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The stock market response to the announcement of new environmental policies in the EU: measuring the effect of ESG rating and public attention

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Abstract

This paper investigates the reaction of the stock market to announcements of new environmental policies by the EU over the years 2011 to 2020, while also considering the influence of ESG rating and public attention. Using the event study methodology, the results show a sector-by-sector reaction, which is in line with previous literature. However, there is no significant difference between the returns of socially responsible and irresponsible firms. Using panel data regression models, the effect of ESG rating and public attention is measured. Neither the ESG rating as a whole nor the separate pillars have a significant negative effect on the returns of socially irresponsible firms. While the level of public attention to either environmental issues or socially responsible investing does have a significant influence on the stock market, this paper shows no evidence for a combined effect with ESG rating. Overall, this paper contributes to the scarce literature investigating the relationship between environmental regulation and stock market performance. Moreover, it is the first paper to assess the EU stock market reaction to announcements of new environmental policies while also considering the effect of both ESG rating and public attention.

Keywords: Environmental Policies, Stock Return, Public Attention, Event Study, Socially Responsible Investing (SRI)

JEL Classification: C33, G12, G14, G41, Q58

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1 Introduction

Over the past decades, climate change has become one of the most pressing global issues. Since the year 2000, nineteen of the warmest years in history have occurred according to NASA's Goddard Institute for Space Studies (GISS) (NASA/GISS, n.d.). Over the years, several frameworks, treaties, and agreements have been created to establish an international policy as a response to the impacts of climate change. Examples of important policies are the Kyoto Protocol and the Paris Agreement. As one of the largest political forces worldwide, the European Union has demonstrated leadership in the global debate on environmental issues. Mitigating climate change has been one of the top priorities of the EU over the past decades. It has adopted several environmental policies on its own, including strategies, regulations, and laws. Such policies put pressure on firms within the EU to adopt strategies that help them mitigate their negative impact on climate change.

One way to measure firm impact is through ESG ratings. These assess firm behaviour towards dealing with environmental (E), social (S), and corporate governance (G) issues. Over the last years, the concept of socially responsible investing (SRI) has become a popular financial trend. This is an investment strategy that aims to generate both social change and financial returns. The relationship between ESG ratings or SRI and financial returns has been widely examined. However, the conclusion remains quite ambiguous. It would be interesting to see how this relates to the announcements of new environmental policies by the EU.

In the last years, the amount of public attention and media coverage of environmental issues has increased. Empirical evidence has shown that investor and public attention have a considerable influence on the stock market (e.g., Da, Engelberg, and Gao, 2011; Bijl, Kringhaug, Molnár, and Sandvik, 2016; Bank, Larch, and Peter, 2011; El Ouadghiri, and Peillex, 2018; El Ouadghiri, Guesmi, Peillex, and Ziegler, 2021). It can therefore be argued that the level of public attention to environmental issues influences the reaction of the stock market when a new environmental policy is announced.

Considering all this, this paper aims to answer the following research question: *'How does the stock market react to announcements of new environmental policies by the EU, and is this reaction influenced by ESG rating and public attention?'*.

This research contributes to the existing literature in several ways. First, it sheds more light on the relationship between environmental regulation and stock market performance. The literature on this remains ambiguous on the direction of the effect. Second, to the best of my knowledge, it is the first paper to assess the EU stock market reaction to announcements of new environmental policies while also considering the effect of both ESG rating and public attention. Most of the existing empirical literature only considers the firm's perspective of the relation. Since environmental awareness and socially responsible investing are becoming increasingly more popular in today's market, it is expected that the influence of investors on this relation is increasing significantly. Moreover, understanding the effect of public attention could be useful in establishing policies to promote financial mechanisms which are environmentally friendly. This paper also contributes to the growing literature that uses the Google Search Volume Index (GSVI) as a proxy for investor or public attention.

The data that is used in this research comes from several sources. First, announcements of environmental policies of the European Commission are collected for the period 2011 to 2020. Next, data on the daily stock prices for all firms included in the sample is obtained using the Eikon Datastream database. Data on the daily market prices, proxied by the Euro Stoxx 600 index, is also collected from the Eikon Datastream database. From these variables, the stock and market returns are calculated. Data on ESG ratings is collected using the Thomson Reuters ESG database, previously known as the ASSET4 database. This database establishes an ESG rating that consists of ten different categories merged into the three main pillars of the ESG score: Environmental, Social, and Governance. To measure the level of public attention, the standardised seven-day average Google Search Volume Index (GSVI) of search terms related to environmental issues and socially responsible investing is taken as a proxy following the research by Da et al. (2011). The search terms related to environmental issues that are included are 'global warming', 'climate change', 'sustainability', 'environmental pollution', and 'environmental governance'. The search terms related to socially responsible investing that are included are 'corporate social responsibility', 'ESG', 'environmental, social and corporate governance', 'socially responsible investing', and 'MSCI ESG'. Lastly, other financial information on the firms in the sample is collected from the Eikon Datastream database to establish control variables.

To examine whether the announcement of new environmental policies affects the stock returns of firms, the event study method of MacKinlay (1997) is used. Using this method, the abnormal returns (AR) and cumulative abnormal returns (CAR) for the event windows [-1, 1] and [-3, 3] are calculated. The normal returns are estimated over an estimation window of 100 trading days, specified as [-110, -11], using the market model with the Euro Stoxx 600 index as a proxy for the market return. The cumulative average abnormal returns (CAARs) are calculated for portfolios of different sectors within the sample. The results from a cross-sectional T-test testing whether the CAARs are statistically different from zero show that sectors show different reactions to the announcements of environmental policies by the EU. Overall, there are more negative than positive reactions in both event windows. CAARs are also calculated for two portfolios consisting of socially responsible and irresponsible firms. While in half of the events the portfolios of socially irresponsible firms show a lower reaction to the announcement than the portfolios of socially responsible firms, there is no significant difference between the reactions of the two portfolios. The estimates of regression models using panel data measuring the effect of the separate ESG pillars on the stock returns of socially irresponsible firms do not confirm that the negative effect of ESG rating as a whole is mainly driven by the environmental (E) pillar. Using regression models with panel data, this paper finds that the level of public attention to search terms related to environmental issues and socially responsible investing has a significant effect on the stock returns when the EU announces a new environmental policy. However, the interaction terms showing the combined effect of public attention and a firm having either a low or a high ESG rating do not show a significant effect. Robustness checks show comparable results. Overall, the findings of this paper show a sector-by-sector stock market reaction to announcements of new environmental policies by the EU. This reaction is often negative. Moreover, the stock returns are significantly influenced by public attention to environmental issues and socially responsible investing, but not by ESG rating.

The rest of this paper is structured as follows. Chapter 2 discusses relevant past literature on different concepts related to the research question. Also, several hypotheses are formulated to answer the research question. Chapter 3 describes the data used in this research and Chapter 4 discusses the methodology that is used. Chapter 5 presents the results that are obtained from the methods. Finally, chapter 6 concludes and reviews the findings from this study and presents some ideas for future research.

2 Theoretical Framework

In the first three subsections of this section, the most important concepts for this research are explained. These concepts are environmental policies, socially responsible investing (SRI) and ESG rating, and investor/public attention. Also, relevant existing evidence regarding the relationship between each of these concepts and the stock market performance will be discussed. In subsection four, empirical evidence regarding all concepts combined will be reviewed. The last subsection introduces several hypotheses based on the studied literature.

2.1 Environmental policies

Since this research investigates the effect of environmental policy announcements on the stock market, it is important to establish a definition of the concept ‘environmental policies’.

Environmental policies are designed to combat the harmful effects of human activities that lead to climate change and global warming. Such measures are established by public or private organisations, for example by governments or corporations (van Bueren, 2019). The need for environmental policies has risen because the decision-making of organisations often does not consider their effect on the environment. A reason for this is that it concerns externalities of which the organisations themselves usually do not bear the consequences. In the case of the environment, most of the negative side effects occur in the future (van Bueren, 2019).

Important international parties that help to establish environmental policies are the IPCC and the UNFCCC. In 1988, the Intergovernmental Panel on Climate Change (IPCC) was formed. This is an international panel of the United Nations that has the goal to review research and to establish assessment reports on global climate change. These assessment reports offer key input for the negotiations to establish international policies to combat climate change (IPCC, 2021). The reports produced by the IPCC contribute to the work of the United Nations Framework Convention on Climate Change (UNFCCC). This is the main international treaty on climate change which was first established in May 1992 and entered into force two years later. The UNFCCC has the main objective of stabilising greenhouse gas concentrations to prevent harmful effects of human activity on the climate (UNFCCC, n.d., a). The UNFCCC consists of 197 members and is the parent treaty of the most important global environmental policies: the Kyoto Protocol and the Paris Agreement.

The Kyoto Protocol is an international treaty established in 1997 which helps to work towards the objectives of the UNFCCC. It has the purpose of making industrialised countries and economies commit to limiting and reducing greenhouse gas emissions to individual targets. On average, these reduction targets amount to an emission reduction of 5% as compared to 1990 levels. This reduction had to be achieved from 2008 to 2012, also called the ‘first commitment period’. The reduction targets in the first commitment period were pursued by 37 industrialised countries and the European Union (consisting of 15 member states at the time) (UNFCCC, n.d., b). In 2012, the Kyoto Protocol was extended for a second commitment period by the Doha Amendment. However, the Doha Amendment took until 2020 to be accepted. It entered into force by the end of 2020 (UNFCCC, n.d., b).

The Paris Agreement is a legally binding agreement within the UNFCCC that was adopted in 2015. This agreement is an important milestone in the battle against global warming because it is the first globally binding agreement. The goal of the Paris Agreement is to limit global warming to 1.5 degrees Celsius above pre-industrial levels. All parties that signed the agreement are obligated to create national plans on how to reduce greenhouse gas emissions. These plans cover 5-year cycles of increasingly ambitious actions, as well as long-term strategies. All countries must regularly report on their plans. The Paris Agreement also provides a support framework for financial, technical, and capacity-building assistance across countries (UNFCCC, 2015).

For years, the European Union (EU) has demonstrated great leadership in the debate on climate change. Besides being a driving force behind global environmental policies, the EU has set ambitious policies itself. This paper researches the effect of announcements of environmental policies by the EU on the stock market, and thus it is interesting to investigate some of the most important pillars, such as the EU Emissions Trading System (EU ETS) and the European Green Deal.

One of the key methods used to reduce greenhouse gas emissions is through carbon markets. These markets allow for international trading of emission allowances. In 2005, the EU established the biggest and first major carbon market in the world: the EU ETS. This carbon market makes use of a ‘cap and trade’ system. This system sets a total amount of greenhouse gas emissions, which is called the ‘cap’. Within this ‘cap’, parties can trade on emission allowances, to fully cover their emissions. Over time, the ‘cap’ is reduced to make sure that the total level of emissions falls (European Commission, n.d., b). The EU ETS operates in phases and is now in its fourth phase which lasts from 2021 to 2030. As the ‘cap’ decreases over time, the system becomes more stringent per phase. The EU ETS forms the basis for a lot of environmental policies adopted by the EU.

In 2019, the European Green Deal was presented. This is a blueprint to create a sustainable economy for the EU and to make its ambitious climate plans a reality. The main objective of this strategy is to reach a climate-neutral EU by 2050. This is accompanied by the goal to reduce greenhouse gas emissions in the EU by at least 55% by 2030 (European Commission, n.d., a). The European Green Deal consists of both legislative and non-legislative initiatives across different sectors to accomplish this goal. In 2021, the European Climate Law was adopted to turn the political commitment of the European Green Deal into a legal obligation (European Council, n.d.). Moreover, the European Green Deal proposes other actions, such as investing in innovative environmentally friendly technologies and rolling out cleaner forms of public and private transport (European Commission, n.d., a).

Environmental policies have put pressure on firms to adopt their own regulations and strategies to make sure that they comply with the goals set to mitigate the negative impact on the climate. There remains a discussion on the effects of this. On the one hand, it could be argued that more regulation leads to higher production costs which in turn lead to lower production levels. On the other hand, better management of environmental matters because of more regulation could lead to favourable investor recognition. Because of these mixed arguments, it is interesting to investigate how environmental policies impact the performance of firms. One way to do this is to look at how the stock market reacts. There have been several papers that have researched this effect.

