

ERASMUS UNIVERSITY ROTTERDAM

ERASMUS SCHOOL OF ECONOMICS

Master Economics & Business

Specialization Financial Economics



**Unveiling the Value of Corporate Social Responsibility through
Short Selling Data: Evidence from the S&P 500**

Author: W.E. Koch
Student number: 477620
Thesis supervisor: Dr. J.J.G. Lemmen
Second reader: Dr. R. Wang
Date: October 24, 2023

PREFACE AND ACKNOWLEDGEMENTS

This thesis represents my final work for the Master Economics and Business, with a specialization in Financial Economics. First and foremost, I would like to express my gratitude to my thesis supervisor, Dr. Jan Lemmen, for his insightful and constructive feedback. Furthermore, I would like to thank my family, friends, and girlfriend for their unconditional support, during both my academic journey as well as various aspects of my life. This thesis marks the end of my time at the Erasmus University in Rotterdam, a period that I will always cherish. Not only did I develop myself from an academic perspective, but most importantly, as a human being. Therefore, I am fully prepared to embrace the journey ahead with excitement and determination.

The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

ABSTRACT

In this paper, I explore the relationship between Corporate Social Responsibility (CSR) and short selling, with an additional focus on the COVID-19 Crisis and Russia-Ukraine War. Because of the high risk involved, short sellers are more informed and sophisticated compared to other investors, therefore providing an interesting context to test the relevance of CSR. The sample consists of S&P 500 companies over the period 2014-2022, resulting in 3,449 firm-year observations. I apply Thomson Reuters Environmental, Social, and Governance (ESG) Scores to measure CSR performance, while short selling is measured by scaled short interest (SSI), a metric indicating the number of stocks sold short relative to shares outstanding. First, using ordinary least squares (OLS) regressions, the relevance of CSR is established by its positive relationship with financial performance, as measured by return on assets (ROA) and Tobin's Q. Furthermore, I demonstrate a negative relationship between CSR and short selling, with the social pillar of ESG displaying the strongest effect. In addition, it becomes evident that CSR is negatively related to short selling during the lockdown period of the COVID-19 Crisis and the Russia-Ukraine War, despite increased short selling activity during these periods.

Keywords: Corporate Social Responsibility; ESG Score; Short Selling; COVID-19 Crisis; Russia-Ukraine War.

JEL Classification: E32; G32; M14.

TABLE OF CONTENTS

PREFACE AND ACKNOWLEDGEMENTS	ii
ABSTRACT.....	iii
TABLE OF CONTENTS.....	iv
LIST OF TABLES	vi
LIST OF ABBREVIATIONS	vii
CHAPTER 1: Introduction	1
CHAPTER 2: Literature Review.....	4
2.1 Corporate Social Responsibility (CSR).....	4
2.1.1 The Rise of CSR	4
2.1.2 CSR and Financial Performance	5
2.2 Short Selling	8
2.2.1 Defining Short Selling.....	8
2.2.2 CSR and Short Selling.....	10
2.2.3 Short Selling Impact on Financial Markets	11
2.2.4 Short Selling Impact on Firms	13
2.3 Global Disruptions	13
2.3.1 CSR and Global Disruptions.....	13
2.3.2 Short Selling and Global Disruptions.....	14
CHAPTER 3: Hypothesis Development.....	16
CHAPTER 4: Data	19
4.1 Sample Construction	19
4.2 Data Construction.....	19
4.3 Descriptive Statistics	21
CHAPTER 5: Methodology.....	23
5.1 Panel Regressions.....	23
5.2 Additional Tests	27
5.2.1 Multicollinearity.....	27
5.2.2 Non-linearity	28
5.2.3 Heteroskedasticity and Autocorrelation	28
5.2.4 Omitted Variable Bias	29
CHAPTER 6: Results	30
6.1 Regression Results	30
6.1.1 CSR and Financial Performance	30
6.1.2 CSR and Short Selling.....	30
6.1.3 CSR and Short Selling During Global Disruptions.....	33

6.2 Robustness Checks.....	33
6.2.1 Alternative ESG Score Provider	33
6.2.2 COVID-19 Crisis Period Split	37
6.2.3 Simultaneity	37
6.2.4 Detrended Scaled Short Interest (SSI).....	39
CHAPTER 7: Conclusion and Discussion.....	41
REFERENCES.....	45
APPENDIX A.....	53
APPENDIX B	56

LIST OF TABLES

Table 1: Literature overview CSR and short selling	12
Table 2: Sample overview	20
Table 3: Descriptive statistics total sample	22
Table 4: Regression results CSR and financial performance	31
Table 5: Regression results CSR and short selling	32
Table 6: Regression results CSR and short selling during global disruptions (ESG Score)	34
Table 7: Regression results CSR and short selling during global disruptions (ESG Pillar Score)	35
Table 8: Regression results CSR and short selling (Bloomberg ESG Score)	36
Table 9: Regression results CSR and short selling (COVID-19 Crisis period split)	38
Table 10: Overview of hypotheses, corresponding p -values, and statistical conclusions	42
Table 11: Weight allocation ESG Score	53
Table 12: Descriptive statistics Non-Crisis Period	53
Table 13: Descriptive statistics COVID-19 Crisis	54
Table 14: Descriptive statistics Russia-Ukraine War	55
Table 15: Pearson correlation matrix	56
Table 16: Variance inflation factors CSR and financial performance	58
Table 17: Variance inflation factors CSR and short selling	58
Table 18: Granger causality test results	58
Table 19: Regression results detrended SSI	59

LIST OF ABBREVIATIONS

COVID-19	Coronavirus disease 2019
CSR	Corporate Social Responsibility
ESG	Environmental, social, governance
FINRA	Financial Industry Regulatory Authority
GPR	Geopolitical risk
IV	Instrumental variable
LR	Likelihood ratio
MST	Meta significance testing
MTBV	Market-to-book value
OLS	Ordinary Least Squares
OVB	Omitted variable bias
ROA	Return on assets
ROS	Return on sales
SEC	Securities and Exchange Commission
SIC	Standard Industrial Classification
S&P 500	Standard and Poor's 500
SSI	Scaled short interest
VIF	Variance inflation factor
WHO	World Health Organization
WRDS	Wharton Research Data Services

CHAPTER 1: Introduction

Corporate Social Responsibility (CSR) has risen to the top of the priority list in corporate boardrooms. As a result, companies are shifting from a purely financial orientation to a broader perspective of their role in society. This shift is driven by factors such as growing customer demand for sustainable products (Gauthier, 2005) or an increasing number of investors who value a company's social responsibilities alongside its financial performance (Barnett & Salomon, 2006). The rise of CSR is illustrated by concrete figures, for example the \$20 billion spending on CSR activities by Fortune Global 500 firms in 2018, averaging \$40 million per company (Meier & Cassar, 2018). Furthermore, a report by the Governance & Accountability Institute revealed that 86% of S&P 500 companies published CSR reports in the same year, a substantial increase from the 20% reported in 2011 (Governance & Accountability Institute, 2019).

As outlined by Blowfield (2005), CSR is a framework for businesses that embodies the responsibility for the environment, stakeholders, and society. This term is often confused with ESG. While there is overlap between these acronyms within the broader framework of sustainable business practices, it is essential to understand the differences. CSR is mainly used internally by companies, whereas ESG Scores have emerged to quantify the performance of businesses on CSR (Cini & Ricci, 2018). Hence, ESG is especially favored by investors seeking well-informed decisions that consider a company's CSR efforts.

What drives companies to adopt CSR? As Bank of America CEO Brian Moynihan mentioned: "sustainability is not just about doing good, it is about good business. Companies that prioritize CSR will be better equipped to navigate the challenges of the future" (CNBC, 2021). This statement indicates the strategic importance of CSR in today's corporate landscape. His view is supported by academic research. Namely, in an era where ESG issues are under scrutiny, companies are expected to manage and address their negative externalities, particularly within the societies they operate in. This approach is beyond business ethics, as it is about ensuring the company's survival in the long-term (Pérez et al., 2022).

In academic literature, numerous studies explore the impact of CSR on firms, particularly in areas such as brand image, competitive advantage, and overall firm performance. Considering firm performance, a growing body of evidence suggests a strong positive link between CSR and financial performance. According to Robin Nuttal, leader of the ESG practice at McKinsey & Company, 70% of 2,000 academic studies on ESG and financial performance identified a positive relationship (Nuttal, 2020). While this may suggest that investors are increasingly drawn to companies that embrace CSR, as they recognize its potential for enhancing financial returns while contributing to 'a better world', the concept is not without critics. Some argue that a firm's only responsibility is to generate profit for its shareholders while complying with the rules of society, echoing the view of Milton Friedman

(Friedman, 1962). Others perceive CSR as a tool for branding rather than a fundamental aspect of a company's strategy.

These conflicting perspectives on CSR provide an interesting foundation for further research, for instance the implications for stock trading. On the one hand, investors may be inclined to invest in stocks of companies that actively engage in CSR, due to the positive correlation with financial performance. Most existing empirical evidence focuses on this part, namely the long investors' view of CSR (B. Cheng et al., 2014; El Ghouli et al., 2011). On the other hand, the short investors' sentiment regarding CSR remains relatively unexplored. These investors profit from declining share prices and are often considered to be more informed and sophisticated compared to regular investors, because of the high risks and costs involved. Moreover, they only engage in trades when the anticipated stock price decline is enough to compensate for the costs and risks involved (Boehmer et al., 2008; Diamond & Verrecchia, 1987). Empirical evidence revealed that short sellers employ a diverse set of methodologies to identify both financial and non-financial information to justify their trades, such as examining fundamental ratios (Boehmer & Wu, 2013) or processing negative news (Engelberg et al., 2012).

On the one hand, it is possible that firms with lower CSR performance experience more short selling due to a higher cost of equity (Ng & Rezaee, 2015) or inherent business risks (Cai et al., 2016). On the other hand, if CSR is indeed positively related to financial performance, short sellers are perhaps less inclined to short stocks performing well on CSR. However, if short sellers tend to follow Friedman's philosophy on CSR or believe it is applied for brand image, firms performing well on this topic might experience more short selling. Apart from these suggestive implications, it is generally accepted that short sellers are informed investors that utilize both financial and non-financial information to substantiate their trades. As a result, these investors may be more inclined to factor CSR performance into their analyses when making short sell decisions. Hence, this research aims to determine whether a company's CSR performance influences short sellers' investment decisions. The following research question is formulated:

What is the effect of CSR on the resilience of firms to short selling?

This topic is particularly relevant given the prominent place of CSR in businesses nowadays and the increased attention on short selling since its surge during the COVID-19 Crisis. Also, the limited academic literature on its relationship presents mixed findings. For instance, Jain et al. (2016) found a negative relationship, suggesting that CSR performance reduces short selling. The authors ascribed this relationship to the positive impact of CSR on firm performance. In contrast, Gao et al. (2021) concluded a positive relationship. They attributed this positive relationship to the tendency of firms to employ CSR as a means of earnings management, where it functions as camouflage for bad firm performance. This study aims to expand the current knowledge on the relationship between CSR

and short selling in several ways. First, utilizing up-to-date data, which is relevant given the growing importance and popularity of CSR over the years (Kell, 2018). Second, employing ESG scores from a different agency compared to previous research, which is important considering the significant differences in the methodologies to formulate these scores (Berg et al., 2022). Third, including the individual pillar scores of ESG into the analyses, which allows for a more comprehensive understanding of each component's influence on short selling. Fourth, diving deeper into the relationship between CSR and short selling during the COVID-19 Crisis and Russia-Ukraine War. Both events offer a unique setting to explore whether CSR actually helps firms to navigate the challenges they face.

First, in an attempt to determine whether CSR adds value to a firm, this paper finds a positive relationship between CSR performance and financial performance, as measured by return on assets (ROA) and Tobin's Q. Next, it is expected that CSR performance, as measured by ESG Scores, is negatively related to short selling. This expectation is validated, as evidence reveals a significant negative relationship between the two. In addition, separate regressions are run using the individual pillar scores of ESG, with the aim to disentangle the total effect. The results of these regressions highlight that the social pillar is most significantly related to short selling, followed by the environmental pillar. When focusing on the COVID-19 Crisis and Russia-Ukraine War, it becomes clear that despite rising short selling activities during these periods, CSR performance decreased short selling during the lockdown period of COVID-19 and the Russia-Ukraine War. A number of robustness tests are included that substantiate the findings that short sellers incorporate CSR into their decision-making process. This emphasizes the positive effects of CSR, as besides increased financial performance, it relates to less short selling.

The remainder of this paper is structured as follows: Chapter 2 provides an overview of the existing literature on the relevant topics. Chapter 3 formulates the hypotheses that will be tested. Chapter 4 describes the data sample and provides descriptive statistics. Chapter 5 outlines the methodology. Chapter 6 presents the results and the robustness checks. Chapter 7 provides the conclusion, discussion, and limitations of this study, as well as recommendations for future research.

CHAPTER 2: Literature Review

2.1 Corporate Social Responsibility (CSR)

2.1.1 The Rise of CSR

Despite the significant expenditure on CSR activities and the increasing number of firms reporting on the topic in recent years, the concept itself is not new. Most researchers attribute Howard Bowen's *Social Responsibilities of the Businessman* (1953) as the seminal work that initiated the concept of CSR (Carroll, 1979; Wartick & Cochran, 1985). He argued that businesses are required to consider the social consequences and responsibilities associated with their actions, given their influence and broad impact of decisions. Nevertheless, it was not until the 1960s that CSR gained popularity among the broader public, fueled by social movements on topics such as civil rights, consumer rights, and environmental causes (Carroll & Shabana, 2010). Alongside the rise of CSR, the number of critics against the practice also increased. For example, Theodore Levitt in his essay *The Dangers of Social Responsibility*, argued that profit maximization should be the only objective of companies, with governments taking care of societal issues (Levitt, 1958). In 1970, the most prominent opponent of CSR, Milton Friedman, published a paper highlighting the shareholder theory, which posits that the only social responsibility of a firm is to increase profits for shareholders (Friedman, 1970).

While Bowen and Friedman held contrasting viewpoints in their theories, the 'self-interest model' by Wallich and McGowan (1970) somewhat bridged this gap. Alongside the increased diversification of shareholders in the 1970s came the growing importance of a stable environment for multiple companies, instead of just a view. Therefore, although agreeing with Friedman's theory on maximizing profits for shareholders, this should not come at the cost of a stable business environment, given its importance for long-term benefits. A decade later, a new theoretical model was presented by CSR pioneer Archie Carroll (1979), which categorized the social responsibilities of firms, including economic, legal, ethical, and discretionary. As of today, Carroll's model is still widely applied in business practices. Nonetheless, several years later, it was Freeman's (1984) book *Strategic Management: A Stakeholder Approach* which truly marked the beginning of another school of thought regarding firms' responsibilities, namely the stakeholder theory. This theory posits that firms must consider the interests of all stakeholders involved in making decisions, such as employees, customers, and suppliers.

Despite the debate on whether the shareholder or stakeholder theory prevails, the early 2000s marked the corporate adoption of CSR¹. Companies like Wells Fargo, Coca-Cola and Walt Disney incorporated the concept into their business processes (Kapoor, 2021). This shift was influenced by

¹ Following the approach by Kurucz et al. (2008), stakeholder theory is considered a subset of CSR.

several factors including: (1) the numerous corporate scandals involving social, ethical, and environmental misconduct (such as Enron, WorldCom, increased pollution) which took place around the turn of the century (Arvidsson, 2010); (2) the extensive scholarly focus on the concept of CSR, increasing the public interest (Smith, 2000); (3) the inception of the United Nations Global Compact in 2000, a global corporate sustainability initiative (Latapí Agudelo et al., 2019); and (4) the development of CSR guidelines for companies by the Global Reporting Initiative, improving transparency and accountability of CSR (Hedberg & Von Malmborg, 2003).

Over the subsequent two decades, the concept and implementation of CSR underwent continuous development and expansion (Carroll, 2021). Examples that contributed to this evolution, were globalization, adoption in developing countries and the announcement by the Business Roundtable, a non-profit organization consisting of CEOs of leading U.S. companies, to shift from a shareholder to stakeholder focus (Business Roundtable, 2019). Moreover, as Carroll (2021) projected, COVID-19 may have catalyzed the development and adoption of CSR, as the pandemic highlighted the important role of businesses in society.

2.1.2 CSR and Financial Performance

Considering that investors, both long and short, are interested in the financial performance of firms, its relationship with CSR is relevant for this study. As there is supporting evidence in both directions, the relationship is often named the 'virtuous circle' (Nelling & Webb, 2009). On the one hand, research suggested that financial performance leads to increased spending on CSR, which is argued by the slack resources theory (Waddock & Graves, 1997). This theory posits that firms with slack resources, for instance spare cash or personnel, have greater freedom to invest in social responsibility domains. Similarly, firms experiencing financial difficulties, such as meeting payroll or repaying debt, tend to prioritize short-term objectives, which often results in the postponement of CSR investments. In addition, this is also found by McGuire et al. (1988), who revealed that a firm's past financial performance is more related to CSR than the influence of CSR on future financial performance.

