.007	-.065	.088
	Bottom 10%	32	.007	.004	-.027	.089
(-3:3)	Top 25%	79	-.038	.010	-.263	.271
	Bottom 25%	80	.007	.010	-.449	.296
	Top 10%	31	-.042	.015	-.188	.271
	Bottom 10%	32	.025	.010	-.089	.156
(-5:5)	Top 25%	79	-.046	.010	-.292	.260
	Bottom 25%	80	-.025	.012	-.594	.309
	Top 10%	31	-.043	.015	-.193	.260
	Bottom 10%	32	-.006	.010	-.119	.097

Appendix E. Descriptive Statistics Event Study, based on Bloomberg Score

	Group	N	Mean Return	Std. Error	Minimum	Maximum
Event Window						
(-1:1)	Top 25%	79	.009	.006	-.158	.183
	Bottom 25%	80	-.006	.006	-.378	.117
	Top 10%	31	.006	.007	-.107	.106
	Bottom 10%	32	.006	.004	-.045	.060
(-3:3)	Top 25%	79	-.018	.012	-.298	.271
	Bottom 25%	80	.011	.012	-.449	.604
	Top 10%	31	-.023	.015	-.249	.194
	Bottom 10%	32	.031	.010	-.089	.156
(-5:5)	Top 25%	79	-.026	.014	-.376	.260
	Bottom 25%	80	-.025	.014	-.594	.544
	Top 10%	31	-.025	.015	-.316	.249
	Bottom 10%	32	-.021	.010	-.221	.096

Appendix F. Welch's t-test based on Eikon Score

	Comparison	Mean Return Diff.	t-value	p-value
Event Window				
(-1:1)	Top 25% - Bottom 25%	-.000	-.056	.955
	Top 10% - Bottom 10%	-.014	-1.808	.077*
(-3:3)	Top 25% Bottom 25%	-.045	-3.198	.002***
	Top 10% Bottom 10%	-.067	-3.820	.000***
(-5:5)	Top 25% Bottom 25%	-.021	-1.354	.178
	Top 10% Bottom 10%	-.037	-2.003	.050**

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Appendix G. Welch's t-test based on Bloomberg Score

	Comparison	Mean Return Diff.	t-value	p-value
Event Window				
(-1:1)	Top 25% - Bottom 25%	.015	1.768	.079*
	Top 10% - Bottom 10%	.068	.017	.947
(-3:3)	Top 25% Bottom 25%	-.028	-1.658	.099*
	Top 10% Bottom 10%	-.054	-2.788	.008***
(-5:5)	Top 25% Bottom 25%	-.000	-.025	.980
	Top 10% Bottom 10%	-.004	-.167	.868

*Note. * Represents p≤0,1, ** represents p≤0.5, *** represents p≤0.01.*

Appendix H. Descriptive Statistics Invariant Variables Random Effects Models

Variable	N	Mean	Std. dev.	Minimum	Maximum
Eikon Score	319	74.484	13.076	24.75	95.45
Bloomberg Score	319	54.835	10.888	16.326	83.613
Asset Ratio	319	.236	.212	.000	.737
Asset Turnover	319	.560	.390	.022	1.365
C&CE	319	5.457	12.022	.047	50.757
Debt Ratio	319	26.852	13.978	.451	63.802
Market Cap	319	22.839	23.407	3.725	88.918
PS Ratio	319	4.099	4.309	.398	15.135
ROA	319	5.833	5.579	-1.211	20.575
Sales Growth	319	-1.884	15.715	-29.450	39.438
Volume	319	.822	1.449	.014	6.001
AIC	319	109.602	10.680	84	120
CPI	319	115.988	13.637	90	144
Distance	319	2895.085	647.541	2222	4450
Political Stability	319	7.626	.414	7.08	8.16
Oil Price	319	899.011	130.690	749.23	1248.94

Appendix I. Descriptive Statistics Time-variant Variables Random Effects Models

	Variable	N	Mean	Std. dev.	Minimum	Maximum
Period						
Short-term	Price	9,889	62.463	68.673	5.046	276.27
	Commodity Index	9,889	293.482	19.263	272.081	353.952
	Market Volatility	9,889	30.976	7.184	21.41	49.64
Long-term	Price	112,926	58.619	66.373	4.9	263.7
	Commodity Index	112,926	325.993	27.549	280.870	370.540
	Market Volatility	112,926	24.885	5.712	16.9	41.2