Research by Ramiah, Martin, and Moosa (2013) analyses the effect of announcements regarding policies against climate change on stocks listed on the Australian Stock Exchange in the period 2005-2011. The paper looks at the effects of the following events: the Kyoto Protocol, the climate change review, the carbon pollution reduction scheme (CPRS), and renewable energy schemes. In this paper, the event study methodology was used to determine the effect of environmental policy announcements on the stock market, accompanied by robustness tests and risk analysis. Both abnormal returns and cumulative abnormal returns were calculated for each stock. These are then grouped at the industry level to measure the differences between industries. The results of the paper show that 21 out of the 35 different industries, representing 60% of the stock market, were either positively or negatively affected by the announcement of environmental policies. There are more industries that experience negative abnormal returns. However, the paper finds that the most polluting industry, the electricity sector, did not experience a significant effect.

Ramiah, Pichelli, and Moosa (2015) examine how the announcements of environmental policies in the United States affect the domestic and international stock market between 1997 and 2011. Using the event study methodology and risk analysis, this paper finds that the announcement of environmental policies in the US had a major impact on both domestic and international industrial stock indices. The study finds an Obama effect in 2008, which shows a significant reaction in 62 domestic and 16 international industrial indices on the day that he was elected as president. The paper also finds a climate change effect, showing that environmental policy announcements had a positive or negative effect on several industrial portfolios. A distinction between polluting and environmentally friendly industries is also made. This distinction shows both positive and negative abnormal returns for polluting industries, though the negative returns are typically greater. For environmentally-friendly industries, only five announcements lead to significant abnormal returns. This is surprising and implies that such industries are relatively unresponsive to announcements of environmental policies.

The paper by Jiang and Luo (2018) researches the reaction of the Chinese stock market to the announcement of environmental policies related to the Copenhagen Climate Summit from 2009 to 2011. The authors expect that the environmental goals and regulations in China will be delayed instead of implemented immediately. The authors hypothesize that investors will react positively to such delayed announcements because firms have more time to continue their economic development without incorporating the costs of the regulations. Moreover, the authors believe that the market will react more positively in carbon-intensive industries. Using the event study methodology, this research calculates the abnormal returns and the cumulative abnormal returns of firms in the Chinese HS300 index. Moreover, cross-sectional analysis is used to assess which other firm-specific characteristics explain the market reaction. The results of the event study show a significant and positive mean abnormal return of the different announcements of 1.03%, thus confirming the first hypothesis. There is also a significantly positive cumulative mean abnormal return of 0.17% over a five-day event window. T-tests show that the mean returns of carbon-intensive industries are significantly more positive than those of non-carbon-intensive industries, confirming the second hypothesis. The results of the cross-sectional analysis show that the variables size, turnover, and growth are positively and significantly related to the market reaction measured by cumulative abnormal returns.

The paper by Pham, Nguyen, Ramiah, Saleem, and Moosa (2019) analyses the effect of announcements regarding the Paris Agreement between 2014 and 2016 on the stock market in Germany using the event study methodology. The results show both positive, negative, and mixed reactions of different industries to the announcements. The authors provide explanations for the reactions of several industries. For instance, they argue that the negative effects on the banks and financial services industries are due to these industries being the main funders of polluting projects. The results also show that there are market reactions in the days before the announcements because of market anticipation. Moreover, delayed reactions to the announcements are found in 14 industries, most of them negative.

Table 1 provides an overview of all discussed papers using event studies to determine the impact of environmental policies.

Table 1: Overview of event studies regarding environmental policies

Author(s)	**Region & period**	**Event study method**	**Estimation period**	**Market return proxy**	**Event window**	**Results**
Ramiah et al. (2013)	Australia 2005 – 2011	CAPM	[-244, -6]	ASX200	[-5, 5]	Significant reaction in 60% of the stock market
Ramiah et al. (2015)	USA 1997 – 2011	Rolling average, market model, CAPM, FF-3 factor	[-244, -6]	S&P 500	[-5, 5]	Obama effect Climate change effect
Jiang and Luo (2018)	China 2009 – 2011	Market model	-	S&P 500 TTOCOMP FTSE100 DJEURO NIKKEI225 HK SNGPO ASX200 DJIWEM	[-2, 2]	Carbon-intensive industries react more positively CAR [-2, 2] = 1.24%
Pham et al. (2019)	Germany 2014 - 2016	CAPM	[-244, -6]	DAX30	[-5, -1] [1, 5]	Various significant reactions

2.2 Socially Responsible Investing (SRI) and ESG rating

As this paper considers the influence of ESG rating on the relationship between environmental policy announcements and stock market reaction, it is important to explain the concepts of socially responsible investing (SRI) and ESG rating.

In recent years, SRI has become increasingly more important for investors. A survey by investment bank Morgan Stanley (2019) has found that 85% of individual investors are interested in SRI as compared to 75% in 2017. The concept of SRI can be explained as basing investing decisions not only on financial criteria such as risk and return but also on non-financial criteria such as social or environmental issues (Sparkes and Cowton, 2004).

One way to quantify a company's corporate responsibility is by measuring the ESG rating. This rating is a combination of three recognised aspects of corporate responsibility, whereas many other kinds of responsibility ratings are one-dimensional responsibility measures. An ESG rating assesses firm behaviour towards dealing with environmental (E), social (S), and corporate governance (G) issues. ESG ratings are usually provided by third-party rating agencies. This leads to the main issue, as there is no consensus on how the different agencies measure their ratings.

Past empirical evidence on the effect of SRI on stock performance leads to ambiguous conclusions. A reason is provided by Mănescu (2011). This research argues that the ESG concept has a multi-dimensional nature which makes it difficult to analyse the trade-off between ESG performance and investment returns. Using cross-sectional regressions, Mănescu (2011) analyses the different categories within the ESG rating. This research finds that only the community relations category has a positive and significant effect on stock returns. The effect of the aggregate ESG score is insignificant.

Kempf and Osthoff (2007) research whether trading based on SRI ratings results in abnormal returns in the period 1992 to 2004. Using SRI ratings from KLD Research & Analytics, the authors construct two portfolios consisting of high and low-rated stocks. The portfolios are constructed using three different screening methods: negative, positive, and best-in-class screening. The performance of the portfolios is measured using the Carhart four-factor model (1997). The results show that trading based on negative screening does not lead to a significant abnormal return. A long-short strategy based on the positive and the best-in-class screening does lead to a significantly positive alpha of around 5%.

Bauer, Derwall, and Otten (2007) look at the relation between SRI and mutual fund performance in Canada. The results of single-factor and multifactor analysis both show no significant difference in performance between SRI and conventional mutual funds.

Using a similar methodology, Renneboog, Ter Horst, and Zhang (2008) research the performance of socially responsible mutual funds across the world. This paper uses asset pricing models to investigate the possible out- or underperformance of SRI mutual funds compared to conventional funds. The results of regressions using equally weighted portfolios show that SRI funds underperform the benchmarks in nearly all countries in the sample. However, no statistically significant difference is found in most countries when the alphas of SRI funds are compared to those of conventional funds.

Conclusions of the research by Derwall, Koedijk, and Ter Horst (2011) show that different views on SRI can complement each other in the short run. Whereas much of the literature on SRI assumes that SRI is a 'values-driven' investment approach, this paper argues that investors also use SRI as a 'profit-seeking' approach. The paper analyses the consequences of this market segmentation by testing two hypotheses: the shunned-stock and the errors-in-expectations hypothesis. It is found that 'values-driven' investors make more use of 'negative' screening methods to avoid controversial stocks, whereas 'profit-seeking' investors make use of 'positive' screening methods. Further analysis shows that abnormal returns occur for both socially responsible and socially controversial stocks. However, only the abnormal returns of socially controversial stocks remain stable and significant in the long run. Therefore, the 'values-driven' and 'profit-seeking' investment approaches are complementary in the short run, but only 'values-driven' investing remains in the long run.

The paper by Mollet and Ziegler (2014) examines the relationship between SRI and stock performance in the US and Europe for the years 1998 to 2009. The methodology consists of portfolio analysis of the risk-adjusted returns estimated using the Carhart four-factor model (1997). This analysis mainly results in insignificant abnormal returns for the different portfolios, both in the US and in Europe.

Research by Halbritter and Dorfleitner (2015) investigates the relation between SRI (based on ESG ratings) and financial performance in the US during the period 1991 to 2012. The sample of ESG ratings includes data from ASSET4, Bloomberg, and KLD Research & Analytics. The analysis in this paper follows two methods: the ESG portfolio method used by Kempf and Osthoff (2007) and cross-sectional regressions similar to Galema, Plantinga, and Scholtens (2008). The results of the ESG portfolio method show no significant differences in returns between the different portfolios. When comparing two subperiods within the sample period, a significant outperformance of high ESG firms is found in earlier years, whereas from the year 2001 the returns became insignificant. The results of the cross-sectional analysis show significant differences between the three different ESG datasets. The ESG scores of ASSET4 and Bloomberg have a significant effect, whereas those of KLD show no significant effect. This shows that the choice of database has a significant impact on the results.

Many papers do not find a significant link between SRI and stock performance (Bauer et al., 2007; Renneboog et al., 2008; Mollet and Ziegler, 2014). An explanation for this is presented by research by Galema et al. (2008). This research investigates how portfolio returns, book-to-market value and excess stock returns in the US relate to various dimensions of SRI. The paper collects data on SRI from KLD Research & Analytics. Different types of analysis are used to measure the effect of KLD scores on returns. The results from the analysis of SRI portfolios show no significant outperformance of the market, thus SRI does not generate positive alphas. Book-to-market regressions show that the KLD categories diversity, environment, and product have a significant negative effect on book-to-market ratios, while governance scores have a significant positive effect. According to this paper, the impact of SRI thus lies in lowering the book-to-market ratios, which is an explanation for the lack of empirical evidence of a link with alphas.

D'Hondt, Merli, and Roger (2021) investigate the drivers of portfolio exposure to ESG factors for retail investors. The research examines stock portfolios of Belgian retail investors for the period 2005 to 2011. Using panel data regression models, the paper shows that sociodemographic factors influence exposure to ESG scores. Moreover, it shows that preferences differ for the three ESG factors.

Table 2 provides an overview of all discussed papers regarding SRI and ESG ratings.

Table 2: Overview of empirical literature regarding SRI and ESG rating

Author(s)	Region & period	Model	SRI/ESG and stock data	Results
Kempf and Osthoff (2007)	USA 1992 - 2004	Long-short strategy with Carhart 4-factor model	KLD Research & Analytics CRSP database	Alpha of up to 8.7% per year
Bauer et al. (2007)	Canada 1994 – 2003	Asset pricing models (CAPM, multifactor models)	Globefund.com S&P/TSX Composite Index Worldscope database	No significant difference in performance
Renneboog et al. (2008)	Global 1991 - 2003	Asset pricing models (CAPM, FFC 4-factor model)	S&P Fund Service CRSP Bloomberg Datastream	No significant difference in alphas of SRI funds
Galema et al. (2008)	USA 1992 – 2006	Asset pricing model (FFC 4-factor model)	KLD Research & Analytics Datastream	SRI leads to lower book-to-market ratios and insignificant alphas
Mănescu (2011)	USA 1992 – 2008	Cross-sectional regression with 4-factor model	KLD Research & Analytics Datastream	Insignificant effect of aggregate ESG
Derwall et al. (2011)	USA 1992 - 2008	Asset pricing model (FFC 4-factor model)	KLD STATS	Different views on SRI can be complementary in the short run
Mollet and Ziegler (2014)	USA & Europe 1998 – 2009	Asset pricing model (Carhart 4-factor model)	ZKB Datastream	Insignificant abnormal stock returns
Halbritter and Dorfleitner (2015)	USA 1991 – 2012	Asset pricing model (Carhart 4-factor model), Fama and Macbeth regression models	ASSET4 Bloomberg KLD Research & Analytics	No significant differences between ESG portfolios, significant influence of ESG rating depending on rating agency
D'Hondt et al. (2021)	Belgium 2005 – 2011	Panel data regression model	ASSET4	ESG factors are not homogeneous, ESG preferences are time-varying

2.3 Public attention

Next to environmental policies and SRI/ESG rating, it is also important to define the concepts of investor and public attention for the contents of this paper.