On the other hand, the opposite direction suggests that CSR is beneficial for a firm's financial performance. For instance, in line with the stakeholder theory, it is suggested that the discontentment by any stakeholder group can influence the financial benefits of a company and even put a risk on the company's future (Clarkson, 1995). Clarkson argued that a firm must equally distribute increased wealth to ensure that no stakeholder group is being treated unfairly. If a stakeholder group is treated unfairly, it will look for other opportunities and withdraw from the firm's stakeholder system. This is what puts a risk on the company's future. To illustrate, if employees are dissatisfied with the company, perhaps when they do not benefit from the company's growing wealth, they may decide to leave and search for opportunities at other companies. If these employees are the key elements of the company's success, it may threaten its survival. In addition, research has shown that a well-established CSR

strategy will serve as a basis for competitive advantage (Hillman & Keim, 2001). This is attributed to the increased competition that firms face. Therefore, they must seek alternative ways to gain distinctive organizational advantage in order to keep attracting capital from investors. Hence, well-established relationships with stakeholders such as customers, employees, and suppliers serve as these distinctive advantages and are considered intangible valuable assets for a firm. Porter and Kramer (2006) also highlighted the increased competitive advantage from CSR. First, they argued that firms must choose a CSR strategy that is appropriate to their business instead of implementing CSR in a generic way, which is the common approach. As a result, CSR can become an opportunity, lead to innovation and consequently, competitive advantage. The authors provided an interesting example, namely the reaction from Toyota on the growing issues relating to car emissions. In 1997, they decided to create a hybrid car, the Toyota Prius, which was the first of their many pioneering cars that increased both their competitive advantage and environmental impact. In fact, the Prius became car of the year in 2004, and its technology was licensed by Toyota to other big car manufacturers. Lin et al. (2019) ascribed the positive effect of CSR on firm performance to brand building. They compared CSR to an insurance policy for brands, as a strong brand image reduces the risk and potential damage when the brand is evaluated in the future. While this may not increase profitability directly, it positively affects financial performance in the long-term. Another argument supporting the positive effect of CSR, relates to the lower cost of equity capital for firms with strong corporate governance mechanisms (C.A. Cheng et al., 2006). The motive behind this argument is that strong corporate governance mechanisms reduce the perceived risk of investing, therefore investors will require a lower return on their equity considering the risk-return trade-off. Furthermore, both consumers and stakeholders put increased value on the social responsibilities of firms in Western societies, driven by societal changes such as demands for sustainability or increased transparency (Van Beurden & Gössling, 2008). Consequently, this mitigates potential risks and associated costs, for example in the form of legal penalties, and creates upside potential such as customer retention.

The view that CSR is likely to pay off is supported in the first meta-analysis of empirical evidence on this topic by Orlitzky et al. (2003), who based their conclusions on 52 studies ranging from 1990 to 1997. Another interesting finding in their study, is that the relationship between CSR and financial performance is positive and significant for accounting-based measures of financial performance, while a weaker and not significant relationship was found with market-based measures. This divergence is ascribed to the nature of both metrics. Accounting-based measures more directly capture the results from increased CSR performance, while market-based indicators are more volatile and subject to greater noise, as it is the result of investor responses and overall market reactions. Besides, the authors also mention the virtuous cycle, namely that CSR and financial performance mutually affect each other. Subsequent meta-analyses found similar positive results for the CSR-financial performance relationship. For example, Allouche and Laroche (2005) increased the number of studies to 83 and included findings on other countries than the U.S. Moreover, meta-significance

testing (MST) was used in their study, which was not addressed before. This is a statistical method to detect possible selection and publication biases in the literature, with the aim to detect a true effect across the empirical findings. Similar to the findings by Orlitzky et al. (2003), it is concluded that CSR is less related to market-based metrics of financial performance. Van Beurden and Gössling (2008) and Margolis et al. (2009) also found positive results in their meta-analyses.

Besides these studies suggesting a positive relationship between CSR and financial performance, evidence exists that reveals a negative relationship. This perception aligns with the traditional perspective as introduced by Friedman (1970), which posits that CSR is expensive and has a negative impact on profitability and therefore firm performance. For instance, the meta-analyses by Orlitzky et al. (2003), Allouche and Laroche (2005), and Margolis et al. (2009) reported several studies that found a negative effect. Even so, these findings were attributed to methodological limitations such as sample sizes, measurement errors, or omitted variable bias. Besides these arguments, Allouche and Laroche (2005) did conclude that U.S. studies more often result in negative relationships compared to Canada and the U.K, which was ascribed to differences in institutional and regulatory contexts. Another explanation for a negative relationship, is that investors may accept a lower rate of return for stocks when CSR performance is high (Kim & Venkatachalam, 2011). For instance, investors may view CSR as beneficial for long-term performance, therefore willing to accept a lower short-term return. Furthermore, CSR is possibly associated with a risk-adjusted perspective, as it may decrease perceived risk and therefore a lower required return.

Since ESG Scores have emerged as the measurement tool for CSR (Cini & Ricci, 2018), several studies have examined the effect of each individual pillar on firm performance. The pillars contain specific components, a selection of which will be highlighted next. For example, the environmental pillar (E) encompasses resource use, emissions, and innovation, whereas the social pillar (S) covers the workforce, human rights, and product responsibility (Refinitiv, 2022). The governance pillar (G) includes overall CSR strategy and transparency, as well as shareholder rights and management structure. Friede et al. (2015) concluded that all three pillars of ESG have a positive relation to financial performance. However, the E and G revealed a more positive relationship compared to the S. Similarly, a report by sustainable asset manager ACTIAM (2020) highlighted that the initial attention and political efforts for companies were aimed at establishing a green economy, in other words the E. Then, due to large controversies in especially banking and the financial sector, increased attention was placed on the G. Now, as the authors expected, the focus will shift to the social pillar, S. This shift is supported by an article of Goldman Sachs Asset Management (2020), which emphasized that COVID-19 has heightened the importance of the S in ESG. Another explanation why the social pillar lagged behind, is attributed to difficulties in its evaluation for investors, as there is limited agreement on the appropriate standards (Boffo & Patalano, 2020).

Despite supportive academic research on both positive and negative effects, which includes several meta-analyses, evidence exists that suggests the absence of a relationship between CSR and

financial performance. One of which is the study by Aupperle et al. (1985), who applied a forced-choice instrument to measure social performance. This measurement technique may be the cause for the conflicting results, as the respondents (CEOs) were forced to choose one of the options for each question in the survey. Therefore, biases were limited compared to open-ended responses, which provides a better view on the importance of social responsibility. Another study suggesting no relationship, is conducted by Alexander and Bucholz (1978), who measured financial performance using stock prices. One of the explanations provided by the authors, is that in an efficient stock market, information is directly incorporated into stock prices, which includes any positive or negative CSR news. Lastly, McWilliams and Siegel (2000) conducted a regression analysis using an index of high CSR firms, namely the Domini 400 Social Index, and also found no significant link between CSR and financial performance.

Existing literature provides several explanations for the mixed results regarding the relationship between CSR and financial performance. The explanations include amongst others: (1) the inconclusive definition of CSR and financial performance (De Bakker et al., 2005); (2) inadequate measurement of financial performance (Davidson & Worrell, 1990); (3) the lack of a comprehensive systematic measure of CSR (Ruf et al., 2001); and (4) limitations in sample size and the use of outdated data (Van Beurden & Gössling, 2008).

2.2 Short Selling

2.2.1 Defining Short Selling

Short selling is an important concept in financial markets. For the understanding of this study, it is important to understand the concept and its underlying mechanisms. The Securities and Exchange Commission (SEC) defines short selling as the sale of a security the seller does not own at the time of entering into an agreement, with the intention to buy it back at a later point in time (SEC, 2022). A short seller usually enters an agreement with a brokerage house or institutional investor, from which it borrows the stock and then sells it on the market. When the position is closed, generally by repurchasing the stock and returning it to the lender, the short seller makes a profit when the repurchase price of the stock is below the initial selling price (Kot, 2007). In other words, short sellers aim to profit from decreasing stock prices.

Engaging in a short position involves more risks compared to taking a long position. The potential profit is limited since stock prices cannot decrease below zero, whereas the potential loss is infinite. For instance, when taking a long position in a stock, the maximum downside is the price paid. In contrast, when shorting a stock, an investor may incur enormous losses when covering the position, as the stock price increase is unbound. Another risk is that the proceeds from the stock sale are held as collateral by the brokerage house or institutional investor until the position is closed, making them unavailable to the investor (Kot, 2007). Furthermore, the loan provided by the lender is typically paid

on demand, exposing short sellers to a so-called 'squeeze' risk (Dechow et al., 2001). This refers to a situation where short sellers have to close positions due to significant price rises, which adds further upward pressure to the stock price and intensifies the squeeze (SEC, 2022).

Considering the risky nature of short selling, investors engaging in this practice are assumed to be sophisticated and informed. This notion is supported by Diamond and Verrecchia (1987), who concluded that short sellers only engage in trades when the anticipated stock price decline is enough to compensate for both the costs and risk involved. Consequently, less-informed investors are driven out of the market, as they become uncertain about future price movements, thereby creating a market environment dominated by investors who are informed. Boehmer et al. (2008) took this one step further, as they described short sellers as extremely well-informed. This conclusion is based on the gross excess returns of short sellers discovered by the authors, suggesting that these investors possess (a source of) information that supports their trades. Other empirical evidence also suggests that short sellers are informed investors. For example, Christophe et al. (2004) discovered increased short selling activity around earnings announcements, while Desai et al. (2006) identified heightened short selling prior to earnings restatements, sometimes months before the correction had been made public. Nevertheless, the notion that short sellers are informed investors is challenged by Daske et al. (2005). Namely, they found no evidence that substantiates increased short sell transactions preceding stock price declines. This difference compared to other studies was ascribed to the large increase in short selling activity during the sample period, which decreased the information content.

Still, being informed entails more than only the ability to anticipate stock price declines. Therefore, it is important to understand how short sellers become informed and what their information sources are. One possible explanation is provided in the work by Engelberg et al. (2012), who analyzed short sales and public news events in the U.S. The conclusion that followed, was that short sellers become informed by their superior ability to process information revealed in public news, which is reflected in 45% of profitability from short selling around news events. In this case, being informed does not only mean anticipating price declines. Another explanation posits that short sellers analyze ratios of fundamentals and compare the outcomes with market values to determine whether a stock is overpriced or not (Dechow et al., 2001). The authors also concluded that short sellers have the ability to identify which firms have temporary low fundamentals, as these are not indicative for the long-term potential and may even anticipate a stock price increase. Additional to comparing financials with market values, Karpoff & Lou (2010) revealed that short sellers identify misrepresentation of financial statements through the analysis of earnings reports. Significant increases in short selling activities already enhanced nineteen months prior to the publication of the financial misconduct. This timespan also substantiates the conclusion by Desai et al. (2006) on the increase of short selling months prior to earnings restatements as described earlier.

Existing literature provides various motives for short selling, which can be classified into three hypotheses (Kot, 2007). Firstly, according to the trend hypothesis, stocks that experience a

short-term price decrease are shorted, whereas the positions are closed when the price starts increasing again. This theory relates to the short-term profitable momentum strategy documented by Jegadeesh and Titman (1993). Secondly, the overpricing hypothesis, which posits that investors with private information regarding a firm's financial performance, for example by examining certain financial ratios compared to market values, engage in short selling when the stock is overpriced. This hypothesis is in line with the findings of Dechow et al. (2001), who found a strong relationship between short sellers' trading strategies and fundamental ratios versus market prices. Thirdly, the arbitrage hypothesis suggests that investors engage in short sell transactions as a mean to arbitrage a price difference between a stock and certain convertible security into the stock, such as a call or put option (Dechow et al., 2001). Besides price differences, empirical evidence reveals significant increases in short selling activity on stocks involved in a merger (merger arbitrage), whereby investors buy the acquiring firm's stock and short the target firm's stock (Mitchell et al., 2004). Lastly, research has indicated that short sellers increase positions in more volatile markets, as this provides opportunities to profit from falling prices (Blau et al., 2009).

2.2.2 CSR and Short Selling

The relationship between CSR and short selling has generated divergent outcomes within the existing literature. On the one hand, it is argued that firms engaging in CSR are more financially stable in the long run. Consequently, this suggests that an investment strategy could involve entering a long position in a firm with high CSR performance, while shorting a firm with low CSR performance (Staub-Bisang, 2012). In other words, firms performing well on CSR are less shorted, whereas firms performing worse on CSR are shorted more. The study by Jain et al. (2016) provides evidence that short sellers take into account CSR performance and CSR disclosure when making investment decisions, as revealed by the negative relationship with short selling. Performance is proxied by the ESG Score from rating agency KLD, whereas disclosure is quantified by the Bloomberg ESG Disclosure Scores. Furthermore, empirical findings revealed that short sellers are less likely to short overpriced stocks with higher ESG scores (Zhang, 2021). This motive is attributed to short squeeze risk and reputation risk. The squeeze risk relates to the popularity of ESG nowadays. Namely, increased attention on this topic may cause a sudden upswing in stock prices, forcing short sellers to close their positions and potentially trigger a squeeze. Regarding reputation, firms with high ESG scores are often viewed positively by the public. Therefore, disclosing short positions in such firms may be detrimental for the reputation of short sellers. Another possible explanation that supports the negative relationship relates to the arbitrage hypothesis. Namely, the Managed Funds Association revealed in a whitepaper that short selling as part of an ESG-focused investment strategy can be both profitable as well as beneficial for the environment (MFA, 2022). For example, entering a long position in a market portfolio while shorting high emission stocks puts downward pressure on these environmentally unfriendly stocks, consequently reallocating capital away from polluting firms.

Essentially, you are punishing environmentally unfriendly firms and therefore indirectly contributing to climate goals. Nevertheless, despite being named an ESG-focused strategy, the paper only discusses subjects related to the environmental pillar, in particular emissions. A possible explanation is that the environmental pillar is more closely linked to a specific objective, namely the net-zero emissions commitments of investors and corporations.

An alternative perspective was found in studies that identified a positive relationship between CSR and short selling. For instance, Gao et al. (2021), who conducted a study covering Chinese public firms, attributed this relationship to the association between increased CSR activities and more earnings management. Namely, CSR engagement is often used as camouflage to cover financial misconduct by creating a positive image of the firm. However, short sellers are informed investors who are able to detect such unethical behavior and will act accordingly. It is important to note that Chinese firms experience more regulation regarding social responsibility versus Western countries such as the U.S., where CSR is more or less voluntary. A different view is presented by Lu et al. (2016), who concluded that managers increase CSR performance as a reaction to short selling pressure. The authors used a natural experiment for their analyses, namely the removal of the uptick rule by the SEC for a randomly selected number of Russell 3000 companies. This rule posits that a short sale can only be executed at a price above the previous trading price, which was intended to prevent short sellers driving down prices rapidly. The removal of this rule meant increased short selling pressure for firms in the pilot group, which resulted in these firms boosting their CSR performance. According to the authors, this strategy aims to deter short sellers, as CSR performance may reduce the impact of so-called bad news on stock prices. Therefore, as these investors profit from declining stock prices, they might be less interested in shorting firms performing well on CSR. A similar conclusion is drawn by Rusinova and Wernicke (2019), who used the same natural experiment. Nevertheless, they noted that the external threat by short sellers only increases CSR performance among long-term oriented firms. These firms are more likely to perceive CSR as a strategic investment, whereas short-term oriented firms focus on meeting financial performance metrics. Table 1 provides a concise overview of the existing literature on the relationship between CSR and short selling.

2.2.3 Short Selling Impact on Financial Markets

The impact of short selling on financial markets is a debated topic, covered by a large strand of literature with contrasting viewpoints. Research in favor of the practice, suggests that it reduces overpricing and increases market efficiency by facilitating faster price adjustments (Diamond & Verrecchia, 1987). To illustrate, if prices are inflated and short sellers discover this, their activity will exert a downward pressure on stock prices, ensuring the reversion to fundamental values with the goal of generating profits. This perspective on the contribution of short sellers in market efficiency is substantiated in later studies (Boehmer et al., 2008; Boehmer & Wu, 2013; Saffi & Sigurdsson, 2011).

However, the practice is not without critics, as it also creates negative effects. One of the concerns is volatility and instability in markets after a period of short selling (Henry & McKenzie, 2006), which resulted in countries banning the practice during the Global Financial Crisis and COVID-19 Crisis. However, banning short selling contradicts both theoretical and empirical evidence highlighting its ineffectiveness. To illustrate, stocks banned from short selling during COVID-19 displayed high information asymmetry and low liquidity, giving reason to believe that the policy had an adverse effect on market stability (Siciliano & Ventoruzzo, 2020). Another concern about short selling relates to its downward pressure on stock prices. Namely, short sellers are often blamed to increase this negative effect by exacerbating declining market movements, which results in a higher profit (Rhee, 2003). If this holds, stock prices are less informative, as they move further away from their fundamental values which contradicts the argument of increased market efficiency (Goldstein & Guembel, 2008).

Table 1

Literature overview CSR and short selling

Author	Dependent / key independent variable	Main control variables	Sample	Method	Results
Lu et al. (2016)	The dependent variable is CSR based on MSCI strengths and weaknesses, the independent variable is a dummy for firms in the pilot group	Liquidity, dividends, standard accounting measures (size, leverage, market-to-book)	Russel 3000, 2005-2007	OLS, DID	Firms increase CSR when facing short selling pressure
Jain et al. (2016)	The dependent variable is short interest, the independent variable is CSR performance using KLD and Bloomberg ESG Disclosure Scores	Institutional ownership, market cap., stock return, standard accounting measures	Firms in KLD database, 2004-2012	MLR, event study	Negative relationship between short selling and CSR performance
Rusinova & Wernicke (2019)	The dependent variable is net CSR index using KLD strengths and weaknesses, the treatment variable is a dummy for firms in the pilot group	Type of institutional ownership, access to finance, standard accounting measures	Russel 3000, 2002-2006	DID	Firms increase CSR when facing short selling pressure
Gao et al. (2021)	The dependent variable is short interest, the independent variable is CSR performance using Hexun ESG Scores	Book-to-market, ownership concentration, governance variables (e.g., CEO duality)	Chinese listed firms, 2010-2021	OLS, DID	Short sellers target firms with high CSR scores
Zhang (2021)	The dependent variables include loan quantity, lendable supply and lending fee, the independent variable is CSR performance using ASSET4 ESG Scores	Market cap., institutional ownership, analyst coverage, leverage, volatility	FTSE4 Good Index, 2006-2019	OLS, DID	Negative relationship ESG performance on short selling for overpriced stocks

Note: this table provides a summary of the existing research on the relationship between CSR performance and short selling. Three papers documented a positive relationship, while two detected a negative relationship.

2.2.4 Short Selling Impact on Firms

Short selling has diverse impacts on firms. From an external corporate governance perspective, research has demonstrated that it serves as a disciplinary mechanism for managers, for instance by decreasing earnings management (Hirshleifer et al., 2011; Massa et al., 2015). Short sellers, as informed investors, are able to identify such manipulation and profit from it. Moreover, the presence of short sellers incentivizes shareholders to actively monitor managers, as their exit payoffs are at risk (Massa et al., 2013). Besides monitoring managers, short selling also disciplines managers, as firms experiencing short selling tend to reduce (value-destroying) overinvestments (He & Tian, 2016). A more direct impact on firms is provided by Grullon et al. (2015), who argued that the downward pressure on stock prices creates challenges for companies to raise capital, both debt and equity, especially for smaller firms. In corporate history, short sellers played a pivotal role in the downfall of companies such as Enron and Wirecard, and more recently, to the challenges at Credit Suisse (Jo et al., 2021).