Over the last decade, the level of public attention to environmental issues has grown severely. Considering that SRI has been on the rise, it can be argued that the level of investor attention to environmental issues has also increased substantially. This view is supported by the attention-grabbing hypothesis established by Barber and Odean (2008). Their research shows that individual investors tend to buy attention-grabbing stocks, thus stocks that have been in the news or that experience high abnormal trading volume.

For a long time, a substantial challenge in measuring investor attention was that there were no direct measures of it, thus researchers had to use proxies. In 2011, the paper by Da et al. (2011) proposed a new and direct measure of investor attention: the Google Search Volume Index (GSVI). This index on the volume of search terms is publicly provided through Google Trends (https://trends.google.nl/trends). It is a representative measure since the search engine Google is the most used Internet search engine to collect information worldwide. Moreover, Da et al. (2011) argue that Internet search is a revealed measure of attention. Thus, individuals are deliberately paying attention to their search terms on Google.

The relation between investor attention and the stock market has already been researched in the existing literature. For instance, Da et al. (2011) find that an increased level of investor attention, measured by GSVI, leads to higher stock prices in the following two weeks. This price increase is reversed within the next year. This observation is especially visible among small stocks and stocks that are traded by retail investors. The research by Da et al. (2011) supports the hypothesis of Barber and Odean (2008). While the GSVI offers a representative proxy for the attention of retail investors, research by Ben-Rephael, Da, and Israelsen (2017) argues that institutional and professional investors use Bloomberg terminals for their searches. Therefore, the authors propose the news-searching and news-reading activity for specific stocks on Bloomberg as a proxy for institutional investor attention.

Research by Bank et al. (2011) examines the relation between GSVI and stock return and liquidity in Germany. The results show that a higher GSVI of a firm's name leads to higher trading activity, improved stock liquidity, and higher future returns in the short run. The last finding is in line with the evidence by Da et al. (2011). To reach this finding, Bank et al. (2011) perform a multivariate analysis controlling for well-known risk factors by employing the CAPM model, the Fama and French three-factor model (1993), and the Carhart four-factor model (1997). The authors sort the stocks in the sample by the change in GSVI and divide the sample into three quantiles. The equally-weighted average returns are calculated for a zero-investment strategy which goes long in the quantile of stocks with the largest change in GSVI and short in the quantile with the smallest change. Then, regressions are run to determine whether these returns are significantly different from zero.

The paper by Joseph, Wintoki, and Zhang (2011) researches whether investor attention, proxied by online ticker searches, can forecast abnormal stock returns and trading volume in a sample of S&P

500 firms in the years 2005-2008. The stocks are divided into five quintiles based on the search intensity. Then, regressions of the daily returns are run for each portfolio using different risk factors. Pursuing a strategy that sells the stocks with the highest search intensity and buys the stocks with the lowest search intensity produces significant positive abnormal returns (0.0280%). Moreover, the results show that trading volume increases as search intensity increases.

Vozlyublennaia (2014) analyses the relationship between investor attention, measured by GSVI, and index performance. This paper uses Granger causality tests and vector autoregression (VAR) models to research the possible causality. The results show that attention significantly impacts the future returns of stock indices, either positively or negatively. This effect is typically short-lived. Moreover, past returns can predict the current impact of investor attention on returns. The results of the paper support the conclusion that a higher level of investor attention leads to lower return predictability which improves market efficiency.

Bijl et al. (2016) analyse whether the GSVI of firm names can be used as a predictor of stock returns of companies in the S&P 500 index in the years 2008 to 2013. Using regression models, this paper finds that GSVI can predict stock returns but has a weak impact. However, the results also show that a higher GSVI predicts negative returns, which is in contrast with the findings by Da et al. (2011) and Bank et al. (2011). Pursuing a trading strategy of selling stocks with a high search volume and buying stocks with a low search volume is profitable, but only if transaction costs are excluded.

Research by Swamy, Dharani, and Takeda (2019) investigates whether the GSVI can forecast the stock returns of companies in an emerging economy. The sample consists of S&P BSE 500 companies that are listed on the Indian stock exchange in the years 2012 to 2017. The paper uses the quantile regression method to estimate the relationship. This method adds to the existing literature as it addresses substantial heterogeneity in the relationship between investor attention and stock returns. The results show that a higher level of investor attention predicts positive returns in the following two weeks. Moreover, higher excess returns are observed for higher quantiles of GSVI.

Pham and Huynh (2020) research how investor attention influences the green bond market. It is the first paper that specifically investigates this link, and it provides interesting insights which could also be relevant to the green equity market. This paper uses the Diebold and Yilmaz (2012) connectedness framework to investigate the relationship between investor attention to the keyword ‘green bond’ and the performance of several green bond indices. This framework consists of several steps. First, VAR models are established for each green bond index. Then, spillovers between the indices, the GSVI and other control variables are computed. Lastly, the 99% confidence interval for the spillover parameters is obtained. This method shows that there is interdependence between the performance of green bond indices and investor attention. However, this interdependence differs over time and is stronger in the short run.

The research by Vozlyublennaia (2014) argues that a large concern related to taking the GSVI as a proxy for investor attention is that the GSVI variables contain attention to the search terms from other individuals. This makes the variables larger than they should be to capture investor attention. Therefore, this paper uses the GSVI measure as established by Da et al. (2011) to investigate the influence of public attention to search terms related to the environment on the relationship between environmental policy announcements and the stock market reaction. It is important to understand the distinction between the two concepts. Investor attention measures the attention to a particular company or index through Google searches of the firm name or ticker code. Public attention measures the attention to a particular concept through Google searches of search terms related to that concept.

El Ouadghiri and Peillex (2018) analyse whether public attention from US citizens to subjects surrounding Islamic terrorism influences US Islamic and conventional stock indices in the period 2004 to 2017. The paper uses the GSVI for search terms related to Islamic terrorism and media coverage as proxies for active and passive public attention, respectively. Using difference-in-difference analysis with panel regression models, the paper finds that public attention to Islamic terrorism in the US has a significantly negative effect on the stock returns of US Islamic indices.

The paper by El Ouadghiri, Guesmi, Peillex, and Ziegler (2021) researches how public attention to climate change and pollution affects the weekly returns of sustainability stock indices in the US from 2004 to 2018. The research considers the effect of unexpected global climate-related natural weather disasters, as well as two proxies for public attention: media coverage of climate change and pollution, and weekly GSVI of the keywords ‘climate change’ and ‘pollution’. To examine the difference in the effect on weekly returns between sustainable and conventional stock indices, three OLS models using panel data and four-factor asset pricing models are constructed. The results show that all three variables of interest have a significantly positive impact on the returns of sustainability stock indices.

Wan, Zue, Linnenluecke, Tian, and Shan (2021) investigate the difference in the impact of attention on investments in clean energy and fossil fuel firms during the COVID-19 crisis. The paper considers data on Chinese listed firms for the period of 25 November 2019 to 16 March 2020. Attention to COVID-19 is proxied by the Baidu Index of nine keywords related to the pandemic. Regression models are established to examine the effect of COVID-19 and attention on the stock returns of clean energy and fossil fuel firms. The results show that while COVID-19 hurts both firm types, the effect is more significant for fossil fuel firms. Moreover, the results show the impact of attention was slightly significant for clean energy firms, but not for fossil fuel firms. This highlights a shift in the behaviour of investors during crises such as the pandemic.

Table 3 provides an overview of all discussed papers regarding investor and public attention.

Table 3: Overview of empirical literature regarding investor and public attention

Author(s)	Region & period	Method	Attention and stock data	Results
Barber and Odean (2008)	USA 1991 – 1999	Comparison of abnormal trading volume, returns, and news	Dow Jones News Service Brokerage data CRSP	Attention-grabbing hypothesis
Da et al. (2011)	USA 2004 – 2008	Time-series correlation, VAR models	Google Trends Russell 3000	Short-term positive relation between GSVI and stock prices
Bank et al. (2011)	Germany 2004 – 2010	Univariate and multivariate regression models	Google Trends Datastream	Higher GSVI temporarily increases future returns
Joseph et al. (2011)	USA 2005 – 2008	Asset pricing models (FFC 4-factor model)	Google Trends S&P 500 stock data from CRSP	Ticker searches predict abnormal stock returns and trading volumes
Vozlyublennaia (2014)	USA 2004 – 2012	Granger Causality tests, VAR models	Google Trends Yahoo Finance	Higher GSVI decreases return predictability
Bijl et al. (2016)	USA 2008 – 2013	Panel data regression models	Google Trends WRDS	High GSVI lead to negative stock returns
Swamy et al. (2019)	India 2012 – 2017	Quantile regression models	Google Trends Prowess database	Higher GSVI predicts short-term positive returns
Pham and Huynh (2020)	USA & Europe 2014 – 2019	Diebold and Yilmaz (2012) connectedness framework	Google Trends Green bond indices	Time-varying interdependence between performance and GSVI
El Ouadghiri and Peillex (2018)	USA 2004 – 2017	Difference-in-difference analysis	Google Trends Media coverage Bloomberg	GSVI negatively affects US Islamic indices
El Ouadghiri et al. (2021)	USA 2004 – 2018	Pooled linear panel model with Carhart 4-factor model	Google Trends DSJI US, FTSE4Good USA, S&P 500, FTSE USA	GSVI has positive (negative) effect on sustainability (conventional) stock indices
Wan et al. (2021)	China 2019 – 2020	Regression models	Baidu Index, CSMAR	Significant impact of attention on returns of clean energy firms

2.4 Empirical evidence on the relationship between environmental policies and stock returns with the influence of ESG rating and public attention

This section looks at the existing empirical evidence on the combination of the three concepts (environmental policies, ESG rating, and public attention) and its effect on stock market performance. However, there is no existing literature on this combination. This paper is the first to investigate the influence of both ESG rating and public attention on the relationship between environmental policies and stock performance. Therefore, previous articles discussing this relationship considering the influence of either ESG rating or public attention will be discussed.

Considering the influence of investor attention, Guo, Kuai, and Liu (2020) investigate the Chinese stock market reaction to the announcement of new environmental policies in the period 2014 to 2017. Using the event study methodology and calculating cumulative average abnormal returns (CAAR) for all events in the sample, the results show significantly negative short-term returns for heavily polluting industries. The CAAR reaches its lowest point of -0.544% two days after the event. Three days following the event, the stock price becomes positive, though not significant. The paper also researches whether there is a difference in effect between environmental laws and regulations. While both suffer a negative reaction, a T-test shows that announcements of environmental laws lead to a significant 1.045% lower CAAR. Moreover, Guo et al. (2020) investigate the influence of attention to environmental issues on the relation between the stock performance of heavily polluting firms and environmental policies. Attention to environmental issues is proxied by the Baidu Index, which is the Chinese alternative for the GSVI, of several keywords related to the environment. The paper establishes multivariate regression models to analyse the effect. The results of this analysis show that heavily polluting industries suffer larger losses when there is more attention to the environment. This paper also finds that the impact of attention is more pronounced in large firms, state-owned enterprises (SOEs), less profitable firms, and firms in the energy-related industry.

Considering the influence of ESG rating, research by Birindelli and Chiappini (2021) investigates the effect of environmental policy announcements by the EU in the years 2013 to 2018 on firms that are part of the EU stock market. These firms are grouped by sector and by environmental commitment. The environmental commitment is based on ESG scores from the Refinitiv database. The paper uses the event study methodology accompanied by a cross-sectional T-test to perform the analysis. For the sector grouping, the results show a sector-by-sector effect with more negative than positive effects. Besides, all industries experience an effect for at least one announcement. Regarding the grouping based on the environmental commitment of firms, the results show that before the Paris Agreement, positive effects only arose for firms with high environmental commitment. After the Paris Agreement, there is a more negative effect regardless of the environmental commitment of firms.

2.5 Hypotheses development

To answer the research question, *'How does the stock market react to announcements of new environmental policies by the EU, and is this reaction influenced by ESG rating and public attention?'*, several hypotheses are formulated on the stock market reaction to the announcement of new environmental policies by the EU.

Previous literature has shown that there is a sector-by-sector reaction following an announcement regarding an environmental policy. Ramiah et al. (2013) examine the relationship between environmental announcements and stock market reaction at the sector level in Australia. This research finds that 21 out of the 35 different industries show a significant reaction. Ten of these industries show a negative reaction, seven industries show a positive reaction and four show mixed reactions. This leads to the following hypothesis:

Hypothesis 1. *The market reaction to announcements of new environmental policies by the EU differs among different sectors.*

The relationship between ESG ratings and stock returns by itself is already widely investigated and leads to ambiguous results. However, the impact of environmental announcements considering the influence of ESG ratings is less widely covered in the existing empirical literature. Research by Guo et al. (2020) finds that stock returns of heavily polluting firms in China are negatively affected by announcements of new environmental policies. Intuitively, such firms are unlikely to have a high ESG rating. Research by Birindelli and Chiappini (2021) finds that until the Paris Agreement came into force, only the shareholder values of firms that were the most committed to the environment were positively affected by the announcement of a new policy in the EU. Moreover, according to Flammer (2013, p. 759), a firm's commitment to the environment "may act as 'insurance', reducing negative reactions by shareholders to the announcement of eco-harmful events". This leads to the following hypothesis:

Hypothesis 2a. *The stock returns of socially irresponsible firms, using firms with a low ESG rating as a proxy, are more negatively affected by announcements of new environmental policies than socially responsible firms, using firms with a high ESG rating as a proxy.*

Research by D'Hondt et al. (2021) has shown that the preferences of retail investors are different for the three ESG factors. Since the announcements are about environmental policies, these are not directly related to the social and corporate governance pillars of the ESG rating. Therefore, this hypothesis is accompanied by the following expectation:

Hypothesis 2b. *The effect on the stock returns of socially irresponsible firms is mainly driven by the environmental (E) pillar of the ESG rating when a new environmental policy is announced.*

Public attention to environmental issues could be an explanation for the negative effect of the second hypothesis. It could be that investors treat announcements of new environmental policies as bad news for socially irresponsible firms and will thus not invest in these firms. El Ouadghiri et al. (2021) find that increased public attention to climate change and pollution has a positive effect on stock returns of sustainability stock indices. The article states that this could be because investors favour stocks of sustainable firms in times of increased public attention to environmental issues. Guo et al. (2020) find that in the event of an announcement of a new environmental policy in China, heavily polluting industries are likely to suffer larger losses when there is higher investor attention to environmental issues. Another explanation for the negative effect of the second hypothesis could be public attention to socially responsible investing. The paper by Pham and Huynh (2020) finds that investor attention can predict the performance of green bonds. In this paper, the following two hypotheses are proposed:

Hypothesis 3a. *A higher level of public attention to environmental issues leads to higher stock returns of firms with a high ESG rating and lower stock returns of firms with a low ESG rating when a new environmental policy is announced.*

Hypothesis 3b. *A higher level of public attention to socially responsible investing leads to higher stock returns of firms with a high ESG rating and lower stock returns of firms with a low ESG rating when a new environmental policy is announced.*

3 Data

This section explains how the data for this research is selected and collected. The first subsection explains the selection of the environmental policy announcements that are covered in the analysis. The following subsections explain the data per subject. The last subsection provides and explains the descriptive statistics on the data sample.

3.1 Event selection

As this paper conducts an event study, it is important to determine the events of interest. In this case, all the events are announcements of environmental policies by the European Commission. Ten different announcements during the period of 2011 to 2020 are selected. The announcements come from the news release webpage of the European Commission (https://ec.europa.eu/clima/news/news_archives_en). The European Commission is the executive body of the European Union. It is responsible for drawing up new legislative proposals, managing the budget of the EU, enforcing the law of the EU, and representing the EU internationally (European Union, n.d.).

It is verified that there were no other relevant events on these dates. Moreover, it is checked whether the stock markets were opened on the dates of the selected events. Three events occurred during the weekend, thus on days that the stock market was closed. For these events, the event date is moved to the next first trading day. An overview of all selected events can be found in Table 4.

Table 4: Overview of climate policy events in the EU in the period 2010-2020

Date	Event
December 11, 2011*	Adoption of the Durban Platform, an agreement on a roadmap for drawing up a legal framework by 2015 for climate action by all countries.
November 29, 2012	Adoption of proposal for a new Environment Action Programme.
April 16, 2013	EU climate change adaption strategy.
January 23, 2014	EU policy framework for climate and energy in the period from 2020 to 2030.
December 12, 2015*	Paris Agreement on climate change.
November 4, 2016	Paris Agreement on climate change came into effect.
December 12, 2017	Action plan for the planet.
November 28, 2018	Adoption of the strategy "A clean planet for all", also known as the 2050 long-term strategy.
December 11, 2019	The European Green Deal is presented.
October 7, 2020	The European Climate Law is approved by the European Parliament.

Source: https://ec.europa.eu/clima/news/news_archives_en

** Stock market was closed on these days; event date is moved to the next first trading day.*

3.2 Stock market data

Daily stock prices for all listed companies in the EU with a reported ESG rating in the Thomson Reuters database are collected from the Eikon Datastream database from January the 1st, 2011 to December the 31st, 2020. This leads to a sample of 1,137 companies. From these stock prices, the daily stock returns are calculated. The stock returns are winsorised at 1% and 99% to account for outliers. Also, the share prices of the Euro Stoxx 600 are downloaded for the same period. The returns calculated over the share prices of this index are used as a proxy for the market returns.

Some firms have incomplete information on the share prices in the event periods, for example, because of mergers and acquisitions or delisting. Since the analysis cannot be performed for these firms, they are deleted from the sample. This reduces the sample by 243 firms to a total of 894 firms. Moreover, there could be firm-specific events, such as the release of financial reports or other information that could influence the share prices. These firms should also be deleted from the sample. However, it would take up too much time within the scope of this research to check this for all firms in the sample. Moreover, Ramiah et al. (2015) claim that one can assume minimal effects of firm-specific information on event dates when the sample size is large.

3.3 ESG data

The Thomson Reuters ESG database is used to collect ESG ratings. This database was previously known as the ASSET4 database. Numerous other databases report ESG ratings, such as the Bloomberg ESG Data Service, MSCI ESG Research, and the Dow Jones Sustainability Index (DJSI).

All databases use varying methodologies and scopes. The Thomson Reuters ESG database is chosen in this paper because it is a comprehensive database that provides a transparent and objective measure of the ESG rating. The database covers ESG data on over 6,000 public companies worldwide (Moy Huber and Comstock, 2017). Moreover, the database includes the scores of the individual E, S, and G pillars.

The ESG rating provided by the Thomson Reuters ESG database is a percentile rank. It consists of scores for ten different subcategories in the categories environment, social, and corporate governance: resource use, emissions, innovation, workforce, human rights, community, product responsibility, management, shareholders, and CSR strategy. These categories are all weighted in the total ESG rating. The database also provides a controversy score that analyses 23 ‘controversy topics’, such as business ethics, critical countries, child labour, human rights, and diversity and opportunity. Both scores are updated every two weeks (Moy Huber and Comstock, 2017). An overview of the different categories, their definitions, and their weights in the total ESG score can be found in Table A.1 in Appendix A. For the analysis of this paper, the individual environment, social, and corporate governance components are also calculated by taking the weighted average of the respective subcategories.

Table 5 provides an overview of the descriptive statistics of the total ESG rating per year. For the years 2011 to 2018, the number of observations increases every year. This implies that the Thomson Reuters ESG database has started to report ESG ratings on more companies during the last decade. Another notable trend is the yearly increase in mean ESG rating, except for the years 2018 and 2019. This shows that the behaviour of the firms in this sample has become more ESG friendly. Table 5 shows a lower number of observations for the year 2020. This can be explained by the fact that not all ESG ratings were already reported in the database at the time this sample was collected.

Table 5: Yearly descriptive statistics of the total ESG rating

ESG	Obs.	Mean	Std. Dev.	Min	Max
2011	126,620	51.772	21.872	1.820	97.060
2012	128,151	52.621	21.160	1.540	97.020
2013	127,890	52.747	20.914	0.630	92.170
2014	129,717	53.447	20.934	1.340	95.980
2015	132,327	55.511	20.939	0.700	93.760
2016	133,110	56.761	20.303	1.020	95.210
2017	144,040	57.779	19.519	2.030	94.310
2018	199,665	54.994	20.670	1.930	93.950
2019	193,923	57.774	19.417	3.900	95.360
2020	72,050	60.864	18.661	11.180	94.780

3.4 Public attention

Following the research by Da et al. (2011), the Google Search Volume Index (GSVI) is used as a proxy for public attention. This measure is obtained from Google Trends (https://trends.google.nl/trends/). Through Google Trends, you can access largely unfiltered data of actual Google searches. The GSVI is anonymised, categorised, and aggregated, allowing the tool to show interest in a particular topic. Moreover, the GSVI is normalised based on the time and location of the search to make the comparison of different search terms easier. The GSVI is scaled between 0 and 100 based on the relative popularity of the search term. The data can be filtered to a specific geographical region or place. Unfortunately, Google Trends does not provide data on the EU. Therefore, the unweighted average of all 27 EU countries is calculated manually in this research.

Following Guo et al. (2020), the seven-day averaged GSVI before the event day is calculated for several search terms related to environmental issues. Some search terms are added following the analysis by El Ouadghiri et al. (2021). The seven-day average is taken because it captures the continuous public attention rather than only on the event day itself. The search terms in this paper include ‘global warming’, ‘climate change’, ‘sustainability’, ‘environmental pollution’, and ‘environmental governance’. Moreover, a total GSVI variable is constructed by taking the aggregate value.

The seven-day averaged GSVI before the event day is also calculated for several search terms related to socially responsible investing. These search terms are provided by Wall Street Survivor (Wall Street Survivor, n.d.) and include ‘corporate social responsibility’, ‘ESG’, ‘environmental, social and corporate governance’, ‘socially responsible investing’, and ‘MSCI ESG’. For the search terms ‘environmental, social and corporate governance’ and ‘socially responsible investing’, Google Trends returns a value of zero for all dates, meaning that people rarely search for these terms (Da et al., 2011).

Therefore, these two search terms are deleted from the research. A total GSVI variable is constructed by taking the aggregate value of the other three search terms.

Figure 1 shows the dynamics of the monthly total GSVI related to environmental issues and socially responsible investing for the period 2011 to 2020. Every year, the GSVI is the lowest in the months July and August. Investors are typically less active during those months. Therefore, the investor attention part of public attention is lower, which leads to a lower GSVI. Moreover, the figure for the monthly total GSVI related to socially responsible investing shows a substantial increase starting from 2019. This illustrates the increased popularity of SRI in recent years.

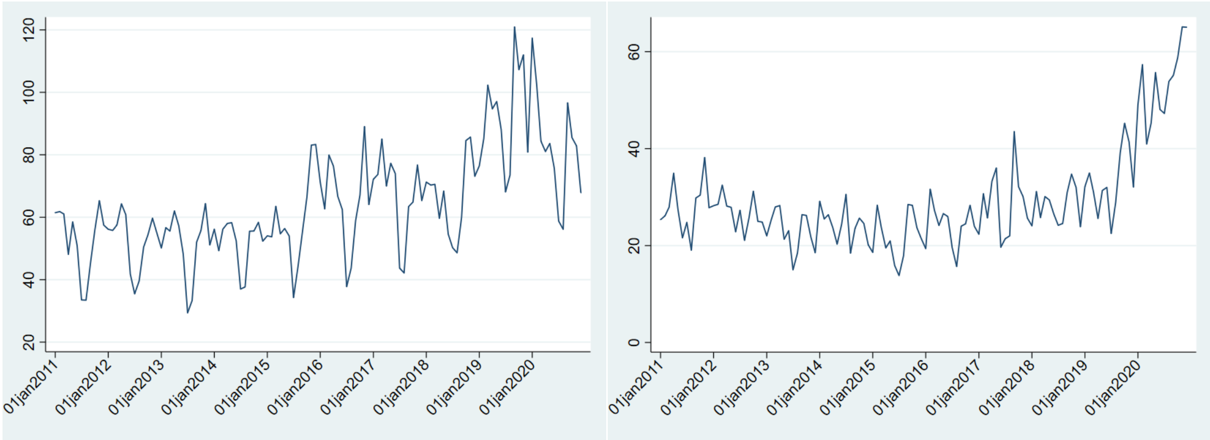

Figure 1: Monthly aggregate GSVI of environmental search terms from 2011 to 2020
The GSVI is from https://trends.google.nl/trends/. The graph on the left shows the dynamics of the monthly total GSVI of search terms related to environmental issues. The graph on the right shows the dynamics of the monthly total GSVI of search terms related to socially responsible investing.