2.3 Global Disruptions

2.3.1 CSR and Global Disruptions

CSR and its relationship with global disruptions, such as the COVID-19 Crisis and Russia-Ukraine War, have gained attention in recent years. These events did not only impact individual nations, but exerted a substantial influence on global economics, politics, and public health. Existing literature reveals that CSR positively affects firms amidst such global disruptions. For example, Zahller et al. (2015) revealed that CSR disclosure helps the resilience of companies to economic shocks, as it increases perceived legitimacy. Namely, CSR may signal credibility, trustworthiness, and management efforts, which are particularly important during economic shocks.

Examining the first disruption, the COVID-19 Crisis, indicates that companies performing well on the environmental and social aspect of CSR displayed more robust stock returns during the market downturn of 2020 (Albuquerque et al., 2020). This resilience is attributed to both customer loyalty, as customers placed increased value on CSR during COVID-19, and investor loyalty, as firms with higher investor-based environmental and social scores have lower stock return volatility, which may indicate their loyalty to environmental and social firms. Research on COVID-19 also revealed that ESG Scores of Chinese firms are positively related to short-term stock returns (Broadstock et al., 2021). This effect is ascribed to the value relevance of ESG performance, especially in navigating the challenges during uncertain market times. This study also examined the effect of individual pillars on short-term stock returns. From the results it is determined that both the environmental and governance pillar displayed a positive relationship, whereas the social pillar exhibits a negative relationship. This negative relationship may be explained by firms that prioritize employee retention instead of layoffs, experienced short-term costs, and potentially lower stock returns.

Following the footprint of the study by Albuquerque et al. (2020), Clancey-Shang and Fu (2022) studied the impact of CSR on stock market quality for U.S. firms in times of political instability caused by the Russia-Ukraine War. In this case, stock market quality refers to for example volatility, liquidity, and transparency. Their findings suggest that CSR performance helps to alleviate increased volatility and liquidity deterioration for U.S. listed foreign firms. While the study revealed a limited impact on U.S. listed domestic firms, the results do imply a positive effect of CSR on firms during times of political instability. Several arguments were provided, including the difference in exposure to political risk for foreign firms and the greater information asymmetry for U.S. listed foreign firms, making it more difficult to maintain market quality when (political) risk is rising.

Nevertheless, it is important to acknowledge that CSR activities particularly enhance the resilience of corporations in societies that assign value to them. This was concluded by Ding et al. (2021) after studying stock price performance during COVID-19 across 61 economies. Besides, the method by which CSR performance is determined also influences results. For example, Bae et al. (2021) presented an alternative perspective on CSR during COVID-19, concluding it had no effect on firm resilience during a crisis. Their divergent outcome was attributed to the use of multiple ESG rating agencies and their focus on the U.S., as opposed to cross-country analyses.

2.3.2 Short Selling and Global Disruptions

Global disruptions and the resulting economic instability may serve as a fertile environment for short sellers to make profits. During the COVID-19 pandemic, investors increased brokerage deposits and opened significantly more accounts (Ortmann et al., 2020). In addition, a surge in short selling activity was revealed, attributed to the high volatility in financial markets. Investors increased their willingness to engage in short positions on average by 2% compared to pre-COVID-19 levels. To mitigate the adverse effects of this trend, several European countries banned the practice (Siciliano & Ventoruzzo, 2020). However, the U.S. decided to retain the possibility of short selling to facilitate regular market trading (Kiernan, 2020). According to Luu et al. (2023), who also studied short selling during COVID-19, this non-intervention approach was effective, as restricting the practice would decrease market quality and slow down the incorporation of negative information in prices.

Considering the next disruption, the Russia-Ukraine War, a recent study on the consequences of geopolitical risk (GPR) found supporting evidence that this affects both volatility and the return of short sellers (Umar et al., 2023). This may be attributed to the increased instability of financial markets caused by GPR, as well as the uncertainty on how the war will evolve. While the authors studied firms from a number of industries, they found that the energy, technology, and consumer industry displayed the most significant effects. This could be explained by the energy crisis resulting from the war, as well as the overall high trading volume of technology and consumer industry stocks. Similar results were found by Zhang et al. (2023), who stated that the GPR resulting from the Russia-Ukraine War was higher than ever, which increased stock market volatility. Moreover, historically

speaking, wars resulted in significant negative economic shocks, providing opportunities for short sellers to capitalize on these situations (Wolf, 2022).

CHAPTER 3: Hypothesis Development

To answer the research question *What is the effect of CSR on the resilience of firms to short selling?*, several hypotheses are formulated.

The initial step to establish a potential link between CSR and short selling is exploring whether CSR correlates with a firm's financial performance. Such correlation would demonstrate the significance of CSR from an investor's perspective. This relationship constitutes a topic of great interest and has gained extensive scholarly attention, but findings have yielded conflicting outcomes. The majority of empirical literature points towards a positive relationship, for instance because of lower cost of equity (C.A. Cheng et al., 2006), increased competitive advantage (Hillman & Keim, 2001; Porter & Kramer, 2006) or an improved brand image (Lin et al., 2019). Moreover, positive results were found in several meta-analyses (Allouche & Laroche, 2005; Margolis et al., 2009; Orlitzky et al., 2003; Van Beurden & Gössling, 2008). However, some studies suggested the absence of a relationship (Aupperle et al., 1985; McWilliams & Siegel, 2000), or even a negative relationship (Kim & Venkatachalam, 2011).

Considering that this study incorporates multiple measures of financial performance (Davidson & Worrell, 1990), comprehensive CSR measurements (Ruf et al., 2001), and recent data (Van Beurden & Gössling, 2008), along with the growing importance of CSR and stakeholder as acknowledged by the Business Roundtable (2019), a positive relationship between CSR and firm financial performance is anticipated. In addition, this study will adopt the same approach as the meta-analyses conducted by Orlitzky et al. (2003) and Margolis et al. (2009) in categorizing financial performance indicators into accounting-based and market based. Subsequently, the null hypothesis posits that CSR performance exhibits a negative or no relationship with financial performance. The alternative hypothesis is as follows:

H1: CSR performance exhibits a positive relationship with financial performance.

Considering the risks associated with short selling, it is expected that these investors are informed and sophisticated (Boehmer et al., 2008; Diamond & Verrecchia, 1987). Some studies provided evidence for the predictive ability of short sellers on price declines (Desai et al., 2006), while others argued that these informed investors are for instance more capable of processing public information such as news events (Engelberg et al., 2012) or better at analyzing fundamental to market ratios to support their trades (Dechow et al., 2001). Besides financial information, short sellers utilize non-financial information to decide which stocks to short, such as CSR performance. If CSR is indeed positively related to financial performance, a profitable strategy may entail long positions in high CSR firms and short positions in low CSR firms, suggesting a negative relationship (Staub-Bisang, 2012). Relating to this, evidence reveals both a negative relationship (Jain et al., 2016; Zhang, 2021) and a

positive relationship (Gao et al., 2021; Lu et al., 2016; Rusinova & Wernicke, 2019) between CSR and short selling. Nevertheless, the regulation of CSR in China (Gao et al., 2021) and the timing of the natural experiment studied by Lu et al. (2016) and Rusinova & Wernicke (2019) may explain the positive relationship found in these studies. However, as most of the research indicated that CSR is positively related to financial performance, combined with the notion that short sellers are sophisticated investors who only engage in trades when sufficient price declines are expected, a negative relationship between short selling and CSR performance is expected. Subsequently, the null hypothesis posits a positive or no relationship between short selling and CSR performance. The alternative hypothesis is as follows:

H2a: CSR performance exhibits a negative relationship with short selling.

CSR is measured by ESG Scores, which consists of three separate pillars. Each pillar may potentially bear unique implications for short selling. As suggested by Friede et al. (2015), the environmental and governance pillar exhibit a slightly more positive relation to financial performance compared to studies focusing on the social pillar. Moreover, the current corporate focus appears to lean towards the environmental and governance pillar (ACTIAM, 2020; Goldman Sachs Asset Management, 2020). Besides, the social pillar lagged behind, because of limited agreement on the appropriate standards (Boffo & Patalano, 2020). Consequently, the null hypothesis posits a stronger (positive) or no relationship between the environmental and governance pillar with short selling compared to the social pillar. The alternative hypothesis is as follows:

H2b: The environmental and governance pillar exhibit a stronger (negative) relationship with short selling compared to the social pillar.

In recent years, the global landscape has experienced several major disruptions, including the COVID-19 Crisis and the Russia-Ukraine War. These events caused turbulence in financial markets, providing an interesting context to test the relevance of CSR. First of all, Zahller et al. (2015) suggested that CSR increases firms' resilience to economic shocks through perceived legitimacy. Furthermore, several studies covering the aforementioned disruptions found a positive relationship between CSR and firm performance (Albuquerque et al., 2020; Broadstock et al., 2021; Clancey-Shang & Fu, 2022). Besides, academic literature supports the notion that short sellers actively capitalize the opportunity amid disruptions, aiming to profit from declining share prices (Ortmann et al., 2020; Umar et al., 2023). Considering these findings, the null hypothesis posits a positive or no relationship between CSR performance and short selling during times of global disruptions. The alternative hypothesis is as follows:

H3a: CSR performance is negatively related to short selling during times of global disruptions.

During the COVID-19 Crisis, the importance of the social pillar was highlighted, especially by the relevance of the workforce, community, and customers during that period. Therefore, the social pillar may exhibit a stronger relationship to short selling during that period (Goldman Sachs Asset Management, 2020). In addition, while the Russia-Ukraine War essentially affects all three pillars, the worldwide energy crisis that followed gives reasons to believe that the environmental pillar exhibits a stronger relationship to short selling in that period (Deloitte, 2023; Goldman Sachs Assets Management, 2022). Consequently, the null hypothesis posits a stronger (positive) or no relationship between the social and environmental pillar with short selling during respectively the COVID-19 Crisis and Russia-Ukraine War. The alternative hypothesis is as follows:

H3b: The social and environmental pillar exhibit a stronger (negative) relationship with short selling during respectively the COVID-19 Crisis and the Russia-Ukraine War.

CHAPTER 4: Data

4.1 Sample Construction

This study examines the impact of CSR on firms in relation to financial performance and short selling. The analyses focus on a sample comprising companies from the S&P 500 over the period 2014-2022. The selection of the S&P 500 stems from its comprehensive coverage of prominent U.S. companies spanning a diverse set of industries. To prevent survivorship bias, companies are included that were part of the S&P 500 during the specified period, considering that firms are often listed and delisted from the index. The rationale behind the specified time period is multifaceted. First of all, despite the steady growth of CSR incorporation since the 2000s, the year 2014 marked the acceleration of ESG investing, which was the result of an increasing number of academic studies that highlighted the link between CSR performance and financial performance (Kell, 2018). Consequently, this started a trend of investors incorporating CSR into their decision-making process. Additionally, the time period includes two global disruptions, namely the COVID-19 Crisis and the Russia-Ukraine War. Both disruptions provide an interesting context to test the relevance of CSR.

To ensure inclusion in the sample, firms are required to have complete information. Eventually, this results in a sample consisting of 3,446 firm-year observations, an overview of which can be found in panel A of Table 2. Furthermore, Table 2 offers a detailed breakdown of the sample by year (panel B), industry (panel C) and period (panel D). The distribution by year reveals that 2022 has the lowest representation, which is ascribed to data availability constraints. Panel C demonstrates that most companies in the sample are active in Manufacturing (29.57%), followed by Services (23.65%) and Finance, Insurance and Real Estate (22.29%). Lastly, the breakdown of periods in panel D highlights that most observations fall in the Non-Crisis Period (69.73%), which aligns with the specified time-period and the relatively short duration of the disruptions.

4.2 Data Construction

To answer the hypotheses, data is retrieved from a variety of data sources. Starting with *Hypothesis 1*, which posits that CSR performance is positively related to financial performance, data on multiple variables is extracted from Thomson Reuters Datastream. These variables include ROA, Tobin's Q, Total Assets, Leverage, Return on Sales (ROS), and Sales. Additionally, as ESG Scores have emerged as the most comprehensive measure for evaluating a company's CSR performance, these scores are also extracted from Thomson Reuters Datastream (Cini & Ricci, 2018). Rating agencies employ data to calculate an ESG Score, making it comparable to CSR but more measurable.

Table 2*Sample overview*

Panel A: Sample distribution			Panel B: Sample distribution by year		
Selection	Number		Year	Number	Percentage
Initial sample – firm year observations	5,277		2014	383	11.11
Firm-year observations with missing data	1,831		2015	392	11.38
Final sample – firm-year observations	3,446		2016	374	10.85
Panel C: Sample distribution by industry			2017	380	11.03
Industry	Number	Percentage	2018	435	12.62
Agriculture	8	0.23	2019	439	12.74
Construction	25	0.73	2020	466	13.52
Finance, Insurance, Real Estate	768	22.29	2021	435	12.62
Manufacturing	1,019	29.57	2022	142	4.12
Mining	72	2.09	Panel D: Sample distribution by period		
Retail trade	199	5.77	Period	Number	Percentage
Services	815	23.65	Non-Crisis	2,403	69.73
Transport & Public Utilities	356	10.33	COVID-19 Crisis	901	26.15
Wholesale trade	184	5.34	Russia-Ukraine War	142	4.12

Note: this table shows the sample distribution of the 3,446 firm-year observations using yearly data from 2014-2022. Industries are classified based on the 4-digit SIC code. The split between the initial sample and final sample is depicted in panel A, whereas the distribution of the final sample by year, industry and period are shown in panels B, C, and D respectively.

Examples of prominent ESG Score providers are Thomson Reuters, Morningstar (Sustainalytics), MSCI, and Bloomberg (Berg et al., 2022). These providers have significant differences in their data collection methodologies, what data they collect and the procedures and weightings they employ to establish ESG Scores. For this study, Thomson Reuters ESG Scores (formerly known as ASSET4) are deemed suitable for the investigation, which are scaled from 0 (worst) to 100 (best). First of all, they cover a large number of global companies, namely over 6,000. Second, this database provides scores for individual pillars, which are of interest for this study. Third, Thomson Reuters ESG Scores are extensively applied in previous studies. Fourth, a large number of ESG metrics is analyzed (450), from which the 178 most relevant are selected (Huber & Comstock, 2017). Subsequently, these datapoints are grouped into ten categories to end up with an ESG Score, as presented in Appendix A (Table 11).

Hypothesis 2 and 3 explore whether CSR performance exhibits a negative relationship with short selling, as well as the impact of individual pillars during both normal times and global disruptions. To test these hypotheses, data is retrieved from multiple sources. Short sell data on S&P 500 companies is extracted from Compustat North America, where the Supplemental Short Interest File provides records of short interest for corporations listed on the New York Stock Exchange,

American Stock Exchange, and NASDAQ. Mandated by FINRA, firms are required to report short interest positions in all customer and proprietary accounts in all equity securities bi-monthly, with the aim of enhancing market transparency and preventing market manipulation (FINRA, n.d.). Starting from 1973, the data covers mid-month short interest, and from 2007 onward, additional month-end data is incorporated. This short interest is used to calculate the Scaled Short Interest (SSI), which is a metric of the number of stocks sold short over outstanding. Furthermore, the regression models require the amount of Institutional Ownership for a stock in a given year. These numbers are retrieved from Form 13F's, available at Wharton Research Data Services (WRDS). As the SEC (2023) described, institutional investors that use the U.S. mail in the course of their business must file Form 13F on a quarterly basis. This file displays securities holdings of institutional investors and is made public to increase investor confidence in the integrity of the U.S. security markets. Furthermore, these hypotheses require Market Capitalization (Market Cap.), Daily Trading Volume, Market Value to Book (MTBV), and Stock Return, which are extracted from Thomson Reuters Datastream. Daily Trading Volume is used to calculate Days to Cover (DTC), which measures the number of days to cover all existing short positions in a specific firm.

4.3 Descriptive Statistics

Table 3 provides descriptive statistics of the raw variables utilized in the regressions. These descriptive statistics, in combination with plotting histograms for each variable in several forms, allow to identify the transformation for which the variable is closest to normal. Consequently, Tobin's Q, SSI, Total Assets, Leverage, Market Capitalization, Daily Trading Volume, DTC, and Stock Return Volatility are transformed into the natural logarithm, as this resulted in the lowest χ^2 and a distribution closest to normal. The same holds for the cube of Institutional Ownership and for one over the square root of MTBV. Furthermore, as revealed by box plots for nearly every variable, significant outliers are present. Consequently, all variables, except for ESG (Pillar) Scores, have been winsorized at the 1st and 99th percentile. Nevertheless, the raw data in Table 3 does provide valuable insights. For example, the average ROA is 8%, whereas the standard deviation of 7% indicates a large variability between firms. In addition, firms in the sample typically have more Leverage compared to Equity, as the mean Leverage as a percentage of Equity is 127%. Examining firm valuation, the average Tobin's Q (2.15) and MTBV (6.96) are both substantially higher than one, suggesting that the market perceives the Debt and Equity value combined (Tobin's Q) as well as the equity value separate (MTBV) as higher than book values. With respect to ESG Scores, the average firm performs better on ESG (60.72) than the average of the total scale (50.00). Also, it is worth noting that none of the firms achieved the highest possible ESG Score of 100. Diving into the individual pillars reveals that the average firm scores best on Social (62.89), followed by Governance (62.73) and Environmental (53.82). Lastly, interesting numbers related to short selling include the average percentage of SSI, which is 3% for the entire sample, with a standard deviation of 2% implying considerable variability across firms.

Furthermore, the average Institutional Ownership is 81% with a standard deviation of 13%, revealing the variability in appetite by institutions for certain stocks. Finally, the table reveals that it takes on average 3.65 trading days to cover all short positions of a firm in the sample, with a standard deviation of 2.39 indicating the variability in this duration. In Appendix A (Table 12-14), descriptive statistics are shown for the separate time periods under review.

Table 3

Descriptive statistics total sample

Variables	Mean	Median	SD	Min	Max	N	Skewn.	Kurt.
ROA	.08	.07	0.07	-.29	.77	3446	1.30	11.14
Tobin's Q	2.15	1.59	2.05	-.23	25.82	3446	3.13	19.80
SSI	.03	.02	0.03	0	.31	3446	2.68	13.72
ESG Score	60.72	62.94	16.80	2.46	93.62	3446	-.45	2.61
E Score	53.82	58.52	26.21	0	98.55	3446	-.50	2.24
S Score	62.89	65.12	19.36	3.24	98.01	3446	-.38	2.40
G Score	62.73	65.12	19.17	2.25	99.44	3446	-.47	2.56
Total Assets (\$b)	72.50	17.96	238.60	.26	3743.57	3446	8.49	89.16
Leverage	1.27	.76	9.95	-340.38	422.12	3446	10.37	1333.86
ROS	.11	.11	0.23	-6.95	1.56	3446	-15.06	400.23
Sales (\$b)	23.27	9.36	47.03	.23	611.29	3446	5.84	50.93
Institutional Ownership	.81	.83	0.13	.01	1.34	3446	-.86	4.97
Market Cap. (\$b)	53.26	21.60	131.69	1.27	2916.90	3446	11.11	175.34
Daily Trading Volume (m)	4.10	2.00	7.30	.02	98.39	3446	5.92	51.47
DTC	3.65	2.91	2.39	.57	26.96	3446	2.66	14.64
MTBV	6.96	3.47	21.90	-95.63	595.30	3446	14.30	311.62
Stock Return	.16	.13	0.36	-.73	8.20	3446	5.52	97.30

Note: this table shows the descriptive statistics for the raw dependent, independent and control variables over the entire sample period (2014-2022). It is important to note that Total Assets, Sales, and Market Cap. are displayed in billions of dollars, whereas Daily Trading Volume is denoted in million units.

CHAPTER 5: Methodology

5.1 Panel Regressions

The goal of *Hypothesis 1* is to test whether CSR performance is positively related to financial performance. Following the existing literature, financial performance is split into an accounting-based performance metric, ROA (e.g., Allouche & Laroche, 2014; Margolis et al., 2009) and a market-based performance metric, Tobin's Q (e.g., Ibhagui & Olokoyo, 2018; Dowell et al., 2000). This approach is important as it addresses the theoretical distinction between the two categories: accounting metrics typically reflect past or short-term financial performance, while market indicators project expected future or long-term financial performance (Gentry & Shen, 2010). The choice for ROA is substantiated by the preference of analysts and investment professionals for this metric to measure profitability (Aydoğmuş et al., 2022). Besides, it is generally considered the most effective measure to assess company performance (Hagel et al., 2013). ROA is preferred over for example ROE, as this metric does not consider debt and provides less insight into a company's capability to generate profits. The market-based indicator Tobin's Q offers valuable insights into the market's perspective on a firm, as it helps determining whether a company is considered over- or underpriced (Singh et al., 2018). It is preferred over share price or stock return, as its relative measure provides a more nuanced view of market valuation. Subsequently, to understand the relationship between CSR performance and the financial performance indicators, two multivariate regressions will be conducted. In regression (1), ROA serves as the dependent variable:

$$(1) ROA_{i,t} = \alpha_0 + \beta_1 ESG\ Score_{i,t} + \beta_2 Firm\ Size_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 ROS_{i,t} + \beta_5 Sales\ Growth_{i,t} + \beta_6 Industry_i + \beta_7 Year_t + \varepsilon_{i,t}$$

The key variable of interest in regression (1) is ESG Score, on which the one-sided t test will be performed.

Besides the key independent variable of interest, several control variables are added, all of which are expected to affect the ROA of a firm:

- i. Firm Size: larger companies tend to demonstrate specific attributes that increase financial performance, for instance economies of scale, control over external stakeholders and attraction of better employees. Moreover, social performance has been found to be positively related to financial performance, even after controlling for firm size (Orlitzky, 2001).
- ii. Leverage: profitable firms typically exhibit lower debt-to-equity ratios (Titman & Wessels, 1988). In line with the pecking order theory, financially healthy firms prioritize internal financing before relying on external sources such as debt or equity. Lastly, interest payments

negatively affect net income and therefore financial performance. Considering these implications, a negative relationship is expected.

- iii. ROS: a higher ROS indicates efficiency, as it reflects more profitability from sales. Conversely, a lower ratio signals financial weakness (Diaz & Pandey, 2019). Improved efficiency results in better financial performance, therefore a positive relationship is expected.
- iv. Sales Growth: profitability measures rise as a consequence of Sales Growth (Ramezani et al., 2002). In addition, market value is also significantly influenced by this metric as found by Connolly & Hirschey (2005). Following their method, Sales Growth is calculated by the 3-year compounded annual growth rate of Sales. In line with existing literature, a positive relationship is expected.

In regression (2), Tobin's Q serves as the dependent variable:

$$(2) \text{ Tobin's } Q_{i,t} = \alpha_0 + \beta_1 \text{ ESG Score}_{i,t} + \beta_2 \text{ Firm Size}_{i,t} + \beta_3 \text{ Leverage}_{i,t} + \beta_4 \text{ ROS}_{i,t} + \beta_5 \text{ Sales Growth}_{i,t} + \beta_6 \text{ Industry}_i + \beta_7 \text{ Year}_t + \varepsilon_{i,t}$$

The key variable of interest in regression (2) is ESG Score, on which the one-sided t test will be performed. The dependent variable is Tobin's Q, which is calculated by dividing the market value of assets over the book value of assets. It is difficult to determine the market value of debt. Nevertheless, there is evidence supporting that minimal differences exist between the book value of debt and market value of debt (Bowman, 1980). Consequently, Tobin's Q is calculated as follows:

$$(3) \text{ Tobin's } Q_{i,t} = \frac{\text{Market Value of Equity}_{i,t} + \text{Book Value of Debt}_{i,t}}{\text{Book Value of Total Assets}_{i,t}}$$

Besides the key variable of interest and dependent variable, similar control variables as in regression (1) are included, all of which are expected to affect the Tobin's Q of a firm in a similar way.

Industry fixed effects and Year fixed effects are incorporated into regressions (1) and (2). This inclusion is determined based on combining a statistical test, namely the Hausman test, and existing literature, both of which imply heterogeneity across industry and years. In fact, the magnitude of industry effects can be so substantial that an average company in a well-performing industry may outperform a great company in a poor industry (Bradley et al., 2018). In the context of CSR, Baird et al. (2012) asserted that a link with financial performance exists when considering industry effects. Moreover, CSR scores provide more insights when compared to other firms within the industry, as substantial differences may exist between industries. Consequently, the 4-digit SIC codes are retrieved from Compustat, dividing the sample in several overarching industries: Agriculture (0100-0999), Mining (1000-1499), Construction (1500-1799), Manufacturing (2000-3999), Transportation (4000-4999), Wholesale Trade (5000-5199), Retail Trade (5200-5999), Finance, Insurance, Real Estate (6000-6799), Services (7000-8999) and Public Administration (9100-9999). Furthermore, Year fixed

effects are added to control for underlying observable and unobservable differences between time units, in this case years (Gösser & Moshgar, 2020). Also, these effects control for macroeconomic shocks because specific years, such as the COVID-19 Crisis, potentially affect the financial performance of firms.

Next, I will discuss how *Hypothesis 2a* is tested, which posits that CSR performance exhibits a negative relationship with short selling. This analysis exploits the regulatory mandate imposed by FINRA, requiring American brokerage firms to report short interest holdings in all equity securities on a bi-monthly basis. As a result, Scaled Short Interest (SSI) is calculated according to the following equation:

$$(4) SSI_{i,t} = \frac{Short\ Interest_{i,t}}{Shares\ Outstanding_{i,t}} * 100$$

Here, Short Interest represents the annualized average number of outstanding short positions of a firm, calculated using the data published by FINRA. In order to scale this number, it is divided by the Shares Outstanding, reflecting the average number of outstanding shares in a year. The resulting metric SSI reflects the percentage of Shares Outstanding that is sold short, following previous research (Asquith et al., 2005; Dechow et al., 2001; Jain et al., 2016). A rise in SSI reveals that relatively more shares are sold short, whereas a decrease reveals the opposite. Applying SSI as the dependent variable, ESG Score as the independent variable and several control variables, regression (5) is formulated to test *Hypothesis 2a*:

$$(5) SSI_{i,t} = \alpha_0 + \beta_1 ESG\ Score_{i,t} + \beta_2 Institutional\ Ownership_{i,t} + \beta_3 Market\ Cap_{i,t} + \beta_4 Daily\ Trading\ Volume_{i,t} + \beta_5 DTC_{i,t} + \beta_6 MTBV_{i,t} + \beta_7 Leverage_{i,t} + \beta_8 Lagged(Stock\ Return)_{i,t-1} + \beta_9 Stock\ Return\ Volatility_i + \beta_{10} Industry_i + \beta_{11} Year_t + \epsilon_{i,t}$$

The key variable of interest in regression (5) is ESG Score, on which the one-sided *t* test will be performed.

Besides the key independent variable of interest, several control variables are added, all of which are expected to influence SSI:

- i. **Institutional Ownership**: as short selling involves borrowing a security from a financial institution, the percentage of stocks held by these institutions is important to facilitate the practice. Therefore, consistent with Asquith et al. (2005), it is expected that higher Institutional Ownership relates to higher SSI. This variable is calculated on a yearly basis as the average of quarterly reported Institutional Ownership numbers in Form 13F's.
- ii. **Market Cap.**: following the study by Commerton-Forde et al. (2016), it is anticipated that a negative relationship between short selling and Market Cap. exists. Several factors clarify this relationship. For instance, larger companies have more liquidity and are therefore less

- susceptible to short-term price movements, making short selling less attractive. In addition, smaller firms may exhibit weaker financials, making them more appealing to short sellers.
- iii. Daily Trading Volume: a higher number of stocks traded decreases the amount of time it takes to cover a short position, in other words, to buy back a borrowed stock and return it to the lender. Therefore, a positive relationship between Daily Trading Volume and SSI is expected (Jain et al., 2013).
 - iv. DTC: represents the number of days required to close all outstanding short positions in a company, given that trading would continue at a constant rate (Hong et al., 2015). This number is calculated by dividing Short Interest over the Daily Trading Volume. As Jain et al. (2013) argued, short sellers are not deterred by the length of time it takes to cover a short position, suggesting that they short previously shorted stocks even more. For this reason, a positive relationship is expected.
 - v. MTBV: short sellers are more likely to target stocks with a high MTBV, which may indicate overvaluation or a higher likelihood of future price declines (Kot, 2007). Therefore, a positive relationship is expected.
 - vi. Leverage: increases the riskiness of a firm, for example because of financial distress risk (Opler & Titman, 1994). Consequently, a positive relationship is expected.
 - vii. Lagged(Stock Return): building on Diether et al.'s (2009) findings that short sellers increase positions following positive returns, a positive relationship is expected.
 - viii. Stock Return Volatility: short sellers tend to target stocks with greater volatility (Angel et al., 2003). Hence, a positive relationship is expected.

Both the Hausman test and existing literature provide evidence to include Industry and Year fixed effects in the regression model.

In order to gain a deeper understanding of how the individual pillars of ESG Score affect SSI, regression (6) is formulated to test *Hypothesis 2b*, namely that the environmental and governmental pillar exhibit a stronger (negative) relationship with short selling compared to the social pillar. Similar control variables are applied as in equation (5):

$$(6) SSI_{i,t} = \alpha_0 + \beta_{1-3} Pillar Score_{i,t} + \beta_4 Institutional Ownership_{i,t} + \beta_5 Market Cap_{i,t} + \beta_6 Daily Trading Volume_{i,t} + \beta_7 DTC_{i,t} + \beta_8 MTBV_{i,t} + \beta_9 Leverage_{i,t} + \beta_{10} Lagged(Stock Return)_{i,t-1} + \beta_{11} Stock Return Volatility_{i,t} + \beta_{12} Industry_i + \beta_{13} Year_t + \varepsilon_{i,t}$$

The key variables of interest in regression (6) are the Pillar Scores, on which the one-sided *t* tests will be performed.

To determine the differential impact of CSR performance on short selling during global disruptions, *Hypothesis 3a* is tested using regression (7), stating that CSR performance decreases short selling during times of global disruptions. For each time period under review, a Period Dummy

variable is created. The first is Non-Crisis Dummy, which corresponds to the years 2014-2019 and constitutes periods of relative market stability. The next crisis is COVID-19, which is displayed by the COVID-19 Dummy and corresponds to the years 2020-2021. This timespan holds significance due to the WHO declaring the disease a pandemic in 2020 (World Health Organization, 2020). Moreover, although several states gradually eased the restrictive measures in 2021, the year was still marked by the pandemic, as evidenced by the number of deaths and emergence of new variants.

Lastly, the Russia-Ukraine War is included in the regression as Russia-Ukraine War Dummy and corresponds to the year 2022. In this year, the entire world experienced the consequences of this war on European territory. Research by Deloitte (2023) suggested that this war will possibly enter the history books as the cause of the first truly global energy crisis. The full regression model corresponding to *Hypothesis 3a* is as follows:

$$(7) SSI_{i,t} = \alpha_0 + \beta_1 ESG\ Score_{i,t} + \beta_{2-4} Period\ Dummy_{i,t} + \beta_{5-7} (ESG\ Score \times Period\ Dummy)_{i,t} + \beta_8 Institutional\ Ownership_{i,t} + \beta_9 Market\ Cap_{i,t} + \beta_{10} Daily\ Trading\ Volume_{i,t} + \beta_{11} DTC_{i,t} + \beta_{12} MTBV_{i,t} + \beta_{13} Leverage_{i,t} + \beta_{14} Lagged(Stock\ Return)_{i,t-1} + \beta_{15} Stock\ Return\ Volatility_{i,t} + \beta_{16} Industry_i + \beta_{17} Year_t + \varepsilon_{i,t}$$

The key variables of interest in regression (7) are the interaction terms between ESG Score \times Period Dummy, on which the one-sided t tests will be performed.

In regression (8), the individual pillar scores are regressed on SSI, while also considering the different time periods similar to regression (7). The aim of this regression is to answer *Hypothesis 3b*, that the social and environmental pillar have a stronger (negative) relationship during respectively the COVID-19 Crisis and Russia-Ukraine War:

$$(8) SSI_{i,t} = \alpha_0 + \beta_{1-3} ESG\ Pillar\ Score_{i,t} + \beta_{4-6} Period\ Dummy_{i,t} + \beta_{7-15} (ESG\ Pillar\ Score \times Period\ Dummy)_{i,t} + \beta_{16} Institutional\ Ownership_{i,t} + \beta_{17} Market\ Cap_{i,t} + \beta_{18} Daily\ Trading\ Volume_{i,t} + \beta_{19} DTC_{i,t} + \beta_{20} MTBV_{i,t} + \beta_{21} Leverage_{i,t} + \beta_{22} Lagged(Stock\ Return)_{i,t-1} + \beta_{23} Stock\ Return\ Volatility_{i,t} + \beta_{24} Industry_i + \beta_{25} Year_t + \varepsilon_{i,t}$$

The key variables of interest in regression (8) are the interaction terms between ESG Pillar Score \times Period Dummy, on which the one-sided t tests will be performed.

5.2 Additional Tests

5.2.1 Multicollinearity

To ensure that the OLS assumptions hold, several diagnostic tests were executed across the regression models. First, to understand the patterns and relationships between pairs of variables, a Pearson correlation matrix is created, which can be found in Appendix B (Table 15). This table facilitates the identification of multicollinearity, a phenomenon which reduces the power of

coefficients and undermines the reliability of p -values. An established rule of thumb suggests that correlation is an issue when the coefficient is greater than 0.8, as this may indicate multicollinearity (Senaviratna & Cooray, 2019). The only combinations of variables with a coefficient greater than 0.8 are the environmental and social score with ESG Score. Nevertheless, this high correlation is to be expected since the ESG Score is composed of its individual pillar scores. In addition to the Pearson correlation matrix, variance inflation factors (VIFs) are included as an additional measure for multicollinearity. While the Pearson correlation matrix only tests for pairs, VIFs assess whether the variance of a parameter increases as a result of correlated regressors (Brooks, 2019). The general practice applies a VIF of 5 as the cut-off value for multicollinearity. The VIFs for the regression model on CSR performance and financial performance are depicted in Appendix B (Table 16), as well as for the model on CSR performance and SSI (Table 17). All VIFs are substantially below the cut-off value of 5. Consequently, based on the results of the Pearson correlation matrix and VIFs, it can be concluded that multicollinearity is not present in the regression models.

5.2.2 Non-linearity

The regression models in section 5.1 assume a linear relationship between SSI and ESG Score. However, it is possible that a non-linear relationship exists between the two variables. For example, the impact of ESG Score on SSI may diminish whenever ESG Scores are already high, as high ESG Scores may offer less incremental relevance for short sellers compared to firms with low ESG Scores. To investigate this possibility, curve estimations between SSI and ESG Score are applied in STATA. The results of these estimations indicate that the linear relationship between SSI and ESG Score is most suitable. This conclusion is based on the t value of the coefficient ($-13.73, p = .000$) and the adjusted R^2 of .052, both of which outperform the logarithmic and quadratic curve estimations. To ensure that this relationship holds, likelihood ratio (LR) tests are performed. This test compares the fit of a restricted model, in this case the model including ESG as a linear variable, to an unrestricted model, namely including ESG Score as either a logarithmic or quadratic variable (Brooks, 2019). Under the null hypothesis, the restricted model is true, whereas the alternative hypothesis suggests that the unrestricted model holds. The LR test for the unrestricted model including a logarithmic ESG Score, $\chi^2 = 1.23, p = .267$, and for the unrestricted model including a squared ESG Score, $\chi^2 = 0.61, p = .434$, both fail to reject the null hypothesis. This implies that the restricted model, with ESG Score as a linear variable, is the most appropriate for the relationship with SSI. Consequently, based on the outcomes of the curve estimation between SSI and ESG Score, as well as the LR tests, it is concluded that the linear relationship between SSI and ESG is most suitable.