In line with previous research from Swamy et al. (2019), the GSVI is standardised to make the GSVI's of the different search terms more comparable. The standardised GSVI is calculated as follows:

$$SGSVI_t = \frac{GSVI_t - \frac{1}{n}\sum_{i=1}^{n} GSVI_i}{\sigma_{GSVI}} \quad (1)$$

where $SGSVI_t$ is the standardised seven-day averaged GSVI, $GSVI_t$ is the seven-day averaged GSVI, $\frac{1}{n}\sum_{i=1}^{n} GSVI_i$ is the mean GSVI, and σ_{GSVI} is the standard deviation of the GSVI.

3.5 Control variables

Other financial data to construct control variables is also obtained from the Eikon Datastream database. These control variables are added to the models to enhance the internal validity of the study, since these variables may also influence the stock reaction. Following research by Capelle-Blancard and Laguna (2010) and Guo et al. (2020), the variables size, leverage, book-to-market ratio (B/M) and return on assets (ROA) are included as control variables. All control variables are winsorised at the 1% and the 99% level to account for outliers.

The variable size measures firm size. It is included because larger companies tend to be more stable, have more control measures for pollution, and might be able to access information faster (Guo et al., 2020). Moreover, larger companies often have more resources to obtain higher ESG scores (Drempetic, Klein, and Zwergel, 2020). The variable is calculated as the logarithmic value of total assets.

To measure the financial features of each firm, leverage, book-to-market ratio (B/M) and return on assets (ROA) are included as control variables. Leverage is proxied by the debt-to-asset ratio which is calculated by dividing the sum of short-term and long-term debt by the level of total assets. B/M and ROA are proxies for the profitability level of a company. B/M is calculated by dividing the book value of equity by the market value of equity and ROA is calculated by dividing the net income by the level of total assets.

3.6 Descriptive Statistics

Table 6 shows the descriptive statistics of all variables from 2011 to 2020. Panel A shows descriptive statistics on the stock market data, including daily stock returns and market returns proxied by the Euro Stoxx 600 index. The means of both variables are close to zero, which means that the average daily stock and market returns are close to 0%. The median values for both variables are also close to zero. For the daily stock returns of all firms in the sample, the minimum and maximum values are -6.0% and +6.4%, respectively. The minimum and maximum daily market returns are -11.5% and +8.4%, respectively. The stock returns are positively skewed, and the market returns are negatively skewed. Both variables show a positive kurtosis, meaning that they have a narrow distribution.

Panel B shows the descriptive statistics on the ESG data in the sample. The mean of the total ESG rating is 55.322. The social component has the highest value of the three ESG components (61.763), while the corporate governance component has the lowest value (49.986). All variables are negatively skewed and show a positive kurtosis.

The descriptive statistics for the standardised seven-day averaged GSVI can be found in Panel C and D of Table 6. The number of observations for all SGSVI variables is 8,940. This makes sense, considering the sample consists of data on 10 events for 894 firms. The SGSVI's of all search terms have a mean of zero and a standard deviation of 1, which is in line with the characteristics of standardised variables. Panel C shows the descriptive statistics of the search terms related to environmental issues. The median values are negative for all search terms relating to environmental issues, except for 'global warming'. The SGSVI for the search term 'global warming' is negatively skewed and shows a positive kurtosis. All other SGSVI's are positively skewed and show a positive kurtosis. Panel D shows the descriptive statistics of the search terms related to socially responsible investing. All search terms have a negative median, are positively skewed, and show a positive kurtosis.

Panel E of Table 6 shows the descriptive statistics of the control variables that are measured for the data sample. The control variable size, which is calculated by taking the logarithmic value of the total assets, has a mean value of 15.222. The mean leverage of the firms in the sample is 25.9%. The average book-to-market ratio (B/M) and return on assets (ROA) in the sample take on a value of 0.014 and 0.034, respectively.

Table 6: Descriptive statistics for the complete sample over the years 2011-2020

Variable	Obs.	Mean	Std. Dev.	Min	Med.	Max	Skew-ness	Kurto-sis
Panel A. Financial data								
Stock returns	2,331,552	0.000	0.019	-0.060	0.000	0.064	0.119	5.338
Market returns	2,332,446	0.000	0.011	-0.115	0.000	0.084	-0.785	13.041
Panel B. ESG data								
ESG	1,387,493	55.322	20.628	0.630	57.260	97.060	-0.410	2.459
E	1,387,493	53.022	27.567	0.000	57.103	98.842	-0.398	2.069
S	1,387,493	61.763	22.849	0.140	65.982	98.623	-0.635	2.692
G	1,388,535	49.986	22.136	0.870	50.531	97.732	-0.046	2.082
Panel C. Seven-day averaged SGSVI environmental issues								
Global warming	8,940	0.000	1.000	-1.782	0.388	1.436	-0.434	1.962
Climate change	8,940	-0.000	1.000	-1.521	-0.116	1.296	0.004	1.447
Sustainability	8,940	-0.000	1.000	-1.477	-0.143	2.070	0.512	2.553
Environmental pollution	8,940	0.000	1.000	-1.283	-0.210	2.301	0.877	3.262
Environmental governance	8,940	-0.000	1.000	-0.333	-0.333	3.000	2.667	8.111
Aggregate SGSVI	8,940	0.000	1.000	-1.581	-0.125	1.345	0.023	1.653
Panel D. Seven-day averaged SGSVI socially responsible investing								
Corporate social responsibility	8,940	0.000	1.000	-1.035	-0.190	2.704	1.782	5.529
ESG	8,940	-0.000	1.000	-0.966	-0.259	2.385	1.266	3.625
MSCI ESG	8,940	0.000	1.000	-0.812	-0.588	2.225	0.949	2.760
Aggregate SGSVI	8,940	-0.000	1.000	-1.191	-0.065	1.863	0.475	1.959
Panel E. Control variables								
Size	2,080,919	15.222	1.966	10.432	15.077	20.532	0.301	3.081
Leverage	2,065,535	0.259	0.172	0.000	0.246	0.754	0.488	2.760
B/M	2,052,267	0.014	0.029	-0.001	0.004	0.205	4.480	26.414
ROA	2,080,136	0.034	0.074	-0.303	0.033	0.283	-0.854	9.501

The descriptive statistics show that some variables have a skewness above +1 or below -1, indicating that the distribution is skewed. Moreover, all variables have kurtosis greater than 1, meaning that the distribution is peaked. These are indications that the data follows a non-normal distribution (Hair, Hult, Ringle, and Sarstedt, 2022). To evaluate whether the variables follow a normal distribution, the Jarque-Bera test is performed. The results of this test can be found in Table C.1 in Appendix C. All variables in the data sample have large Chi^2 test statistics and p-values close to zero. Therefore, the null hypothesis, corresponding to a normal distribution, can be rejected for all variables. However, as the sample consists of many data points, the sample is approximately normally distributed, according to the Central Limit Theorem (Kwak and Kim, 2017). Still, the results of the analysis conducted on this data must be interpreted with caution.

4 Methodology

This section explains the methodology that is used to perform the analysis. The first subsection explains the event study methodology used to test the first hypothesis and the first part of the second hypothesis. To test the second and third hypotheses, regression models using panel data will be constructed. These are explained in the second subsection. The last subsection explains the robustness checks that are used.

4.1 Event study methodology

To test the first hypothesis, stating that the market reaction to the announcement of new environmental policies by the EU differs among different sectors, the event study method is used. This methodology was first used in studies by Ball and Brown (1968) and Fama, Fisher, Jensen, and Roll (1969) and has been widely used in empirical literature since. An event study is used to measure the effects of events on the value of firms. Assuming rationality in the market, the effect of an event will be immediately reflected in stock returns. To determine this effect, the event study method tests whether the actual returns are significantly different from the normal returns. This paper uses the event study methodology as presented by MacKinlay (1997), following research by Guo et al. (2020).

To capture the stock market reactions to the announcement of new environmental policies, the abnormal return (AR) and the cumulative abnormal return (CAR) are used. Several steps are performed to calculate both the AR and the CAR. First, following Guo et al. (2020), an estimation window of 100 trading days is set, from day -110 to day -11 before the event day. This estimation window is chosen because some of the environmental policies that are chosen as events were announced close to each other. Therefore, a longer estimation window might lead to a declined accuracy of the estimated returns. Moreover, the estimation window and the event window must not overlap. This could lead to the normal return estimations being influenced by the event returns (MacKinlay, 1997). To estimate the normal returns of all firms on each day during the estimation window, a market model (equation 2) is conducted. Following Birindelli and Chiappini (2021), the Euro Stoxx 600 index, which is the European equivalent of the S&P 500, is taken as the benchmark index to determine the market return.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, t \in [-110, -11], i = 1, 2, \dots, N \quad (2)$$

where R_{it} is the return on stock i on day t and R_{mt} is the market return on day t. Using the estimated parameters α_i and β_i, the daily expected returns can be calculated. Then, the abnormal returns, AR_{it}, can be calculated by taking the difference between the realised returns and the estimated normal returns (equation 3).

$$AR_{it} = R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{mt}\right), t \in [t_1, t_2] \quad (3)$$

In this model, t_1 and t_2 denote the beginning and the ending day of the event window. In this paper, the event window includes 1 day before and 1 day after the announcement of a new environmental policy, thus [-1, 1]. This short timeframe is chosen to limit problems with overlapping and confounding events. Moreover, a shorter timeframe is more reliable in an event study (Brown and Warner, 1985).

Also, following research by Guo et al. (2020), a one-week timeframe is included as event window. This event window can be defined as [-3, 3]. With this event window, it is checked whether the abnormal returns hold on for longer than one day. The cumulative abnormal returns, CAR_{it}, are calculated for the days in both event windows (equation 4).

$$CAR_{it} = CAR_{i(t_1,t_2)} = \sum_{t_1}^{t_2} AR_{it}\,, where\ t = t_2 - t_1 \tag{4}$$

To test the cumulative average effect of each event on a portfolio of firms, the cumulative average abnormal return, $CAAR_t$, is calculated (equation 5).

$$CAAR_t = \frac{\sum_t^N CAR_{it}}{N} \tag{5}$$

where N represents the number of companies included in the portfolio. To examine whether the market reaction to announcements of new environmental policies by the EU differs among different sectors, portfolios are constructed for the different sectors in the sample. The sectors are classified using the Global Industry Classification Standard (GICS).

For each sector, it is tested whether the CAAR is significantly different from zero. This is done using a cross-sectional T-test (equation 6). With this test, a t-statistic is computed. There are three possible outcomes of the test: (1) the CAAR is not significantly different from zero ($CAAR_t = 0$); (2) the CAAR is significantly negative ($CAAR_t < 0$); or (3) the CAAR is significantly positive ($CAAR_t > 0$). If the absolute value of the t-statistic is greater than 1.96, then the CAAR is significantly different from zero at the 5% significance level. It is expected that outcome (2) occurs for the most polluting sectors. Outcome (3) is expected to occur for environmentally friendly firms.

$$t_{CAAR} = \sqrt{N}\frac{CAAR}{s_{CAAR}}, where\ s^2{}_{CAAR} = \frac{1}{N-1}\sum_{i=1}^{N}(CAR_i - CAAR)^2 \tag{6}$$

In this equation, N stands for the sample size, thus the number of observations per sector.