5.2.3 Heteroskedasticity and Autocorrelation

Another important factor to consider is the presence of heteroscedasticity in the models. This refers to a situation where the variance of the error-term is not constant across different levels of

independent variables. Addressing heteroskedasticity is important for the assumptions of classical linear regression, as it can lead to inefficient results (Breusch & Pagan, 1979). To detect whether heteroskedasticity is present in the models, the Breusch-Pagan Test is employed. This test examines whether the variance of residuals within a model remain constant across different levels of the independent variable. The null hypothesis posits the presence of homoskedasticity in the model, which implies that the spread or dispersion of residuals does not change when moving along predicted values. For all models, the null hypothesis was rejected ($p < .05$), meaning that the sample suffers from heteroskedasticity. To deal with this problem, robust standard errors are applied. What is also important to consider, is autocorrelation. As per Brooks (2019), ignoring autocorrelation when it is present causes similar consequences to those of ignoring heteroskedasticity. While correlation assesses the relationship between variables, autocorrelation examines the relationship with a lagged variable. Because this study uses panel data, it is likely that autocorrelation is present. The Woolridge test for each regression model confirms this expectation, as the null hypothesis of no autocorrelation is rejected in all cases ($p < .05$). Consequently, in order to deal with this issue, standard errors are clustered on the company level.

5.2.4 Omitted Variable Bias

Due to the difficulty in capturing all potential influences on the dependent variable, regression models are exposed to omitted variable bias (OVB) (Dranove, 2012). OVB is one of the sources of endogeneity, besides simultaneity, and measurement errors. Among the frequently employed techniques to mitigate OVB is the inclusion of fixed effects. The rationale behind this approach, is that unaccounted effects of omitted variables are consistent across for example time or industries, thereby affecting the dependent variable (Dranove, 2012). The trade-off between fixed and random effects is that including fixed effects results in unbiased estimators, whereas random effects will often have smaller standard errors. To decide on this trade-off, a Hausman test is conducted for each regression model. The null hypothesis of this test posits that the random-effects model is consistent and efficient, suggesting no correlation between the error term and independent variables. The null hypothesis is rejected for all the regression models ($p < .05$), which indicates the presence of OVB and therefore, fixed effects will be included. Relating to measurement errors, another source of endogeneity, this study used widely accepted independent and dependent variables, which are collected in a careful and structured way, including multiple checks. Moreover, data is collected from trustworthy data sources. Consequently, the risk of measurement errors is perceived low for this study.

CHAPTER 6: Results

6.1 Regression Results

6.1.1 CSR and Financial Performance

All results in this chapter were derived from the statistical program STATA. The first step is to determine whether CSR performance is positively related to financial performance. Table 4 reveals the results of regressing ESG Score on two financial performance metrics, namely ROA (accounting-based) and Tobin's Q (market-based), while also including control variables and fixed effects. The one-sided t test for the coefficient of ESG Score in column (1), $t(518) = 1.28$, $p = .100$, significant at a 10% significance level. For the coefficient in column (2), $t(518) = 1.40$, $p = .081$, also significant at a 10% significance level. Consequently, for both financial performance indicators, the effect of ESG Score is significantly positive. Therefore, *Hypothesis 1* is accepted: CSR performance exhibits a positive relationship with financial performance. The adjusted R^2 , which indicates the ability of the model to explain the variance of the dependent variable, is higher in column (1), namely .573, compared to the .186 in model (2). When considering the control variables, several key observations become apparent. First of all, while a positive effect was expected with Firm Size, the results display a negative relationship in columns (1) and (2), significant at a 1% significance level. A possible explanation for this discrepancy stems from the fact that this paper utilizes the natural logarithm of Total Assets to measure Firm Size, whereas some other papers deployed raw values. Besides, an increased Total Assets increases the denominator of the ROA formula. Hence, an increase in net income is necessary to avoid a decreased ROA. In line with expectations, the effect for Leverage in column (1) is negative, significant at a 1% significance level. Nevertheless, column (2) reveals a slightly positive effect between Leverage and Tobin's Q, however not significant. Lastly, both models reveal positive and significant coefficients for Sales Growth and ROS, which is in line with expectations.

6.1.2 CSR and Short Selling

Table 5 provides the results for regressing ESG Score on short selling, as measured by SSI. Besides regressing the total ESG Score in column (1), the individual pillars are regressed in columns (2), (3), and (4) to evaluate their separate effect. The key variables of interest are the ESG (Pillar) Scores, on which the one-sided t tests will be performed. The negative coefficient for ESG Score in column (1), $t(518) = -1.51$, $p = .066$, is significant at a 10% significance level. This provides evidence supporting *Hypothesis 2a*: CSR performance exhibits a negative relationship with short selling. In addition, the adjusted R^2 of .960 suggests that the model in column (1) has a high explanatory power.

Table 4*Regression results CSR and financial performance*

Variables	(1) ROA	(5) Tobin's Q
ESG Score	0.0001 (0.0001)	0.0013 (0.0010)
Firm Size	-0.0168*** (0.0017)	-0.3015*** (0.0233)
Leverage	-0.0058*** (0.0016)	0.0134 (0.0148)
ROS	0.4364*** (0.0170)	1.2331*** (0.1323)
Sales Growth	0.0567*** (0.0102)	0.7844*** (0.1185)
Constant	0.0669*** (0.0065)	0.9443*** (0.0800)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	3,446	3,446
Adjusted R^2	.573	.186

Note: this table shows the results of the regressions of ESG Score on the financial performance indicators ROA (accounting-based), and Tobin's Q (market-based), over the entire sample period (2014-2022). The regressions control for both Industry and Year fixed effects. The robust standard errors are displayed in the parentheses. Significance is indicated by *, **, and ***, which represent the level of significance at the 10%, 5% and 1% level respectively.

Most coefficients of control variables in column (1) of Table 5 are in line with expectations, namely Institutional Ownership (significantly positive), Market Cap. (significantly negative), Daily Trading Volume (significantly positive), DTC (significantly positive), and Stock Return Volatility (significantly positive). While the coefficient for MTBV was expected to be positive, given that short sellers target overvalued stocks, the results display a negative coefficient, significant at a 1% significance level. This may indicate that short sellers are not more likely to target stocks with high MTBV, as this would have resulted in a positive coefficient. This result is in contrast to the finding of Kot (2007). The difference could be attributed to the utilization of more recent data in this study (2014-2022) compared to the time frame covered in Kot's research (1988-2002). Also, perhaps short sellers take into consideration other factors instead of the MTBV, as the stocks of firms in the S&P 500 are generally higher compared to their book value. Lastly, the coefficients of Leverage and Lagged(Stock Return) are positive as expected, however they are not significant.

In columns (2), (3), and (4) of Table 5, the results of regressing the Pillar Scores on SSI are depicted. The negative coefficient of the environmental pillar, $t(518) = -1.41, p = .080$, is significant at a 10% significance level. In addition, the social pillar, $t(518) = -2.21, p = .014$, is significant at a 5% significance level. Lastly, the governance pillar, $t(518) = 0.19, p = .575$, is not significant and the only pillar with a positive coefficient. Considering these results, there is no supporting evidence for *Hypothesis 2b*: the environmental pillar and governance pillar exhibit a stronger (negative)

relationship with short selling compared to the social pillar. In fact, the environmental and social pillar exhibit a stronger (negative) relationship with short selling compared to the governance pillar.

Therefore, despite the E and G having a more positive relationship to financial performance as found by Friede et al. (2015), as well as the corporate focus on these pillars (ACTIAM, 2020; Goldman Sachs Asset Management, 2020), this is not reflected in short sell numbers. The results in columns (2), (3), and (4) reveal an adjusted R^2 of .960, which indicates that a large variance of the SSI is explained by the models.

Table 5

Regression results CSR and short selling

Variables	(1) SSI	(2) SSI	(3) SSI	(4) SSI
ESG Score	-0.000657 (0.000436)			
E Score		-0.000381 (0.000269)		
S Score			-0.000745** (0.000337)	
G Score				4.56e-05 (0.000241)
Institutional Ownership	0.0893*** (0.0287)	0.0893*** (0.0289)	0.0903*** (0.0287)	0.0872*** (0.0287)
Market Cap.	-0.152*** (0.0133)	-0.151*** (0.0134)	-0.152*** (0.0133)	-0.153*** (0.0137)
Daily Trading Volume	0.808*** (0.0234)	0.809*** (0.0234)	0.808*** (0.0234)	0.808*** (0.0234)
DTC	1.019*** (0.00870)	1.018*** (0.00876)	1.019*** (0.00870)	1.018*** (0.00876)
MTBV	-0.416*** (0.0508)	-0.414*** (0.0512)	-0.416*** (0.0505)	-0.417*** (0.0512)
Leverage	0.00773 (0.00552)	0.00804 (0.00555)	0.00786 (0.00549)	0.00798 (0.00552)
Lagged(Stock Return)	0.0124 (0.0102)	0.0129 (0.0101)	0.0121 (0.0101)	0.0131 (0.0101)
Stock Return Volatility	0.0774*** (0.0163)	0.0767*** (0.0165)	0.0776*** (0.0163)	0.0780*** (0.0164)
Constant	-4.778*** (0.0789)	-4.799*** (0.0749)	-4.772*** (0.0777)	-4.811*** (0.0766)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,446	3,446	3,446	3,446
Adjusted R^2	.960	.960	.960	.960

Note: this table shows the results of the regressions of ESG (Pillar) scores on SSI over the entire sample period (2014-2022). The regressions control for both Industry and Year fixed effects. The robust standard errors are displayed in the parentheses. Significance is indicated by *, **, and ***, which represent the level of significance at the 10%, 5% and 1% level respectively.

6.1.3 CSR and Short Selling During Global Disruptions

Table 6 provides the results of regressing ESG Score on SSI during the COVID-19 Crisis and the Russia-Ukraine War. First, *ceteris paribus*, both global disruptions dummy's display a positive significant coefficient. This indicates that SSI was significantly higher during the COVID-19 Crisis and the Russia-Ukraine War than during the Non-Crisis Period. When looking at the first interaction term between ESG Score \times COVID-19 Crisis, the one-sided t test, $t(518) = -1.06, p = .145$, is not significant. The second interaction term, ESG Score \times Russia-Ukraine War, $t(518) = -1.84, p = .033$, is significant at a 5% significance level. This provides evidence that ESG significantly decreased SSI during the period of the Russia-Ukraine War as compared to the Non-Crisis Period. However, the p -value of .145 corresponding to the interaction term with COVID-19 is not low enough to infer a significant effect. As a result, there is not enough evidence supporting *Hypothesis 3a*: CSR performance is negatively related to short selling during times of global disruptions.

Table 7 provides the results for regressing individual pillar performance on SSI during the global disruptions. The interaction term between S \times COVID-19 Crisis, $t(518) = -0.55, p = .291$, suggests that the social pillar did not significantly decrease SSI during the COVID-19 Crisis. When looking at the interaction term between E \times Russia-Ukraine War, $t(518) = -1.29, p = .099$, it becomes clear that the environmental pillar significantly decreased SSI during the Russia-Ukraine War. As a result, despite the environmental pillar exhibiting a stronger (negative) relationship with short selling during the Russia-Ukraine War, this does not hold for the social pillar during the COVID-19 Crisis. Therefore, there is not enough evidence supporting *Hypothesis 3b*: The social and environmental pillar exhibit a stronger (negative) relationship with short selling during respectively the COVID-19 Crisis and Russia-Ukraine War. What is also interesting to see, is that the interaction term between the environmental pillar and the COVID-19 Crisis is negative and significant, whereas the interaction term between the social pillar and Russia-Ukraine War is also negative and significant.

6.2 Robustness Checks

6.2.1 Alternative ESG Score Provider

The first robustness check relates to the key independent variable ESG Score. As mentioned earlier, a great divergence exists in the data collection methodologies among rating agencies, as well as the type of data collected and the procedures and weightings employed to create ESG Scores (Berg et al., 2022). Following their advice, it is important to employ an alternative ESG Score from a different provider. For this purpose, Bloomberg ESG Disclosure scores (B. ESG Scores) are deemed suitable, and therefore extracted from the Bloomberg database. Bloomberg calculates these scores based on the analysis of 120 ESG related indicators found in publicly disclosed information. This information is found in channels such as annual reports, specific CSR reports or websites (Huber & Comstock, 2017). Essentially, companies are rated on their disclosure of quantitative and policy

related ESG data. The scale for B. ESG Scores ranges from 0 (worst) to 100 (best). The average B. ESG Score for the sample is 49.78, which is below the average total score average of 50.00.

Table 6

Regression results CSR and short selling during global disruptions (ESG Score)

Variables	(1) SSI
ESG Score	-0.000628 (0.000437)
COVID-19 Crisis (dummy)	0.126*** (0.0310)
Russia-Ukraine War (dummy)	0.222*** (0.0613)
ESG Score * COVID-19 Crisis	-0.000415 (0.000392)
ESG Score * Russia-Ukraine War	-0.00171* (0.000934)
Institutional Ownership	0.0895*** (0.0290)
Market Cap.	-0.154*** (0.0135)
Daily Trading Volume	0.808*** (0.0232)
DTC	1.018*** (0.00870)
MTBV	-0.419*** (0.0509)
Leverage	0.00773 (0.00552)
Lagged(Stock Return)	0.0126 (0.0101)
Stock Return Volatility	0.0761*** (0.0163)
Constant	-4.773*** (0.0790)
Industry fixed effects	Yes
Year fixed effects	Yes
Observations	3,446
Adjusted R^2	.960

Note: this table shows the results of the regressions of ESG scores on SSI for the Non-Crisis Period, the COVID-19 Crisis, and Russia-Ukraine War. The regressions control for both Industry and Year fixed effects. The robust standard errors are displayed in the parentheses. Significance is indicated by *, **, and ***, which represent the level of significance at the 10%, 5% and 1% level respectively.

This contradicts the average of the ESG Score from Thomson Reuters for the sample, which was substantially above the total score average (60.72). The results of the analysis are depicted in Table 8. Please note that the number of observations dropped from 3,446 to 3,096. Column (1) reveals that the B. ESG Score is negatively related to SSI, $t(511) = -2.24$, $p = .013$, significant at a 5% significance level. This is in line with the relationship found in the main regression results. Moreover, the coefficient B. ESG Score (-0.00165) is substantially larger and more significant compared to the ESG

Score (-0.000657). The main regression results did not find a stronger (negative) effect of the environmental and governance pillar, which holds when using B. ESG Scores.

Table 7

Regression results CSR performance and short selling during global disruptions (ESG Pillar Score)

Variables	(1) SSI	(2) SSI	(3) SSI
E Score	-0.000341 (0.000270)		
S Score		-0.000713** (0.000336)	
G Score			0.000109 (0.000250)
COVID-19 crisis (dummy)	0.120*** (0.0213)	0.111*** (0.0288)	0.104*** (0.0213)
Russia-Ukraine war (dummy)	0.155*** (0.0399)	0.210*** (0.0506)	0.128*** (0.0413)
E Score * COVID-19 crisis	-0.000413* (0.000250)		
E Score * Russia-Ukraine war	-0.000865 (0.000670)		
S Score * COVID-19 crisis		-0.000182 (0.000333)	
S Score * Russia-Ukraine war		-0.00149* (0.000758)	
G Score * COVID-19 crisis			-0.000276 (0.000271)
G Score * Russia-Ukraine war			-0.000551 (0.000546)
Institutional Ownership	0.0889*** (0.0296)	0.0894*** (0.0288)	0.0880*** (0.0289)
Market Cap.	-0.154*** (0.0137)	-0.153*** (0.0134)	-0.154*** (0.0136)
Daily Trading Volume	0.809*** (0.0233)	0.808*** (0.0232)	0.808*** (0.0234)
DTC	1.018*** (0.00877)	1.018*** (0.00872)	1.019*** (0.00876)
MTBV	-0.416*** (0.0512)	-0.417*** (0.0505)	-0.419*** (0.0511)
Leverage	0.00868 (0.00563)	0.00759 (0.00547)	0.00793 (0.00552)
Lagged(Stock Return)	0.0137 (0.0101)	0.0124 (0.0101)	0.0132 (0.0101)
Stock Return Volatility	0.0750*** (0.0163)	0.0766*** (0.0163)	0.0782*** (0.0164)
Constant	-4.793*** (0.0752)	-4.772*** (0.0775)	-4.810*** (0.0765)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	3,446	3,446	3,446
Adjusted R^2	.960	.960	.960

Note: this table shows the results of the regressions of ESG Pillar Scores on SSI for the Non-Crisis Period, the COVID-19 Crisis, and Russia-Ukraine War. The regressions control for both Industry and Year fixed effects. The robust standard errors are displayed in the parentheses. Significance is indicated by *, **, and ***, which represent the level of significance at the 10%, 5% and 1% level respectively.

Nevertheless, what is interesting to see in columns (2), (3) and (4) of Table 8, is that the opposite is true, namely that the social pillar exhibits a stronger (negative) relationship with SSI compared to the other pillars. Once again, this is interesting given the findings of Friede et al. (2015), Boffo and Patalano (2020), and the current corporate focus on the environmental and governance pillar (ACTIAM, 2020; Goldman Sachs Asset Management, 2020). For all four models, the adjusted R^2 is .957. This number is slightly lower in comparison to the main regression results (.960), but still considered high.

Table 8

Regression results CSR and short selling (Bloomberg ESG Score)

Variable	(1) SSI	(2) SSI	(3) SSI	(4) SSI
B. ESG Score	-0.00165** (0.000738)			
B. E Score		-0.000641* (0.000360)		
B. S Score			-0.00120** (0.000470)	
B. G Score				-0.000295 (0.000828)
Institutional Ownership	0.0709** (0.0290)	0.0712** (0.0291)	0.0703** (0.0291)	0.0696** (0.0292)
Log(Market Cap.)	-0.152*** (0.0151)	-0.152*** (0.0151)	-0.153*** (0.0151)	-0.153*** (0.0152)
Log(Daily Trading Volume)	0.822*** (0.0186)	0.822*** (0.0186)	0.822*** (0.0186)	0.823*** (0.0186)
DTC	1.010*** (0.00940)	1.010*** (0.00939)	1.009*** (0.00939)	1.010*** (0.00936)
MTBV	-0.434*** (0.0535)	-0.435*** (0.0537)	-0.433*** (0.0536)	-0.436*** (0.0541)
Leverage	0.00283 (0.00694)	0.00267 (0.00695)	0.00286 (0.00694)	0.00279 (0.00695)
Lagged(Stock Return)	0.00689 (0.0103)	0.00736 (0.0102)	0.00661 (0.0103)	0.00732 (0.0103)
Stock Return Volatility	0.0776*** (0.0184)	0.0781*** (0.0184)	0.0781*** (0.0184)	0.0796*** (0.0185)
Constant	-4.752*** (0.0869)	-4.807*** (0.0790)	-4.794*** (0.0805)	-4.790*** (0.113)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,096	3,096	3,096	3,096
Adjusted R^2	0.957	0.957	0.957	0.957

Note: this table shows the results of the regressions of B. ESG (Pillar) Scores on SSI over the entire sample period (2014-2022). The regressions control for both Industry and Year fixed effects. The robust standard errors are displayed in the parentheses. Significance is indicated by *, **, and ***, which represent the level of significance at the 10%, 5% and 1% level respectively.