To test the first part of the second hypothesis, stating that the stock returns of socially irresponsible firms are more negatively affected by announcements of new environmental policies than the stock returns of socially responsible firms, taking ESG rating as a proxy for social responsibility, the event study method is also used. To analyse this hypothesis, the CAAR is calculated for two portfolios: one with socially irresponsible firms ($CAAR_{ESG_1}$) and one with socially responsible firms ($CAAR_{ESG_{10}}$). To determine which firms to include in these portfolios, the firms in the sample are ranked based on their ESG ratings. Firms with the 10% lowest ESG ratings are marked as socially irresponsible and firms with the 10% highest ESG ratings as socially responsible.

To test whether the CAARs of the two portfolios are significantly different, a two-sample T-test is performed (equation 7). This T-test has the following possible outcomes: (1) the difference in CAAR is not significantly different ($CAAR_{ESG_1} = CAAR_{ESG_{10}}$); (2) the difference in CAAR is significantly negative ($CAAR_{ESG_1} < CAAR_{ESG_{10}}$); (3) the difference in CAAR is significantly positive ($CAAR_{ESG_1} >$

$CAAR_{ESG_{10}}$). It is expected that the analysis results in outcome (2). This test is a one-sided T-test since there is either a more positive or more negative effect. Thus, when the t-statistic is lower than -1.645, the CAAR of socially irresponsible firms is significantly lower than the CAAR of socially responsible firms at the 5% significance level.

$$t_{CAAR} = \frac{CAAR_{ESG_1} - CAAR_{ESG_{10}}}{s_p \sqrt{\frac{1}{N_{CAAR_{ESG_1}}} + \frac{1}{N_{CAAR_{ESG_{10}}}}}},$$
$$where\ s^2{}_p = \frac{\left(N_{CAAR_{ESG_1}} - 1\right) s^2{}_{CAAR_{ESG_1}} + \left(N_{CAAR_{ESG_{10}}} - 1\right) s^2{}_{CAAR_{ESG_{10}}}}{N_{CAAR_{ESG_1}} + N_{CAAR_{ESG_{10}}} - 2} \quad (7)$$

4.2 Regression analysis

To test the second and third hypotheses, regression models using panel data are constructed. To do this, the data needs to be checked on several attributes. First, correlation matrices are constructed to check for multicollinearity of the variables. These matrices can be found in Appendix D. Based on the matrices, there are not many concerns of high correlation between variables used in the same regression model. The control variable size has a higher correlation with the ESG variables. This can be explained by the observation that larger companies often have more resources to obtain higher ESG scores (Drempetic et al., 2020).

Another assumption that needs to be checked is whether the residuals of the regression models are normally distributed. To do this, quantile-quantile (Q-Q) plots are constructed for the regression models in this analysis. The plots can be found in Appendix E. The plots for the different models all show a similar pattern. All plots form a roughly straight line, except for the tail ends of the distributions. Those with the abnormal return on the event day as the dependent variable are the most in line with a normal distribution. The plots where the three-day or seven-day CAR is the dependent variable show a larger deviation at the tail ends of the line. This shows that the distributions are tailed, which means that there are extreme values in the data that are not expected in the normal distribution. However, as the sample size in the models is sufficiently large, the distribution can still be seen as approximately normal according to the Central Limit Theorem (Kwak and Kim, 2017).

Moreover, the data needs to be checked on endogeneity. This is a critical issue that could lead to biased and inconsistent estimates. Endogeneity arises when there is correlation between the independent variables and the error term in a regression model. Sources of endogeneity include omitted variable bias, simultaneity, and measurement errors (Roberts and Whited, 2013). In this research, omitted variable bias and simultaneity are assumed to be the most probable causes of endogeneity. The simultaneity issue occurs when the dependent variable and one or more of the independent variables influence each other. Thus, it is uncertain which variable causes the effect first. This issue is especially present in the relation between stock returns and ESG rating due to the problem of larger firms having more resources to invest in higher ESG ratings. The regression models use panel data, which offers a partial solution to the problem of endogeneity (Roberts and Whited, 2013). For panel data, the regressions can be tested on endogeneity caused by fixed effects. To check whether there is endogeneity among the firms in the sample, a Hausman test is performed. This test helps to examine the equality of the coefficients of fixed effect and random effect estimations. The null hypothesis of the Hausman test states that these coefficients are similar and that there is no correlation between the unobservable heterogeneity and the explanatory variables. When the null hypothesis can be accepted, the appropriate model to use is the random effects model. When the null hypothesis can be rejected, thus there is correlation, the fixed effects model is the appropriate model to apply. Depending on the outcome of the Hausman test, either the random or the fixed effects model is applied to each regression model. Also, industry and year fixed effects are controlled for in the models and robust standard errors are included to control for heteroscedasticity.

The descriptive statistics of the variables that are included in the regression models can be found in Table F.1 in Appendix F. The results of the Jarque-Bera test for normality can be found in Table C.2 in Appendix C and show that all variables do not follow a normal distribution. The dependent variables do not have outliers but are slightly skewed. However, based on the descriptive statistics, there is no need to winsorise the dependent variables. Table B.1 in Appendix B shows a complete overview of all variables used in the analysis of this paper.

4.2.1 Influence of ESG rating

To analyse the second part of the second hypothesis, stating that the negative effect on the stock returns of socially irresponsible firms is mainly driven by the environmental (E) pillar of the ESG rating when a new environmental policy is announced, regression models using panel data and including an interaction effect are established. First, several models analysing the effect of the ESG rating as a whole will be established. In these models, the dependent variables are the abnormal returns on the event day itself and the cumulative abnormal returns for the two event windows, [-1, 1] and [-3, 3]. These variables are measured for all firms included in the sample. The independent variable in these models includes the total ESG rating per firm. To measure the effect on the stock returns of socially irresponsible firms, a dummy variable and an interaction term are added to the models. The models are complemented by the following set of control variables: size, leverage, book-to-market ratio (B/M) and return on assets (ROA). This leads to the following models (equation 8):

$$Y_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 ESG\_low_{it} + \beta_3 ESG_{it} * ESG\_low_{it} + \beta_4 X_{it} + \varepsilon_{it} \quad (8)$$

where Y_{it} is one of the dependent variables AR_{it}, $CAR[-1,1]_{it}$, or $CAR[-3,3]_{it}$ of firm *i* in the year *t*, ESG_{it} is the ESG rating of firm *i* in the year *t*, the dummy variable ESG_low_{it} takes on a value of one if a firm is part of the 10% lowest ESG ratings and a value of zero otherwise, the variable $ESG_{it} * ESG\_low_{it}$ is the interaction term between ESG rating and social responsibility level, and X_{it} is a set of the firm-level control variables size, leverage, B/M and ROA.

Next, another set of regression models will be established in which the total ESG rating will be split up into its three components environment (E), social (S), and corporate governance (G). All other variables in these regression models are the same. These regressions will be conducted on the sample of socially irresponsible firms only. This leads to the following models (equation 9):

$$Y_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 S_{it} + \beta_3 G_{it} + \beta_4 X_{it} + \varepsilon_{it} \quad (9)$$

where E_{it}, S_{it}, and G_{it} are the separate E, S, and G ratings of firm *i* in the year *t* and all other variables are the same as in equation 7.

The coefficients of interest in these regression models are the coefficients of the E, S, and G ratings, thus β_1, β_2, and β_3. It is expected that the coefficient of the E variable, thus β_1, has the most negative effect on the dependent variables.

4.2.2 Influence of public attention

To test the first and second parts of the third hypothesis, stating that a higher level of public attention to either environmental issues (part one) or socially responsible investing (part two) leads to higher stock returns for firms with a high ESG rating and lower stock returns of firms with a low ESG rating when a new environmental policy is announced, regression models using panel data and including an interaction term and a dummy variable are established. The models are complemented by the following set of control variables: size, leverage, B/M, and ROA. This leads to the following models (equation 10):

$$\begin{aligned} Y_{it} = \beta_0 + \beta_1 SGSVI_t + \beta_2 ESG\_low_{it} + \beta_3 SGSVI_t * ESG\_low_{it} + \beta_4 ESG\_high_{it} \\ + \beta_5 SGSVI_t * ESG\_high_{it} + \beta_6 X_{it} + \varepsilon_{it} \end{aligned} \quad (10)$$

where Y_{it} is one of the dependent variables AR_{it}, $CAR[-1,1]_{it}$, or $CAR[-3,3]_{it}$ of firm *i* in the year *t*. The independent variable $SGSVI_t$ measures the standardised seven-day averaged public attention in the year *t* to either one of the five search terms related to environmental issues or the aggregate index of the five search terms, or one of the three search terms related to socially responsible investing or the aggregate index of the three search terms. The dummy variable ESG_low_{it} takes on a value of one if a firm is part of the 10% lowest ESG ratings and a value of zero otherwise. The variable $SGSVI_t * ESG\_low_{it}$ is the interaction term between the level of public attention to each search term and low social responsibility level. The dummy variable ESG_high_{it} takes on a value of one if a firm is part of the 10% highest ESG ratings and a value of zero otherwise. The variable $SGSVI_t * ESG\_high_{it}$ is the interaction term between the level of public attention to each search term and high social responsibility level. Lastly, X_{it} is a set of the firm-level control variables size, leverage, B/M and ROA.

In these models, the coefficients of interest are the coefficients of the SGSVI interaction terms, thus β_3 and β_5. It is expected that the coefficient of the SGSVI interaction term for low ESG firms (β_3) is negative and the coefficient of the SGSVI term for high ESG firms (β_5) is positive.

4.3 Robustness checks

To test the robustness of the findings from the applied methodology, several robustness checks are performed. First, the normal returns in the event study are estimated using the Fama and French five-factor model rather than the market model. The data that is needed to apply this model is collected from the Kenneth R. French data library (French, 2021).

As a robustness check for the second hypothesis, the ESG portfolios are constructed based on different cut-off rates. This is a widely used robustness check in existing literature (e.g., Kempf and Osthoff, 2017). In this robustness check, portfolios of firms are created based on the 5% and 20% lowest and highest ESG ratings instead of 10%. Moreover, to further investigate the possible simultaneity bias between stock returns and ESG rating, Granger causality tests are performed.

To test the robustness of the findings of the third hypothesis, the standardised two-week averaged GSVI is used as a proxy for public attention, following the research of Guo et al. (2020). This measure captures a longer period of public attention. Because of this, the standardised two-week average GSVI reflects the public attention to environmental issues in somewhat normal situations.

5 Results

This section provides the results of the analysis of the different hypotheses.

5.1 Market reaction to the announcements of environmental policies

The event study methodology is applied to study the first hypothesis, stating that the market reaction to announcements of new environmental policies by the EU differs among different sectors. Table 7 shows the descriptive statistics of the (cumulative) abnormal returns for the different event windows applied in the event study. The results of the Jarque-Bera test for normality for these variables can be found in Table C.3 in Appendix C.

Table 7: Descriptive statistics for the (C)ARs calculated for the different event windows

	Obs.	Mean	Std. Dev.	Min	Med.	Max	Skew-ness	Kurto-sis
Panel A. Abnormal return								
[-1, 1]	26,820	-0.000	0.017	-0.082	0.000	0.093	0.276	6.114
[-3, 3]	62,580	-0.001	0.017	-0.082	0.000	0.094	0.224	6.029
Panel B. Cumulative abnormal return								
[-1, 1]	8,940	-0.001	0.028	-0.177	0.000	0.189	0.187	6.306
[-3, 3]	8,940	-0.004	0.043	-0.315	-0.001	0.354	0.149	7.365

First, the cumulative average abnormal returns for all different events are calculated to test whether there is a significant reaction of the market to each event. The descriptive statistics of the CAARs for the two event windows can be found in Table F.2 in Appendix F. The results of the Jarque-Bera test for normality for these two variables can be found in Table C.4 in Appendix C. The results show that the CAARs are normally distributed, thus their significance can be tested using a cross-sectional T-test. This leads to the results in Table 8.

The first selected event date (December 11, 2011) shows a significantly negative reaction in both event windows. On this date, the Durban Platform was adopted. This is an agreement on a roadmap for drawing up a legal framework by 2015 for climate action by all UN countries. The CAAR shows a small decrease for the seven-day event window compared to the three-day event window.

On the second event date (November 29, 2012), the European Commission adopted a proposal for the Environment Action Programme aimed to enhance the ecological resilience of Europe. One of the top priorities of this proposal is the acceleration of the transition to a low-carbon economy. Moreover, it provides a long-term policy framework for businesses and politicians. The market shows no significant reaction to this event in the three-day event window. However, there is a slightly positive reaction, significant at the 10% level, in the seven-day event window.

On the 16th of April 2013 (the third event date), the EU announced the EU climate change adaptation strategy. This strategy focuses on three key objectives: (a) promoting actions by the Member

States, (b) advocating adaptation in vulnerable sectors such as agriculture, fisheries, and cohesion policy, and (c) better-informed decision-making. In both event windows, the market shows a significantly negative reaction to this event of -0.491% and -0.686%, respectively.

The fourth event date (January 23, 2014) concerns the announcement of an EU policy framework for climate and energy from 2020 to 2030. It sets targets for a reduction in GHG emissions by 40% below 1990 levels, renewable energy of at least 27% and improvements in energy efficiency policies. Again, the market reacts significantly negative to this event. The reaction is larger for the seven-day event window (-0.683%) than for the three-day event window (-0.324%).

On the fifth event date (December 12, 2015), the Paris Agreement was signed by 196 parties, including the EU. This is the first legally binding global climate deal ever. The goal of the Paris Agreement is to limit global warming to 1.5 degrees Celsius above pre-industrial levels. All parties that signed the agreement are obligated to create national plans on how to reduce greenhouse gas emissions. The market reaction in the three-day event window (-0.520%) is significantly negative at the 1% level. However, this reaction decreases to -0.152% and becomes insignificant in the seven-day event window.

On November 4, 2016 (the sixth event date), the Paris Agreement entered into force. The agreement was a clear signal to investors, companies, and policymakers that the transition to clean energy was permanent. Such stakeholders had to take initiatives to shift resources away from polluting materials. This event has a significantly negative reaction of -0.389% on the stock market in the three-day event window. This reaction becomes even stronger in the seven-day event window (-1.849%).

The seventh event date (December 12, 2017) has a negative effect on the market in the EU. However, only the reaction in the three-day event window is significant. On this date, the European Commission adopted the “Action Plan for the Planet” strategy which includes ten transformative initiatives and calls for a valid taxonomy of green investments.

On the eighth event date (November 28, 2018), the European Commission adopted a strategy that created a strategic long-term vision for a climate-neutral economy by 2050 (“A Clean Planet for All”). The market shows a significantly positive reaction to this announcement in both event windows.

The ninth event date (December 11, 2019) shows a significantly positive market reaction in the three-day event window (0.366%) and a significantly negative market reaction in the seven-day event window (-0.715%). On this date, the European Commission presented the European Green Deal, which aims to reach a climate-neutral EU by 2050. Moreover, it has the goal to reduce GHG by at least 55% by 2030. The European Green Deal consists of both legislative and non-legislative initiatives across different sectors to accomplish these goals. Interestingly, the market reacts positively to this announcement at first, but this reaction becomes negative over a longer period.

On the tenth event date (October 7, 2020), the European Climate Law was proposed by the European Commission to turn the political commitment of the European Green Deal into a legal obligation. The stock market in the EU initially shows a significantly positive reaction to this announcement, but this reaction becomes insignificant in the seven-day event window.

Table 8: T-test for statistical significance of the CAARs of the different events
This table shows the results of the cross-sectional T-test testing whether the CAARs for the different events are significantly different from zero. The second and the fourth columns show the CAARs calculated over the different event windows for each event. Columns three and five show the respective test statistics following the T-test and their statistical significance.

		Panel A [-1, 1]		Panel B [-3, 3]	
	Obs.	**CAARs**	**T-test**	**CAARs**	**T-test**
December 11, 2011*	894	-1.011%	-10.480***	-1.647%	-10.358***
November 29, 2012	894	-0.025%	-0.274	0.237%	1.866*
April 16, 2013	894	-0.491%	-4.676***	-0.686%	-4.453***
January 23, 2014	894	-0.324%	-3.380***	-0.683%	-4.587***
December 12, 2015*	894	-0.520%	-6.230***	-0.152%	-1.087
November 4, 2016	894	-0.389%	-4.855***	-1.849%	-13.264***
December 12, 2017	894	-0.238%	-2.964***	-0.094%	-0.728
November 28, 2018	894	0.739%	7.988***	1.030%	7.209***
December 11, 2019	894	0.366%	4.423***	-0.715%	-5.437***
October 7, 2020	894	0.702%	6.830***	0.149%	0.988

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

To investigate the first hypothesis, the sample is split into sector portfolios. Table F.3 in Appendix F provides an overview of the different sectors and the number of companies per sector. For each event, the CAAR is calculated for the different sectors over the two event windows. The descriptive statistics of these variables can be found in Table F.4 in Appendix F. Moreover, the CAAR variables are tested for normality using the Jarque-Bera test (Table C.5 in Appendix C). The results show that the variables are normally distributed, thus a cross-sectional T-test is used to test the significance of the CAARs for the different sectors per event date. The results of this T-test can be found in Table 9.

On the first event date (December 11, 2011), nine of the eleven different sectors show a significantly negative reaction to the announcement in both event windows. This might be explained by the announcement's focus on the roadmap to a legal framework, which will probably lead to companies needing to make radical changes within their business. The Materials and Industrials sectors show the largest CAARs. Both sectors are part of the most polluting industries, as the Industrials sector includes transportation companies, and the Materials sector includes manufacturing companies.

On the second event date (November 29, 2012), Consumer Discretionary is the only sector showing a small significant reaction (at the 10% level). The sector reacts positively in both the three-day and the seven-day event window by 1.747% and 1.664%, respectively. A possible explanation for this reaction is the sector's sensitivity to economic cycles.

On the third event date (April 16, 2013), about half of the sectors show a significantly negative reaction to the announcement. However, there are differences between the three-day and the seven-day event window. The Materials, Communication Services, and Utilities sectors show a smaller and less significant CAAR in the longer event window. On the other hand, the Industrials, Consumer Discretionary, and Consumer Staples sectors show a larger and more significant CAAR. The Financials sector shows a similar reaction in both event windows.

Table 9: T-test for statistical significance of the sector CAARs of the different events
This table shows the results of the cross-sectional T-test testing whether the sector CAARs are significantly different from zero per event. The second and the fourth columns show the CAARs calculated over the different event windows for each sector. Columns three and five show the respective test statistics following the T-test and their statistical significance.

		Panel A [-1, 1]		**Panel B [-3, 3]**	
	Obs.	**CAARs**	**T-test**	**CAARs**	**T-test**
December 11, 2011*					
Energy	44	-1.039%	-2.480**	-1.692%	-2.255**
Materials	70	-1.443%	-5.349***	-1.894%	-4.165***
Industrials	173	-1.268%	-4.880***	-1.681%	-4.180***
Consumer Discretionary	76	-0.513%	-1.634	-0.207%	-0.384
Consumer Staples	39	-0.749%	-2.034**	-1.056%	-1.937*
Health Care	62	-1.315%	-4.056***	-1.498%	-2.493**
Financials	136	-0.757%	-3.337***	-2.128%	-4.978***
Information Technology	50	-1.116%	-3.117***	-1.654%	-3.483***
Communication Services	54	0.084%	0.205	-0.918%	-1.333
Utilities	35	-2.225%	-3.070***	-2.296%	-2.712***
Real Estate	41	-1.523%	-3.652***	-2.619%	-3.565***
November 29, 2012					
Energy	44	-0.191%	-0.355	0.191%	0.372
Materials	70	-0.304%	-0.962	-0.158%	-0.357
Industrials	173	-0.138%	-0.622	0.145%	0.422
Consumer Discretionary	76	0.394%	1.747*	0.582%	1.664*
Consumer Staples	39	-0.146%	-0.391	0.367%	0.761
Health Care	62	0.245%	0.814	0.471%	1.234
Financials	136	0.155%	0.644	0.228%	0.626
Information Technology	50	-0.245%	-0.547	0.204%	0.366
Communication Services	54	0.103%	0.219	1.048%	1.489
Utilities	35	-0.458%	-0.877	0.100%	0.189
Real Estate	41	-0.055%	-0.163	0.226%	0.366
April 16, 2013					
Energy	44	-0.566%	-1.236	-1.026%	-1.633
Materials	70	-0.833%	-2.922***	-0.978%	-1.697*
Industrials	173	-0.327%	-1.217	-0.892%	-2.287**
Consumer Discretionary	76	-0.655%	-1.885*	-1.209%	-2.112**
Consumer Staples	39	-0.677%	-1.390	-1.156%	-1.750*
Health Care	62	-0.475%	-1.105	-0.068%	-0.129
Financials	136	-0.722%	-3.011***	-0.946%	-2.616***
Information Technology	50	0.619%	1.268	0.235%	0.383
Communication Services	54	-1.615%	-3.233***	-1.218%	-1.774*
Utilities	35	-1.223%	-2.150**	-0.354%	-0.369
Real Estate	41	-0.121%	-0.242	-0.611%	-0.899
January 23, 2014					
Energy	44	-0.693%	-1.908*	-0.401%	-0.828
Materials	70	-0.432%	-1.236	-0.988%	-1.740*
Industrials	173	-0.289%	-1.208	-0.763%	-2.030**
Consumer Discretionary	76	-0.661%	-2.199**	-1.126%	-2.205**
Consumer Staples	39	-1.114%	-1.933*	-0.802%	-1.108
Health Care	62	-0.249%	-1.104	-0.244%	-0.517
Financials	136	-0.383%	-1.471	-0.620%	-1.501
Information Technology	50	-1.012%	-2.834***	-1.893%	-2.765***
Communication Services	54	0.290%	0.815	-1.263%	-1.961**
Utilities	35	0.262%	0.395	-0.354%	-0.493
Real Estate	41	-0.886%	-2.194**	-1.061%	-1.760*

(continued)					
December 12, 2015*					
Energy	44	-0.801%	-2.601***	-0.271%	-0.508
Materials	70	-0.593%	-1.659*	-0.348%	-0.516
Industrials	173	-0.832%	-3.875***	-0.287%	-0.766
Consumer Discretionary	76	-0.371%	-1.460	-0.082%	-0.196
Consumer Staples	39	-0.265%	-0.895	-0.006%	-0.013
Health Care	62	-0.722%	-2.638***	-0.486%	-0.969
Financials	136	-0.204%	-1.088	0.157%	0.463
Information Technology	50	-0.670%	-1.605	-0.692%	-1.536
Communication Services	54	-0.787%	-1.818*	-0.152%	-0.228
Utilities	35	-0.422%	-1.245	0.251%	0.383
Real Estate	41	-0.698%	-1.358	-0.291%	-0.328
November 4, 2016					
Energy	44	0.119%	0.431	-0.359%	-0.642
Materials	70	-0.587%	-2.257**	-1.634%	-3.576***
Industrials	173	-0.643%	-3.169***	-2.271%	-7.549***
Consumer Discretionary	76	-0.522%	-1.920*	-2.516%	-4.690***
Consumer Staples	39	-0.028%	-0.070	-0.767%	-0.912
Health Care	62	-0.386%	-1.181	-2.868%	-5.318***
Financials	136	-0.314%	-1.447	-1.957%	-5.012***
Information Technology	50	-0.081%	-0.273	-2.059%	-4.956***
Communication Services	54	-0.676%	-1.960**	-1.308%	-1.946*
Utilities	35	-0.214%	-0.654	-1.919%	-2.573**
Real Estate	41	-0.572%	-1.087	-2.395%	-2.946***
December 12, 2017					
Energy	44	-0.556%	-2.065**	-0.849%	-2.166**
Materials	70	-0.502%	-1.760*	-0.833%	-1.993**
Industrials	173	-0.286%	-1.570	0.150%	0.474
Consumer Discretionary	76	-0.163%	-0.545	-0.388%	-0.693
Consumer Staples	39	-0.177%	-0.506	-0.035%	-0.074
Health Care	62	-0.513%	-1.469	-0.665%	-1.166
Financials	136	0.021%	0.087	0.104%	0.296
Information Technology	50	-0.224%	-0.942	0.204%	0.423
Communication Services	54	-0.076%	-0.192	-0.146%	-0.243
Utilities	35	-0.446%	-0.923	-0.362%	-0.487
Real Estate	41	-0.255%	-0.752	0.860%	1.431
November 28, 2018					
Energy	44	0.571%	1.464	0.152%	0.290
Materials	70	0.732%	2.119**	1.095%	2.097**
Industrials	173	0.813%	3.539***	0.888%	2.461**
Consumer Discretionary	76	0.857%	2.383**	1.251%	2.451**
Consumer Staples	39	0.879%	2.240**	0.680%	1.187
Health Care	62	0.440%	1.055	0.779%	1.309
Financials	136	1.043%	4.238***	1.503%	3.579***
Information Technology	50	0.921%	2.324**	1.269%	2.103**
Communication Services	54	0.562%	1.727*	1.201%	2.342**
Utilities	35	0.966%	2.543**	1.493%	2.674***
Real Estate	41	1.301%	2.792***	1.997%	2.706***