6.2.2 COVID-19 Crisis Period Split

In the main regression results, the COVID-19 Crisis was treated as one period spanning two years (2020-2021). Nevertheless, substantial differences exist between these two years. The pandemic began in the U.S. in March 2020, which resulted in the implementation of several lockdowns and other restrictive measures to prevent the spread of the virus (Yakusheva et al., 2022). These policies remained in effect in many U.S. states until the end of August 2020, after which they were gradually lifted. The lockdown period in 2020 represents both a supply and demand shock in the U.S. economy (Guerrieri et al., 2022). First, there is the supply shock, characterized by a disruption in the production of goods and services. This is followed by an even larger demand shock, as economic activity decreases due to the implementation of restrictive measures and liquidity constrained consumers cutting back on spending. In addition, the beginning of 2020 saw a stock market crash, accompanied by a major downturn in the U.S. economy (Barnes et al., 2021). The next year, 2021, is considered the opening up period. While some states have already opened up in 2020, most restrictive measures in the country were lifted in 2021. Consequently, economic activity increased and caused a demand shock, as the demand for goods and services rose rapidly. However, it is worth noting that the opening up period was accompanied by certain supply shock bottlenecks caused by the COVID-19 Crisis, such as labor shortages or shipping delays (Soto, 2023). When considering both the lockdown period and opening up period, it is interesting to see how ESG Score and SSI relate during these divergent periods.

Table 9 shows the results of splitting the COVID-19 Crisis in two periods, as well as the interaction terms with ESG Score. First of all, *ceteris paribus*, both periods display an increase of SSI compared to the Non-Crisis Period, significant at a 1% significance level. Shifting to the interaction term, ESG Score \times COVID-19 Crisis lockdown reveals that, $t(518) = -1.32$, $p = .094$, significant at a 10% significance level. Furthermore, the interaction term ESG Score \times COVID-19 Crisis opening up reveals that, $t(518) = -0.58$, $p = .281$, which is not significant. While the interaction term between ESG Score \times COVID-19 Crisis was not significant in the main regression results, it is significantly negative during the lockdown period. This suggests that higher ESG Scores correspond to significantly lower short selling during the lockdown period as compared to the Non-Crisis Period.

6.2.3 Simultaneity

Besides OVB and measurement errors, one of the forms that may cause endogeneity is called simultaneity. This refers to a situation where the independent variable affects the dependent variable, as expected, but also the other way around (Hill et al., 2021). In the existing literature on CSR and short selling, simultaneity has not been discussed explicitly. Nevertheless, it is possible that a bi-directional relationship exists.

Table 9*Regression results CSR and short selling (COVID-19 Crisis period split)*

Variables	(1) SSI
ESG Score	-0.000623 (0.000439)
COVID-19 Crisis lockdown (dummy)	0.113*** (0.0298)
COVID-19 Crisis opening up (dummy)	0.117*** (0.0384)
Russia-Ukraine War (dummy)	0.221*** (0.0616)
ESG Score * COVID-19 Crisis lockdown	-0.000504 (0.000381)
ESG Score * COVID-19 Crisis opening up	-0.000283 (0.000487)
ESG Score * Russia-Ukraine War	-0.00171* (0.000936)
Institutional Ownership	0.0893*** (0.0290)
Market Cap.	-0.154*** (0.0135)
Daily Trading Volume	0.808*** (0.0233)
DTC	1.018*** (0.00871)
MTBV	-0.418*** (0.0509)
Leverage	0.00779 (0.00551)
Lagged(Stock Return)	0.0126 (0.0101)
Stock Return Volatility	0.0763*** (0.0163)
Constant	-4.773*** (0.0790)
Industry fixed effects	Yes
Year fixed effects	Yes
Observations	3,446
Adjusted R^2	.960

Note: This table shows the results of the regressions of ESG Scores on SSI for the Non-Crisis Period, the COVID-19 Crisis (lockdown and opening up) and Russia-Ukraine War. The regressions control for both Industry and Year fixed effects. The robust standard errors are displayed in the parentheses. Significance is indicated by *, **, and ***, which represent the level of significance at the 10%, 5% and 1% level respectively.

An established method to reveal simultaneity is performing a Granger causality test. This test determines if lagged variables of x are predictors of y and vice versa. The null hypothesis posits no Granger causality between the variables x and y and vice versa. If this hypothesis is rejected in both directions of x and y, it suggests a Granger causal relationship, and therefore simultaneity. It is important to note that a Granger causal relationship is not a cause-and-effect relationship, but rather suggests predictive information in the past values of one variable on another variable. Table 18 in Appendix B reveals the results of the Granger causality test. The first row reveals that the null

hypothesis that ESG Score does not Granger cause SSI is rejected at a significance level of 5%. In the second row, it becomes clear that the null hypothesis that SSI does not Granger cause ESG Score is rejected at a significance level of 1%. This raises concerns, as rejecting both null hypotheses for Granger causality indicates simultaneity, and therefore endogeneity may be a problem. Still, it should be noted that the relationship found in Table 17 does not imply causation, which is a common mistake known as the Granger causality fallacy (Maziarz, 2015). Nevertheless, the bi-directional results either mean an instant Granger causality between the time series, or that x and y are determined by a third variable.

A possible solution to solve endogeneity is implementing instrumental variables (IVs) and performing a two-stage least-squares regression. In theory, an IV should not exhibit a direct relationship with the dependent variable and the error term of the regression, except through its effect via the independent variable (Sturm, 1998). Finding an appropriate IV that meets these conditions is difficult, for example because many variables already affect the dependent variable indirectly, instead of only via the independent variable. Also, while the result of including an IV leads to unbiased coefficient estimates, it reduces the precision. Unfortunately, despite exploring and analyzing multiple possible IVs, no suitable instrument that meets the necessary criteria was found. For example, the industry average ESG Score was applied, following the method by Gao et al. (2021). This IV displayed a very high Cragg-Donald F-Statistic, which was compared to the Stock-Yogo critical values. Therefore, while this F-Statistic indicated that the IV is not weak, it was relatively high compared to the critical values, which may suggest the IV is too strong. Furthermore, an issue with this IV is the challenge of validating that the only way through which industry average ESG Score affects short selling is through the ESG performance of individual firms (Gao et al., 2021). Another IV that was considered, is the number of deaths from natural disasters, as this would increase corporate donations and therefore the ESG Score (Gao et al., 2021). Unfortunately, this instrument was too weak based on the Cragg-Donald F-Statistic, which was compared to the Stock-Yogo critical values.

6.2.4 Detrended Scaled Short Interest (SSI)

The reported adjusted R^2 in the main regression results is high, namely .960. One possible explanation for this high value could be overfitting, a scenario where the model is too complex for the available data (Austin & Steyerberg, 2015). Nevertheless, it is unlikely that overfitting is a problem, given the large number of observations in this study. A less familiar explanation for the high adjusted R^2 is the presence of a trend in panel data. While Year fixed effects control for time-related variation in the data, this may not fully capture all time-related issues or trends. This is highlighted by Woolridge (1996), who argued that the adjusted R^2 can be artificially high when the dependent variable, in this case SSI, is trending. A trending SSI may relate to the finding of P. Mackintosh (2022), who reported that short interest of S&P 500 stocks has generally declined since 2016. Because

it is possible that a trend is present in the data, the regression of section 6.1.2 is run using a detrended SSI to determine if the negative relationship with ESG Score still holds. Following the method of Woolridge (1996), the regression is run on the residuals of the predicted value of SSI and the actual value. The rationale behind this method is to only count the changes in the dependent variable (SSI) after adjusting for both fixed effects. The results of regressing on the detrended SSI are depicted in Appendix B (Table 18). The one-sided t test of ESG Score, $t(518) = -1.40$, $p = 0.082$, is significant at a 10% significance level. Moreover, the effect of the individual pillars displays similar results compared to regressing on the regular SSI. What is also interesting to see is that the adjusted R^2 decreased substantially, namely to .762. While this number is still high, it is more acceptable than .960 and corresponds better with existing research. Based on this analysis, it can be concluded that ESG Score has a significant negative relationship with SSI, even when dealing with a potential trend in the data.

CHAPTER 7: Conclusion and Discussion

The aim of this paper is to answer the research question *What is the effect of CSR on the resilience of firms to short selling?* In the ongoing discussion of whether CSR actually adds value to a firm, this paper seeks to provide evidence from the perspective of short selling. Furthermore, by diving deeper into the effect of CSR during the COVID-19 Crisis and the Russia-Ukraine War, this paper aims to determine resilience during global disruptions. The perspective from short selling is interesting, given that short sellers are more informed and sophisticated than average investors, which is the result of the high risks involved. One of the potential information sources to substantiate their trades is CSR performance, measured by ESG Scores. First of all, this study reveals that a positive relationship exists between CSR performance and financial performance, as measured by ROA and Tobin's Q. In addition, the results indicate a negative relationship between CSR performance and short selling. This also holds during the lockdown period of COVID-19 and the Russia-Ukraine War. This negative relationship implies that CSR has a positive effect on the resilience of firms to short selling. Table 10 provides an overview of the hypotheses tested in this paper, as well as the statistical outcomes.

The starting point of this paper's analysis was to determine the relationship between CSR performance and financial performance, as this possibly affects the attitude of short sellers towards CSR. The majority of empirical research points towards a positive relationship (e.g., Margolis et al., 2009; Orlitzky et al., 2003; Van Beurden & Gössling, 2008), which was also found in this study. This positive significant effect of CSR on financial performance holds for both ROA (accounting-based) and Tobin's Q (market-based).

In the next part, a negative relationship was discovered between CSR and SSI, which is in accordance with the findings of Jain et al. (2016). While Zhang (2021) also concluded a negative relationship, this related to overpriced stocks, whereas this study does not make such a distinction. The reasons why my result differs from other studies finding a positive relationship is multi-dimensional. For instance, the positive relationship found by Gao et al. (2021), which is attributed to earnings management, relates to Chinese firms. These firms face stricter regulations on CSR compared to the U.S. Consequently, Chinese firms may be more inclined to engage in earnings management to meet CSR requirements. Moreover, the positive findings found by Rusinova and Wernicke (2019) and Lu et al. (2016), are in the context of a natural experiment around 2005. This experiment may provide only temporary effects of short selling pressure. In addition, it is anticipated that the phase of CSR in 2005 is substantially different from its current form, especially within corporates, where the concept was new at the time. Nowadays, CSR has evolved and is likely integrated in every (major) organization, which may result in different conclusions regarding the CSR and SSI relationship. Lastly, the positive findings of Rusinova and Wernicke (2019) and Lu et al. (2016) may be attributed to the use of a different ESG Score provider. In this study, the significantly

negative relationship with SSI holds when using a different ESG Score, which is important given the divergence in data collection and calculation methods applied by rating agencies (Berg et al., 2022).

Table 10

Overview of hypotheses, corresponding p-values, and statistical conclusions

Nr.	Null Hypothesis	Alternative Hypothesis	p-value(s)	Statistical conclusion
1	CSR performance exhibits a negative or no relationship with financial performance	CSR performance exhibits a positive relationship with financial performance	.100 (ROA) .081 (Tobin's Q)	Reject the null hypothesis at a 10% significance level
2a	CSR performance exhibits a positive or no relationship with short selling	CSR performance exhibits a negative relationship with short selling	.066	Reject the null hypothesis at a 10% significance level
2b	The E and G pillar of CSR exhibit a stronger (positive) or no relationship with short selling compared to the S pillar	The E and G pillar of CSR exhibit a stronger (negative) relationship with short selling compared to the S pillar	.080 (E) .014 (S) .575 (G)	Fail to reject the null hypothesis
3a	CSR exhibits a positive or no relationship with short selling during global disruptions	CSR exhibits a negative relationship with short selling during global disruptions	.145 (COVID-19) .033 (R-U War)	Fail to reject the null hypothesis
3b	The S and E pillar exhibit a (stronger) positive or no relationship with short selling during respectively the COVID-19 Crisis and the Russia-Ukraine War	The S and E pillar exhibit a stronger (negative) relationship with short selling during respectively the COVID-19 Crisis and the Russia-Ukraine War	.291 (S, COVID-19) .099 (E, R-U War)	Fail to reject the null hypothesis

Note: this table provides an overview of the hypotheses tested in this paper. For *Hypothesis 1* and *2a*, there is sufficient evidence to reject the null hypothesis. For *Hypothesis 2b*, *3a*, and *3b*, there is not enough evidence to reject the null hypothesis.

The results of regressing ESG Pillar Scores on SSI did not reveal a stronger (negative) effect of the environmental and governance pillar compared to the social pillar. Hence, while the environmental and governance pillar exhibit a more positive relationship to financial performance (Friede et al., 2015), as well as the corporate focus on these pillars (ACTIAM, 2020; Goldman Sachs Asset Management, 2020), this is not reflected in SSI. In fact, the results showed that the environmental and social pillars were found to significantly affect SSI. While the first may come as no surprise, given the significant (corporate) focus on the environment (ACTIAM, 2020), the effect of the social pillar is surprising, considering it has lagged behind and is difficult to assess (Boffo & Patalano, 2020). A possible explanation may be that short sellers, as informed investors, have recognized the significance of this pillar at an early stage and attributed greater value to it, whereas for the average investor, the pillar has lagged behind. A potential reason why the governance pillar did not significantly relate to SSI during the sample period, is that governance principles are inherent in businesses for a longer time, especially in the S&P 500. For instance, corporate scandals involving

Enron and WorldCom in the early 2000s, already revealed the importance of strong corporate governance mechanisms (Arvidsson, 2010). Therefore, this may not be a substantial source of information for short sellers.

The global disruptions under review, the COVID-19 Crisis, and Russia-Ukraine War, revealed increased short selling activity compared to the Non-Crisis Period, in line with expectations (Ortmann et al., 2020; Umar et al., 2023; Wolf, 2022). While one could argue that this is driven by an upward trend in short selling over time, considering that COVID-19 corresponds to 2020-2021 and the Russia-Ukraine War to 2022, research has shown that short interest was in decline for S&P 500 stocks over the last decade (P. Mackintosh, 2022). The results suggest that CSR had a significantly negative relationship with short selling during the Russia-Ukraine War, and not during COVID-19. A possible explanation for the insignificant result for the COVID-19 period, is possibly related to the two distinguishing periods of the pandemic: a lockdown period, accompanied by increased economic instability, and an opening up period, a phase of recovery. The result of splitting the COVID-19 Crisis reveals that CSR significantly decreased short selling during the lockdown period of COVID-19, which was not found for the opening up period. In other words, in the period that saw a stock market crash and where the U.S. economy faced significant challenges (Barnes et al., 2021), stocks with higher CSR performance were less shorted. Therefore, CSR performance does decrease short selling significantly during the COVID-19 lockdown period and Russia-Ukraine War, but not during the entire COVID-19 Crisis.

Finally, while it was expected that the pillars of central importance during the COVID-19 Crisis (S) and Russia-Ukraine War (E) would exhibit stronger (negative) relationships with SSI, this expectation is only confirmed for the environmental pillar. Nevertheless, the results across all regression models demonstrate the one-sided significant negative effect of the environmental pillar, both during the entire period as well as the COVID-19 Crisis and the Russia-Ukraine War. Hence, the environmental pillar seems to be an important pillar in general, and not explicitly related to the energy crisis resulting from the war. In addition, while the social pillar did not significantly affect short selling during COVID-19, it did during the Russia-Ukraine War one year later. This may indicate it took time for the social pillar to demonstrate its relevance since COVID-19. Moreover, it possibly suggests that it took some time for firms to adjust to new standards relating to the social aspect, or that ESG Scores in general move slowly (J. Mackintosh, 2022).

In a time where CSR is in the center of corporate attention, this research offers multiple contributions. From a theoretical perspective, it provides evidence for the positive relationship between CSR and financial performance. In addition, this study expands the current knowledge on the relationship between CSR performance and short selling, which is both limited and mixed. Furthermore, to the best of my knowledge, this study is the first to analyze this relationship during global disruptions. From a practical perspective, the positive effect of CSR on the resilience against short selling may stimulate firms to engage more in CSR. While it is not expected that firms will

drastically change their strategies as a result of the negative relationship between CSR and short selling, it positively contributes to the overall assessment of benefits and drawbacks. Consequently, this result may accelerate CSR investments or take a more prominent position in determining (long-term) strategy. Moreover, the results during global disruptions reveal the resilience of firms in times of adverse market conditions. Considering that these periods are etched in the memories of people, both from a personal as well as a business perspective, this may serve as an additional catalyst to engage in CSR.

It is important to address the limitations of this study, as well as introducing suggestions for further research. Firstly, SSI is calculated on a yearly basis, while short sell data is published bi-monthly, potentially introducing noise into the metric. The decision for a yearly metric resulted from the availability of ESG Score databases for this study, which were all calculated on an annual basis. Another limitation concerns the possible presence of simultaneity, which was found in the robustness check. As discussed, no suitable IVs were found to deal with this problem, which is also a limitation. Additionally, this paper analyzes S&P 500 firms, therefore only accounting for the largest U.S. companies.

From these limitations, several suggestions for further research emerge. For instance, using daily updated RepRisk ESG Scores, which could provide a more nuanced identification of the CSR-short selling relationship and remove the noise of a yearly average. Moreover, given the divergent and untransparent methodologies employed by ESG Score providers, it may be interesting to investigate the relationship between short selling and concrete performance metrics, such as green patents, CO₂ emissions or carbon offsetting. Another suggestion for further research is to analyze an index for smaller firms, such as the firms in the Russell 2000 index. Smaller companies operate under different conditions, face other challenges, and perhaps reveal contrasting investor behavior. Lastly, conducting a similar study for European companies would be interesting. The reason for this suggestion is that since the beginning of 2023, the EU Corporate Sustainability Reporting Directive came into effect, obligating large and listed companies to report on ESG.

REFERENCES

- ACTIAM. (2020, December). *The 'S' more central in ESG*.
<https://www.actiam.com/nl/beleggingsoplossingen/s-meer-centraal-binnen-esg>.
- Albuquerque, R., Koskinen, Y., Yang, S., & Zhang, C. (2020). Resiliency of environmental and social stocks: An analysis of the exogenous COVID-19 market crash. *The Review of Corporate Finance Studies*, 9(3), 593-621.
- Alexander, G. J., & Buchholz, R. A. (1978). Corporate social responsibility and stock market performance. *Academy of Management Journal*, 21(3), 479-486.
- Allouche, J., & Laroche, P. (2005). A meta-analytical investigation of the relationship between corporate social and financial performance. *Revue De Gestion Des Ressources Humaines*, (57), 18.
- Angel, J. J., Christophe, S. E., & Ferri, M. G. (2003). A close look at short selling on Nasdaq. *Financial Analysts Journal*, 59(6), 66-74.
- Arvidsson, S. (2010). Communication of corporate social responsibility: A study of the views of management teams in large companies. *Journal of Business Ethics*, 96, 339-354.
- Asquith, P., Pathak, P. A., & Ritter, J. R. (2005). Short interest, institutional ownership, and stock returns. *Journal of Financial Economics*, 78(2), 243-276.
- Aupperle, K. E., Carroll, A. B., & Hatfield, J. D. (1985). An empirical examination of the relationship between corporate social responsibility and profitability. *Academy of Management Journal*, 28(2), 446-463.
- Austin, P. C., & Steyerberg, E. W. (2015). The number of subjects per variable required in linear regression analyses. *Journal of clinical epidemiology*, 68(6), 627-636.
- Aydoğmuş, M., Gülay, G., & Ergun, K. (2022). Impact of ESG performance on firm value and profitability. *Borsa Istanbul Review*.
- Bae, K.H., El Ghouli, S., Gong, Z.J., & Guedhami, O. (2021). Does CSR matter in times of crisis? evidence from the COVID-19 pandemic. *Journal of Corporate Finance*, 67, 101876.
- Baird, P. L., Geylani, P. C., & Roberts, J. A. (2012). Corporate social and financial performance re-examined: Industry effects in a linear mixed model analysis. *Journal of Business Ethics*, 109, 367-388.
- Barnes, M., Bauer, L., & Edelberg, W. (2021). 11 Facts on the economic recovery from the COVID-19 pandemic. *Hamilton Project Economic Facts*.
- Barnett, M. L., & Salomon, R. M. (2006). Beyond dichotomy: The curvilinear relationship between social responsibility and financial performance. *Strategic Management Journal*, 27(11), 1101-1122.
- Berg, F., Koelbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, 26(6), 1315-1344.
- Blowfield, M. (2005). Corporate social responsibility-the failing discipline and why it matters for international relations. *International Relations*, 19(2), 173-191.
- Boef, A. G., Dekkers, O. M., Vandenbroucke, J. P., & le Cessie, S. (2014). Sample size importantly limits the usefulness of instrumental variable methods, depending on instrument strength and level of confounding. *Journal of Clinical Epidemiology*, 67(11), 1258-1264.

- Boehmer, E., Jones, C. M., & Zhang, X. (2008). Which shorts are informed? *The Journal of Finance*, 63(2), 491-527.
- Boehmer, E., & Wu, J. (2013). Short selling and the price discovery process. *The Review of Financial Studies*, 26(2), 287-322.
- Boffo, R., & Patalano, R. (2020). ESG investing: practices, progress and challenges. *Editions OCDE, Paris*.
- Bowen, H. (1953). Social responsibilities of the businessman. *New York: Harper*.
- Bowman, R. G. (1980). The importance of a market-value measurement of debt in assessing leverage. *Journal of Accounting Research*, 242-254.
- Bradley, C., Hirt, M., & Smit, S. (2018). *Strategy beyond the hockey stick: People, probabilities, and big moves to beat the odds*. John Wiley & Sons.
- Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica: Journal of the Econometric Society*, 1287-1294.
- Broadstock, D. C., Chan, K., Cheng, L. T., & Wang, X. (2021). The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China. *Finance Research Letters*, 38, 101716.
- Brooks, C. (2019). *Introductory econometrics for finance*. Cambridge university press.
- Business Roundtable. (2019). Business roundtable redefines the purpose of a corporation to promote 'an economy that serves all Americans'. *Business Roundtable*.
- Cai, L., Cui, J., & Jo, H. (2016). Corporate environmental responsibility and firm risk. *Journal of Business Ethics*, 139, 563-594.
- Carroll, A. B. (1979). A three-dimensional conceptual model of corporate performance. *Academy of Management Review*, 4(4), 497-505.
- Carroll, A. B. (2021). Corporate social responsibility: Perspectives on the CSR construct's development and future. *Business & Society*, 60(6), 1258-1278.
- Carroll, A. B., & Shabana, K. M. (2010). The business case for corporate social responsibility: A review of concepts, research and practice. *International Journal of Management Reviews*, 12(1), 85-105.
- Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, 35(1), 1-23.
- Cheng, C. A., Collins, D., & Huang, H. H. (2006). Shareholder rights, financial disclosure and the cost of equity capital. *Review of Quantitative Finance and Accounting*, 27, 175-204.
- Christophe, S. E., Ferri, M. G., & Angel, J. J. (2004). Short-selling prior to earnings announcements. *The Journal of Finance*, 59(4), 1845-1876.
- Cini, A. C., & Ricci, C. (2018). CSR as a driver where ESG performance will ultimately matter. *Symphonya. Emerging Issues in Management*, (1), 68-75.
- Clancey-Shang, D., & Fu, C. (2022). CSR disclosure, political risk and market quality: Evidence from the Russia-Ukraine conflict. Available at SSRN 4181022.
- Clarkson, M. E. (1995). A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of Management Review*, 20(1), 92-117.

- CNBC. (2021, October 27). *Bank of America CEO Brian Moynihan on going green disclosing climate risks* [Video]. <https://www.cnbc.com/video/2021/10/27/bank-of-america-ceo-brian-moynihan-on-going-green-disclosing-climate-risks.html>.
- Comerton-Forde, C., Jones, C. M., & Putniņš, T. J. (2016). Shorting at close range: A tale of two types. *Journal of Financial Economics*, 121(3), 546-568.
- Connolly, R. A., & Hirschey, M. (2005). Firm size and the effect of R&D on Tobin's q. *R&D Management*, 35(2), 217-223.
- Daske, H., Richardson, S. A., & Tuna, A. (2005). Do short sale transactions precede bad news events? Available at SSRN 722242.
- Davidson, W. N., & Worrell, D. L. (1990). A comparison and test of the use of accounting and stock-market data in relating corporate social-responsibility and financial performance. *Akron Business and Economic Review*, 21(3), 7-19.
- De Bakker, F. G., Groenewegen, P., & Den Hond, F. (2005). A bibliometric analysis of 30 years of research and theory on corporate social responsibility and corporate social performance. *Business & Society*, 44(3), 283-317.
- Dechow, P. M., Hutton, A. P., Meulbroek, L., & Sloan, R. G. (2001). Short-sellers, fundamental analysis, and stock returns. *Journal of Financial Economics*, 61(1), 77-106.
- Deloitte. (2023). The year 2022, the most extreme energy-year-ever. <https://www2.deloitte.com/nl/nl/pages/energy-resources-industrials/articles/2022-the-most-extreme-energy-year-ever.html>.
- Desai, H., Krishnamurthy, S., & Venkataraman, K. (2006). Do short sellers target firms with poor earnings quality? Evidence from earnings restatements. *Review of Accounting Studies*, 11, 71-90.
- Diamond, D. W., & Verrecchia, R. E. (1987). Constraints on short-selling and asset price adjustment to private information. *Journal of Financial Economics*, 18(2), 277-311.
- Diaz, J. F., & Pandey, R. (2019). Factors affecting return on assets of US technology and financial corporations. *Jurnal Manajemen Dan Kewirausahaan*, 21(2), 134-144.
- Diether, K. B., Lee, K., & Werner, I. M. (2009). Short-sale strategies and return predictability. *The Review of Financial Studies*, 22(2), 575-607.
- Ding, W., Levine, R., Lin, C., & Xie, W. (2021). Corporate immunity to the COVID-19 pandemic. *Journal of Financial Economics*, 141(2), 802-830.
- Dowell, G., Hart, S., & Yeung, B. (2000). Do corporate global environmental standards create or destroy market value? *Management science*, 46(8), 1059-1074.
- Dranove, D. (2012). Practical Regression: Introduction to endogeneity: Omitted variable bias. *Northwestern University Kellogg School of Management Technical Note*, 7, 112.
- El Ghouli, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 35(9), 2388-2406.
- Engelberg, J. E., Reed, A. V., & Ringgenberg, M. C. (2012). How are shorts informed?: Short sellers, news, and information processing. *Journal of Financial Economics*, 105(2), 260-278.
- FINRA. (n.d.). Short interest reporting. <https://www.finra.org/filing-reporting/regulatory-filing-systems/short-interest>.
- Freeman, R. (1984). Strategic management: a stakeholder approach. Pitman, Boston Freeman RE (1994) The politics of stakeholder theory: some future directions. *Bus Ethics Q*, 4(4), 409-421.

- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4), 210-233.
- Friedman, M. (1962). *Capitalism and freedom: With the assistance of Rose D. Friedman*. University of Chicago Press.
- Friedman, M. (1970). A Friedman doctrine: The social responsibility of business is to increase its profits. *The New York Times Magazine*, 13(1970), 32-33.
- Gao, L., Lu, J., Wang, W., & Xiong, Y. (2021). Corporate social responsibility and short-selling: Evidence from China. Available at SSRN 3969050.
- Gauthier, C. (2005). Measuring corporate social and environmental performance: The extended life-cycle assessment. *Journal of Business Ethics*, 59, 199-206.
- Gentry, R. J., & Shen, W. (2010). The relationship between accounting and market measures of firm financial performance: How strong is it? *Journal of Managerial Issues*, 514-530.
- Goldman Sachs Asset Management. (2020, April 22). COVID-19 and the rising importance of the 'S' in ESG. https://www.gsam.com/COVID-19_and_the_Rising_Importance_of_the_S_in_ESG.html.
- Goldman Sachs Assets Management. (2022, March 11). ESG implications of Russia-Ukraine conflict. <https://www.investmentofficer.nl/goldman-sachs-esg-implications-russia-ukraine-conflict>
- Goldstein, I., & Guembel, A. (2008). Manipulation and the allocational role of prices. *The Review of Economic Studies*, 75(1), 133-164.
- Gösser, N., & Moshgbar, N. (2020). *Smoothing time fixed effects* (No. 343). DICE Discussion Paper.
- Governance & Accountability Institute. (2019, May 16). Navigating the way to sustainability. <https://www.ga-institute.com/sustainability-responsibility-reports.html>.
- Grullon, G., Michenaud, S., & Weston, J. P. (2015). The real effects of short-selling constraints. *The Review of Financial Studies*, 28(6), 1737-1767.
- Guerrieri, V., Lorenzoni, G., Straub, L., & Werning, I. (2022). Macroeconomic implications of COVID-19: Can negative supply shocks cause demand shortages? *American Economic Review*, 112(5), 1437-1474.
- Hagel, J., Brown, J., & Lui, M. (2013). Success or struggle: ROA as a true measure of business performance. Deloitte Insights.
- He, J., & Tian, X. (2016). Do short sellers exacerbate or mitigate managerial myopia? evidence from patenting activities.
- Hedberg, C., & Von Malmberg, F. (2003). The global reporting initiative and corporate sustainability reporting in Swedish companies. *Corporate Social Responsibility and Environmental Management*, 10(3), 153-164.
- Henry, Ó T., & McKenzie, M. (2006). The impact of short selling on the price-volume relationship: Evidence from Hong Kong. *The Journal of Business*, 79(2), 671-691.
- Hill, A. D., Johnson, S. G., Greco, L. M., O'Boyle, E. H., & Walter, S. L. (2021). Endogeneity: A review and agenda for the methodology-practice divide affecting micro and macro research. *Journal of Management*, 47(1), 105-143.
- Hillman, A. J., & Keim, G. D. (2001). Shareholder value, stakeholder management, and social issues: What's the bottom line? *Strategic Management Journal*, 22(2), 125-139.

- Hirshleifer, D., Teoh, S. H., & Yu, J. J. (2011). Short arbitrage, return asymmetry, and the accrual anomaly. *The Review of Financial Studies*, 24(7), 2429-2461.
- Hong, H., Li, W., Ni, S. X., Scheinkman, J. A., & Yan, P. (2015). *Days to cover and stock returns* (No. w21166). Working paper. National Bureau of Economic Research.
- Huber, B. M., Comstock, M., & Polk, D. (2017). ESG reports and ratings: What they are, why they matter. *The Corporate Governance Advisor*, 25(5), 1-12.
- Ibhagui, O. W., & Olokoyo, F. O. (2018). Leverage and firm performance: New evidence on the role of firm size. *The North American Journal of Economics and Finance*, 45, 57-82.
- Jain, A., Jain, P. K., McInish, T. H., & McKenzie, M. (2013). Worldwide reach of short selling regulations. *Journal of Financial Economics*, 109(1), 177-197.
- Jain, A., Jain, P. K., & Rezaee, Z. (2016). Value-relevance of corporate social responsibility: Evidence from short selling. *Journal of Management Accounting Research*, 28(2), 29-52.
- Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance*, 48(1), 65-91.
- Jo, H., Hsu, A., Llanos-Popolizio, R., & Vergara-Vega, J. (2021). Corporate governance and financial fraud of Wirecard. *European Journal of Business and Management Research*, 6(2), 96-106.
- Kapoor, S. (2021). Evolution of corporate social responsibility. *Issue 4 Int'L JL Mgmt. & Human.*, 4, 3776.
- Karpoff, J. M., & Lou, X. (2010). Short sellers and financial misconduct. *The Journal of Finance*, 65(5), 1879-1913.
- Kell, G. (2018, July 11). The remarkable rise of ESG. <https://www.forbes.com/sites/georgkell/2018/07/11/the-remarkable-rise-of-esg/?sh=58cd6b16951f>.
- Kiernan, P. (2020, March 30). SEC Chairman: Government Shouldn't Ban Short Selling in Current Market. *The Wall Street Journal*. <https://www.wsj.com/articles/sec-chairman-government-shouldnt-ban-short-selling-in-current-market>
- Kim, I., & Venkatachalam, M. (2011). Are sin stocks paying the price for accounting sins? *Journal of Accounting, Auditing & Finance*, 26(2), 415-442.
- Kot, H. W. (2007). What determines the level of short-selling activity? *Financial Management*, 123-141.
- Kurucz, E. C., Colbert, B. A., & Wheeler, D. (2008). The business case for corporate social responsibility.
- Latapí Agudelo, M. A., Jóhannsdóttir, L., & Davídsdóttir, B. (2019). A literature review of the history and evolution of corporate social responsibility. *International Journal of Corporate Social Responsibility*, 4(1), 1-23.
- Levitt, T. (1958). The dangers of social-responsibility. *Harvard Business Review*, 36(5), 41-50.
- Lin, L., Hung, P., Chou, D., & Lai, C. W. (2019). Financial performance and corporate social responsibility: Empirical evidence from Taiwan. *Asia Pacific Management Review*, 24(1), 61-71.
- Lu, L. Y., Yu, Y., & Zhang, L. (2016). Short selling pressure and corporate social responsibility performance.
- Luu, E., Xu, F., & Zheng, L. (2023). Short-selling activities in the time of COVID-19. *The British Accounting Review*, 101216.

- Mackintosh, J. (2022, March 27). War in Ukraine Reveals Flaws in Sustainable Investing. *The Wall Street Journal*, <https://www.wsj.com/war-in-ukraine-reveals-flaws-in-sustainable-investing>.
- Mackintosh, P. (2022, March 3). Short interest in decline. <https://www.nasdaq.com/articles/short-interest-in-decline>.
- Margolis, J. D., Elfenbein, H. A., & Walsh, J. P. (2009). Does it pay to be good... and does it matter? A meta-analysis of the relationship between corporate social and financial performance. *And does it Matter*.
- Massa, M., Zhang, B., & Zhang, H. (2013). Governance through threat: Does short selling improve internal governance?
- Massa, M., Zhang, B., & Zhang, H. (2015). The invisible hand of short selling: Does short selling discipline earnings management? *The Review of Financial Studies*, 28(6), 1701-1736.
- Maziarz, M. (2015). A review of the granger-causality fallacy. *The Journal of Philosophical Economics: Reflections on Economic and Social Issues*, 8(2), 86-105.
- McGuire, J. B., Sundgren, A., & Schneeweis, T. (1988). Corporate social responsibility and firm financial performance. *Academy of Management Journal*, 31(4), 854-872.
- McWilliams, A., & Siegel, D. (2000). Corporate social responsibility and financial performance: Correlation or misspecification? *Strategic Management Journal*, 21(5), 603-609.
- Meier, S., & Cassar, L. (2018, January 31). Stop talking about how CSR helps your bottom line. *Harvard Business Review*, <https://hbr.org/2018/01/stop-talking-about-how-csr-helps-your-bottom-line>.
- MFA. (2022, June). The use of short selling to achieve ESG goals. <https://www.managedfunds.org/wp-content/uploads/2022/09/ESG-Short-Selling-White-Paper.pdf>.
- Mitchell, M., Pulvino, T., & Stafford, E. (2004). Price pressure around mergers. *The Journal of Finance*, 59(1), 31-63.
- Nelling, E., & Webb, E. (2009). Corporate social responsibility and financial performance: The “virtuous circle” revisited. *Review of Quantitative Finance and Accounting*, 32, 197-209.
- Ng, A. C., & Rezaee, Z. (2015). Business sustainability performance and cost of equity capital. *Journal of Corporate Finance*, 34, 128-149.
- Nuttall, R. (2020, May). Why ESG is here to stay. *McKinsey*.
- Opler, T. C., & Titman, S. (1994). Financial distress and corporate performance. *The Journal of Finance*, 49(3), 1015-1040.
- Orlitzky, M. (2001). Does firm size confound the relationship between corporate social performance and firm financial performance? *Journal of Business Ethics*, 33, 167-180.
- Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. *Organization Studies*, 24(3), 403-441.
- Ortmann, R., Pelster, M., & Wengerek, S. T. (2020). COVID-19 and investor behavior. *Finance Research Letters*, 37, 101717.
- Pérez, L., Hunt, V., Samandari, H., Nuttall, R., & Biniek, K. (2022). Does ESG really matter—and why. *McKinsey Quarterly*.
- Polley, C. (2022, February 10). ESG vs. CSR: What’s the difference? <https://thesustainableagency.com/blog/esg-vs-csr/>.

- Porter, M. E., & Kramer, M. R. (2006). The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84(12), 78-92.
- Ramezani, C. A., Soenen, L., & Jung, A. (2002). Growth, corporate profitability, and value creation. *Financial Analysts Journal*, 58(6), 56-67.
- Refinitiv. (2022). Environmental, social and governance (ESG) scores from Refinitiv. <https://www.refinitiv.com/refinitiv-esg-scores-methodology.pdf>.
- Rhee, S. G. (2003). Short-sale constraints: Good or bad news for the stock market. *Organization for Economic Cooperation and Development Report*.
- Ruf, B. M., Muralidhar, K., Brown, R. M., Janney, J. J., & Paul, K. (2001). An empirical investigation of the relationship between change in corporate social performance and financial performance: A stakeholder theory perspective. *Journal of Business Ethics*, 32, 143-156.
- Rusinova, V., & Wernicke, G. (2019, July). Short selling and performance on corporate social responsibility: Evidence from a natural experiment. In *Academy of Management Proceedings* (Vol. 2019, No. 1, p. 17145). Briarcliff Manor, NY 10510: Academy of Management.
- Saffi, P. A., & Sigurdsson, K. (2011). Price efficiency and short selling. *The Review of Financial Studies*, 24(3), 821-852.
- SEC. (2022). Key points about regulation SHO. <https://www.sec.gov/investor/pubs/regsho.htm>.
- SEC. (2023, May 25). Frequently asked questions about form 13F. <https://www.sec.gov/divisions/investment/13ffaq>.
- Senaviratna, N., & A Cooray, T. (2019). Diagnosing multicollinearity of logistic regression model. *Asian Journal of Probability and Statistics*, 5(2), 1-9.
- Siciliano, G., & Ventoruzzo, M. (2020). Banning Cassandra from the market? an empirical analysis of short-selling bans during the COVID-19 crisis. *European Company and Financial Law Review*, 17(3-4), 386-418.
- Singh, S., Tabassum, N., Darwish, T. K., & Batsakis, G. (2018). Corporate governance and Tobin's Q as a measure of organizational performance. *British Journal of Management*, 29(1), 171-190.
- Smith, N. C. (2000). Changes in corporate practices in response to public interest advocacy and actions: The role of consumer boycotts and socially responsible corporate social responsibility.
- Soto, P. (2023, February 6). Measurement and effects of supply chain bottlenecks using natural language processing. <https://www.federalreserve.gov/measurement-and-effects-of-supply-chain-bottlenecks-using-natural-language-processing.html>.
- Staub-Bisang, M. (2012). *Sustainable investing for institutional investors: Risks, regulations and strategies*. John Wiley & Sons.
- Sturm, R. (1998). Instrumental variable methods for effectiveness research. *International Journal of Methods in Psychiatric Research*, 7(1), 17-26.
- Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, 43(1), 1-19.
- Umar, Z., Bossman, A., Choi, S., & Vo, X. V. (2023). Are short stocks susceptible to geopolitical shocks? time-frequency evidence from the Russian-Ukrainian conflict. *Finance Research Letters*, 52, 103388.
- Van Beurden, P., & Gössling, T. (2008). The worth of values—a literature review on the relation between corporate social and financial performance. *Journal of Business Ethics*, 82, 407-424.

- Waddock, S. A., & Graves, S. B. (1997). The corporate social performance–financial performance link. *Strategic Management Journal*, 18(4), 303-319.
- Wallich, H. C., & McGowan, J. J. (1970). Stockholder interest and the corporation's role in social policy. *A New Rationale for Corporate Social Policy*, 39-59.
- Wartick, S. L., & Cochran, P. L. (1985). The evolution of the corporate social performance model. *Academy of Management Review*, 10(4), 758-769.
- Wolf, M. (2022, April 26). War in Ukraine is causing a many-sided economic shock. *Financial Times*. <https://www.ft.com/content/d4bde497-edbf-4baa-bfa3-d06b07c63f79>.
- Wooldridge, J. M. (1996). *Introductory Econometrics: A Modern Approach*. 5th edition. South-Western Cengage Learning.
- World Health Organization. (2020, October 13). Impact of COVID-19 on people's livelihoods, their health and our food systems. <https://www.who.int/impact-of-covid-19>.
- Yakusheva, O., van den Broek-Altenburg, E., Brekke, G., & Atherly, A. (2022). Lives saved and lost in the first six month of the US COVID-19 pandemic: A retrospective cost-benefit analysis. *Plos One*, 17(1), e0261759.
- Zahller, K. A., Arnold, V., & Roberts, R. W. (2015). Using CSR disclosure quality to develop social resilience to exogenous shocks: A test of investor perceptions. *Behavioral Research in Accounting*, 27(2), 155-177.
- Zhang, W. (2021). *Green Or Brown: Which Overpriced Stock to Short Sell*. Working paper, Chinese University of Hong Kong.
- Zhang, Y., He, J., He, M., & Li, S. (2023). Geopolitical risk and stock market volatility: A global perspective. *Finance Research Letters*, 53, 103620.

APPENDIX A

Table 11

Weight allocation ESG Score

Pillar	Category	Category weights	Sum of category weights
Environmental	Emissions	0.15	0.44
	Resource use	0.15	
	Innovation	0.13	
Social	Community	0.09	0.31
	Human rights	0.05	
	Product responsibility	0.04	
	Workforce	0.13	
Governance	Shareholders	0.05	0.26
	CSR strategy	0.03	
	Management	0.17	

Note: this table shows the weight allocation of each category in relation to the corresponding pillar. The total ESG Score is determined by the weighting of the three ESG pillars (Refinitiv, 2022).

Table 12

Descriptive statistics Non-Crisis Period

Variables	Mean	Median	SD	Min	Max	N	Skewn.	Kurt.
ROA	.08	.07	0.07	-.26	.54	2403	1.39	8.63
Tobin's Q	2.03	1.59	1.84	-.21	25.82	2403	3.52	26.48
SSI	.03	.02	0.03	0	.3	2403	2.56	12.62
ESG Score	57.78	58.93	17.21	2.46	93.14	2403	-.3	2.47
E Score	50.41	53.98	27.18	0	98.55	2403	-.36	2.03
S Score	59.72	60.93	19.76	3.24	98.01	2403	-.23	2.29
G Score	60.71	63.01	19.52	2.25	98.56	2403	-.43	2.49
Total Assets (\$b)	67.14	16.4	218.93	.26	2687.38	2403	8.13	79.69
Leverage	1.24	.77	3.70	-45.05	67.07	2403	6.56	134.55
ROS	.12	.1	0.11	-.83	.81	2403	.43	10.15
Sales (\$b)	21.8	8.6	42.64	.23	523.96	2403	5.62	49.08
Institutional Ownership	.82	.84	0.14	.01	1.34	2403	-.94	5.23
Market Cap. (\$b)	43.33	18.47	82.73	1.27	1304.76	2403	6.75	70.42
Daily Trading Volume (m)	3.8	1.98	6.20	.03	85.7	2403	5.9	54.94
DTC	3.98	3.25	2.52	.63	26.96	2403	2.4	12.13
MTBV	6.43	3.39	22.42	-95.63	595.3	2403	17.02	389.71
Stock Return	.14	.12	0.28	-.62	4.73	2403	2.7	36.53

Note: this table shows the descriptive statistics for the raw dependent, independent and control variables over the entire sample period (2014-2022). It is important to note that Total Assets, Sales, and Market Cap. are displayed in billions of dollars, whereas Daily Trading Volume is denoted in million units.

Table 13*Descriptive statistics COVID-19 Crisis*

Variables	Mean	Median	SD	Min	Max	N	Skewn.	Kurt.
ROA	.08	.06	0.09	-.29	.77	901	1.28	12.12
Tobin's Q	2.4	1.56	2.48	-.23	22.81	901	2.55	12.67
SSI	.02	.02	0.02	0	.18	901	2.55	12
ESG Score	67.43	69.49	13.71	23.37	93.62	901	-.66	3.04
E Score	61.68	66.64	21.98	0	97.6	901	-.74	2.84
S Score	70.18	73.1	16.41	19.6	97.48	901	-.62	2.77
G Score	67.33	69.97	17.62	10.59	99.44	901	-.53	2.59
Total Assets (\$b)	85.59	22.3	283.06	1.11	3743.57	901	8.62	89.85
Leverage	1.37	.75	18.50	-340.38	422.1	901	6.03	427.64
ROS	.1	.12	0.40	-6.95	1.56	901	-10.04	149.05
Sales (\$b)	25.57	10.15	51.51	.65	572.75	901	5.51	44.07
Institutional Ownership	.81	.82	0.13	.26	1.25	901	-.74	4.44
Market Cap. (\$b)	76.81	29.25	205.98	3.54	2916.9	901	8.91	97.49
Daily Trading Volume (m)	4.82	2.08	9.24	.02	98.39	901	5.42	40.62
DTC	2.94	2.41	1.90	.62	25.7	901	4.09	33.4
MTBV	8.44	3.64	21.75	-84.49	248.72	901	6.08	55.41
Stock Return	.26	.21	0.51	-.73	8.2	901	5.97	81.39

Note: this table shows the descriptive statistics for the raw dependent, independent and control variables over the entire sample period (2014-2022). It is important to note that Total Assets, Sales, and Market Cap. are displayed in billions of dollars, whereas Daily Trading Volume is denoted in million units.

Table 14*Descriptive statistics Russia-Ukraine War*

Variables	Mean	Median	SD	Min	Max	N	Skewn.	Kurt.
ROA	.09	.08	0.07	-.22	.35	142	.22	5.88
Tobin's Q	2.49	1.81	2.20	-.19	11.7	142	1.84	6.84
SSI	.02	.02	0.02	0	.12	142	2.65	12.53
ESG Score	67.89	69.75	12.59	37.83	91.57	142	-.38	2.46
E Score	61.64	64.08	21.36	4.58	96.66	142	-.52	2.62
S Score	70.12	71.38	14.69	34.88	94.35	142	-.5	2.6
G Score	67.74	69.23	16.73	27.62	99.19	142	-.33	2.17
Total Assets (\$b)	80.28	22.17	247.72	1.61	2383.32	142	7.07	60.18
Leverage	1.16	.64	1.90	-4.37	12.53	142	3.21	19.13
ROS	.13	.12	0.11	-.27	.5	142	.73	5.38
Sales (\$b)	33.53	12.61	77.11	.72	611.29	142	5.33	35.24
Institutional Ownership	.8	.81	0.15	.3	1.19	142	-.29	4.02
Market Cap. (\$b)	71.84	31.28	175.34	6.18	1790.02	142	7.51	69.12
Daily Trading Volume (m)	4.76	1.84	9.86	.27	72.39	142	4.52	25.6
DTC	2.69	2.18	1.41	.57	9.91	142	1.94	7.94
MTBV	6.6	3.9	10.88	-45.39	79.89	142	2.16	21.73
Stock Return	-.15	-.19	0.22	-.68	.68	142	.76	4.24

Note: this table shows the descriptive statistics for the raw dependent, independent and control variables over the entire sample period (2014-2022). It is important to note that Total Assets, Sales, and Market Cap. are displayed in billions of dollars, whereas Daily Trading Volume is denoted in million units.

APPENDIX B

Table 15

Pearson correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) ROA	1.000								
(2) Tobin's Q	0.660*	1.000							
(3) SSI	-0.042*	-0.030	1.000						
(4) ESG Score	-0.061*	-0.088*	-0.229*	1.000					
(5) E Score	-0.091*	-0.114*	-0.203*	0.832*	1.000				
(6) S Score	-0.017	-0.031	-0.216*	0.864*	0.684*	1.000			
(7) G Score	-0.059*	-0.111*	-0.102*	0.633*	0.328*	0.280*	1.000		
(8) Firm Size	-0.426*	-0.643*	-0.391*	0.426*	0.448*	0.369*	0.219*	1.000	
(9) Leverage	-0.208*	-0.104*	0.051*	0.158*	0.205*	0.093*	0.106*	0.206*	1.000
(10) ROS	0.485*	0.198*	-0.251*	0.066*	0.002	0.106*	0.022	0.051*	-0.108*
(11) Sales Growth	0.211*	0.275*	-0.016	-0.234*	-0.266*	-0.167*	-0.144*	-0.181*	-0.179*
(12) Institutional Ownership	-0.021	0.093*	0.310*	-0.226*	-0.278*	-0.199*	-0.061*	-0.348*	0.000
(13) Market Cap.	0.103*	0.089*	-0.561*	0.466*	0.454*	0.457*	0.169*	0.667*	0.075*
(14) Daily Trading Volume	-0.182*	-0.274*	-0.079*	0.374*	0.406*	0.339*	0.165*	0.616*	0.154*
(15) DTC	0.058*	0.102*	0.681*	-0.229*	-0.221*	-0.199*	-0.137*	-0.373*	-0.006
(16) MTBV	-0.573*	-0.801*	0.056*	0.023	0.074*	-0.027	0.074*	0.484*	-0.148*
(17) Lagged(Stock Return)	0.270*	0.301*	-0.104*	-0.128*	-0.135*	-0.096*	-0.094*	-0.176*	-0.110*
(18) Stock Return Volatility	-0.056*	-0.003	0.205*	0.037*	0.019	0.052*	0.018	-0.085*	-0.039*

Variables	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(10) ROS	1.000								
(11) Sales Growth	0.160*	1.000							
(12) Institutional Ownership	-0.021	0.173*	1.000						
(13) Market Cap.	0.276*	0.014	-0.380*	1.000					
(14) Daily Trading Volume	-0.083*	-0.166*	-0.288*	0.527*	1.000				
(15) DTC	-0.033*	-0.009	0.155*	-0.393*	-0.330*	1.000			
(16) MTBV	-0.180*	-0.165*	-0.056*	-0.165*	0.241*	-0.088*	1.000		
(17) Lagged(Stock Return)	0.150*	0.358*	0.033	0.057*	-0.133*	-0.094*	-0.276*	1.000	
(18) Stock Return Volatility	-0.186*	0.108*	0.138*	-0.106*	0.161*	-0.220*	0.065*	0.000	1.000

Note: this table displays the pairwise correlations between all the variables employed in this study. 5% significance is denoted by *.

Table 16*Variance inflation factors CSR and financial performance*

Variable	VIF	1/VIF
ESG Score	1.24	0.8091
Firm Size	1.23	0.8146
Leverage	1.09	0.9205
Return on Sales	1.06	0.9475
Sales Growth	1.10	0.9052
Mean	1.14	

Note: this table displays the VIFs for the regression model on CSR performance and financial performance. The cut-off value for multicollinearity is $VIF > 10$.

Table 17*Variance inflation factors CSR and short selling*

Variable	VIF	1/VIF
Institutional Ownership	1.26	0.7962
Market Cap.	2.25	0.4453
Daily Trading Volume	1.87	0.5354
DTC	1.37	0.7292
MTBV	1.42	0.7056
Leverage	1.13	0.8847
Lagged(Stock Return)	1.12	0.8901
Stock Return Volatility	1.22	0.8901
Mean	1.44	

Note: this table displays the VIFs for the regression model on CSR performance and short selling. The cut-off value for multicollinearity is $VIF > 10$.

Table 18*Granger causality test results*

Null hypothesis	Observations	χ^2	<i>p</i> -value
ESG Score does not Granger cause SSI	3,446	6.505	.039
SSI does not Granger cause ESG Score	3,446	13.214	.001

Note: this table displays the results of the Granger causality test. The null hypothesis is rejected if *p*-value $< .05$.

Table 19*Regression results detrended SSI*

Variables	(1) Detrended SSI	(2) Detrended SSI	(3) Detrended SSI	(4) Detrended SSI
ESG Score	-0.000613 (0.000436)			
E Score		-0.000361 (0.000269)		
S Score			-0.000717** (0.000337)	
G Score				6.44e-05 (0.000241)
Institutional Ownership	0.364*** (0.0287)	0.364*** (0.0289)	0.365*** (0.0287)	0.362*** (0.0287)
Market Cap.	0.122*** (0.0133)	0.122*** (0.0134)	0.122*** (0.0133)	0.121*** (0.0136)
Daily Trading Volume	0.600*** (0.0234)	0.601*** (0.0234)	0.600*** (0.0234)	0.601*** (0.0234)
DTC	0.0191** (0.00870)	0.0187** (0.00876)	0.0190** (0.00870)	0.0188** (0.00875)
MTBV	-0.454*** (0.0508)	-0.452*** (0.0511)	-0.454*** (0.0505)	-0.456*** (0.0512)
Leverage	-0.0359*** (0.00552)	-0.0356*** (0.00554)	-0.0358*** (0.00549)	-0.0357*** (0.00552)
Lagged(Stock Return)	-0.0206** (0.0102)	-0.0201** (0.0101)	-0.0209** (0.0101)	-0.0199* (0.0101)
Stock Return Volatility	-0.634*** (0.0163)	-0.635*** (0.0165)	-0.634*** (0.0163)	-0.634*** (0.0164)
Constant	-1.371*** (0.0789)	-1.391*** (0.0749)	-1.365*** (0.0777)	-1.403*** (0.0765)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3,446	3,446	3,446	3,446
Adjusted R^2	.762	.762	.762	.762

Note: this table shows the results of the regressions of ESG (Pillar) scores on the Detrended SSI over the entire sample period (2014-2022). The regressions control for both Industry and Year fixed effects. The robust standard errors are displayed in the parentheses. Significance is indicated by *, **, and ***, which represent the level of significance at the 10%, 5% and 1% level respectively.