(continued)					
December 11, 2019					
Energy	44	0.256%	1.044	-1.094%	-2.201**
Materials	70	0.308%	0.920	-0.695%	-1.318
Industrials	173	0.441%	2.150**	-0.404%	-1.192
Consumer Discretionary	76	0.437%	1.731*	-0.423%	-0.978
Consumer Staples	39	0.131%	0.321	-0.622%	-1.049
Health Care	62	0.191%	0.548	-1.244%	-1.905*
Financials	136	0.218%	1.072	-0.833%	-2.455**
Information Technology	50	0.931%	2.123**	0.093%	0.183
Communication Services	54	0.519%	1.242	-1.874%	-3.444***
Utilities	35	0.341%	0.851	-0.107%	-0.209
Real Estate	41	0.851%	2.795***	-1.041%	-1.970**
October 7, 2020					
Energy	44	-0.314%	-0.672	0.642%	1.006
Materials	70	0.732%	2.034**	0.417%	0.916
Industrials	173	0.997%	3.828***	-0.026%	-0.064
Consumer Discretionary	76	0.730%	2.150**	-0.452%	-1.137
Consumer Staples	39	-0.077%	-0.173	-0.247%	-0.353
Health Care	62	0.060%	0.170	-0.387%	-0.552
Financials	136	0.989%	3.340***	0.336%	0.800
Information Technology	50	0.752%	1.730*	-0.397%	-0.530
Communication Services	54	0.884%	2.033**	-0.055%	-0.096
Utilities	35	0.833%	1.877*	1.213%	1.977**
Real Estate	41	0.876%	1.679*	-0.009%	-0.014

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

On the fourth event date (January 23, 2014), again around half of the sectors show a significantly negative CAAR. For this event, there is more difference between the three-day and the seven-day event window though. Only the Consumer Discretionary, Information Technology, and Real Estate sectors show a significant reaction in both sectors. The largest CAARs are shown by the Information Technology and Consumer Discretionary sectors at around -2.8% and -2.2%, respectively.

On the fifth event date (December 12, 2015), the Paris Agreement was signed. Due to the importance of this agreement, a significant market reaction is expected. However, only five sectors show a significantly negative reaction solely for the three-day event window. This could be due to the content of the agreement already being known by the market. Among the sectors showing a significantly negative reaction are the Energy and Industrials sectors which are two of the most polluting sectors.

On the sixth event date (November 4, 2016), the Paris Agreement came into effect. This has a significantly negative effect on a substantial number of sectors, especially in the seven-day window. Investors in the Industrials sector react the most negative, leading to a CAAR of -2.271%. Other sectors that show a strongly significant effect are Health Care, Financials, Information Technology, Consumer Discretionary, Materials, and Real Estate. In the week surrounding the event, only two sectors do not show a significant effect. Surprisingly, one of those is the Energy sector.

On the seventh event date (December 12, 2017), only the Energy and Materials sectors react significantly negative to the announcement. The reactions become more negative and significant in the seven-day event window. The Energy sector is the most polluting sector due to its engagement in oil, gas, and fossil fuels.

On the eighth event date (November 28, 2018), nearly all sectors show a significantly positive CAAR in both event windows. This suggests that most investors have positive expectations of the effects of the "A Clean Planet for All" strategy on companies in different sectors. The Financials and Industrials sectors show the greatest positive reaction. Only the Energy and Health Care sectors show no significant reaction in one of the event windows.

On the ninth event date (December 11, 2019), all sectors show a positive reaction to the announcement in the three-day event window. Only the CAARs of the Real Estate, Industrials, Information Technology, and Consumer Discretionary sectors are significant, though. However, in the seven-day event window, all CAARs except that of the Information Technology sector become negative. In this event window, the CAARs of the Communication Services, Financials, Energy, Real Estate, and Health Care sectors are significant.

On the tenth event date (October 7, 2020), eight sectors show a significantly positive reaction in the three-day event window. The largest CAARs occur for the Industrials (0.997%) and the Financials sectors (0.989%), both significant at the 1% level. In the seven-day event window, only the Utilities sector shows a significantly positive effect. The reaction increases to 1.213% compared to 0.833% in the three-day event window.

Table 10: Summary of the T-test results of the sector CAARs

	Panel A [-1, 1]			**Panel B [-3, 3]**		
Sector	Positive effect	Negative effect	Not significant	Positive effect	Negative effect	Not significant
Energy	0	4	6	0	3	7
Materials	2	5	3	1	5	4
Industrials	3	3	4	1	4	5
Consumer Discretionary	4	3	3	2	3	5
Consumer Staples	1	2	7	0	2	8
Health Care	0	2	8	0	3	7
Financials	2	2	6	1	4	5
Information Technology	3	2	5	1	3	6
Communication Services	2	3	5	1	4	5
Utilities	2	2	6	2	2	6
Real Estate	3	2	5	1	4	5
Total	22	30	58	10	37	63

Table 10 shows a summary of the market reaction to the announcements of environmental policies for all sectors. All sectors show a significant reaction, either positive or negative, to at least one announcement. Overall, there are more significantly negative CAARs for both event windows. These results are in line with the findings of previous literature (Ramiah et al., 2013, Pham et al., 2019, and Birindelli and Chiappini, 2021).

The summary of the market reaction divided by sector shows that the Materials, Consumer Discretionary, and Industrials sectors are the most affected. Thus, investors in companies from these sectors expect that the announcements will have significant consequences for companies, either positively or negatively. Surprisingly, the Energy sector is not part of the most affected sectors. The sector shows a significant reaction to four announcements in the three-day event window and three announcements in the seven-day event window. All significant effects of this sector are negative, which is as expected since this sector is the most polluting due to its exposure to oil, gas and fossil fuels. Analysis by Ramiah et al. (2013) and Birindelli and Chiappini (2021) also finds that the Energy sector was not among the most affected. In the research by Ramiah et al. (2013), the sector reacted significantly negative to one event and in the research by Birindelli and Chiappini (2021) to two events. Thus, in this paper, the Energy sector is more affected than in previous literature.

Overall, the results show that sectors show different reactions to the announcements of environmental policies by the EU. Therefore, the first hypothesis can be accepted based on the results of this research. There are more negative than positive reactions in both event windows, which suggests that the announcement of new environmental policies by the EU is mainly perceived by the market to have negative consequences on companies.

5.2 Influence of ESG rating

5.2.1 Event study results

To construct an answer to the first part of the second hypothesis, stating that the stock returns of socially irresponsible firms are more negatively affected by announcements of new environmental policies than the stock returns of socially responsible firms, the CAARs of two portfolios are compared. The first portfolio consists of firms with the 10% lowest ESG ratings and the second portfolio consists of firms with the 10% highest ESG ratings. Table F.5 in Appendix F shows the descriptive statistics of the two portfolios. The mean CAAR of socially irresponsible firms is negative in both event windows. For socially responsible firms, the CAAR of the three-day event window is slightly positive, whereas the CAAR of the seven-day event window is similar to the CAAR of socially irresponsible firms. Moreover, the CAAR variables for the two portfolios are tested for normality using the Jarque-Bera test. The results can be found in Table C.6 in Appendix C and show that the variables are normally distributed. Thus, a cross-sectional T-test is used to test the significance of the CAARs for the different portfolios. Moreover, a T-test is conducted to test whether there is a significant difference between the CAARs of the two portfolios. The results of both T-tests are summarised in Table 11.

For the first event date (December 11, 2011), both portfolios show significantly negative reactions to the announcement in both event windows. While the reaction of the portfolio of socially irresponsible firms is more negative than the reaction of the portfolio of socially responsible firms, the difference between the CAARs is insignificant.

For the second, third, and fourth event dates, both portfolios show insignificant reactions to the announcement. For the second event date (November 29, 2012), the portfolio of socially irresponsible firms shows a negative reaction in the three-day event window and the portfolio of socially responsible firms shows a positive reaction. However, in the seven-day event window, this is reversed. The difference between the CAARs is insignificant in both event windows. For the third event date (April 16, 2013), the portfolio of socially irresponsible firms shows more positive reactions than the portfolio of socially responsible firms in both event windows. Again, the difference is insignificant. For the fourth event date (January 23, 2014), the portfolio of socially irresponsible firms shows more negative reactions than the portfolio of socially responsible firms in both event windows. However, the difference in CAARs between the two portfolios shows no significance.

For the fifth event date (December 12, 2015), the portfolio of socially irresponsible firms shows a significantly negative reaction to the announcement in the three-day event window. In this event window, the portfolio of socially responsible firms shows a positive, but insignificant reaction. While negative, the difference in CAARs is insignificant. Contrastingly, the CAAR of the portfolio of socially irresponsible firms is more positive than that of the portfolio of socially responsible firms in the seven-day event window. However, both CAARs and the differences between them are insignificant.

For the sixth event date (November 4, 2016), the CAAR of the portfolio of socially irresponsible firms is negative in the three-day event window, compared to a positive CAAR for socially responsible firms. Both values and the difference in CAARs between the two portfolios are insignificant, however. In the seven-day event window, the reactions of both portfolios are significantly negative. While the reaction of socially irresponsible firms is more negative, the difference is insignificant.

For the seventh event date (December 12, 2017), both portfolios show insignificant reactions to the announcement in both event windows. Although the reaction of the portfolio of socially irresponsible firms is more negative than the reaction of the portfolio of socially responsible firms in both event windows, the difference shows no significance.

For the eighth event window (November 28, 2018), the reaction of the portfolio of socially irresponsible firms is significantly positive in both event windows. For the portfolio of socially responsible firms, the reaction is also positive, but lower in both event windows. The difference between the reactions is significant at the 5% level. This is the opposite of what is expected in the hypothesis.

For the ninth event window (December 11, 2019), the reaction of both portfolios is positive in the three-day event window. While the reaction of socially responsible firms is higher and significant, the difference between the two portfolios is insignificant. In the seven-day event window, both portfolios show a negative reaction. While the reaction of socially irresponsible firms is more negative and significant, the difference between the two portfolios remains insignificant.

Table 11: T-tests for statistical significance of the CAARs of the portfolios of socially responsible and irresponsible firms and the difference in CAARs between the two portfolios of the different events

This table shows the results of the cross-sectional T-test testing whether the CAARs for the two portfolios of socially responsible and irresponsible firms are significantly different from zero per event. Moreover, the results of the T-test testing whether the difference between the CAARs is significantly different from zero are shown. The second and fourth columns show the CAARs calculated over the different event windows. Columns three and five show the respective test statistics from the T-tests and the statistical significance.

		Panel A [-1, 1]		**Panel B [-3, 3]**	
	Obs.	**CAARs**	**T-statistic**	**CAARs**	**T-statistic**
December 11, 2011*					
Lowest 10% ESG ratings	49	-1.933%	-5.203***	-1.996%	-2.523**
Highest 10% ESG ratings	48	-0.835%	-1.830*	-1.582%	-2.219**
Difference		*-1.098%*	*-1.030*	*-0.415%*	*-0.389*
November 29, 2012					
Lowest 10% ESG ratings	50	-0.543%	-0.980	0.731%	0.982
Highest 10% ESG ratings	49	0.275%	0.867	-0.029%	-0.059
Difference		*-0.818%*	*-0.914*	*0.760%*	*0.849*
April 16, 2013					
Lowest 10% ESG ratings	49	0.657%	1.114	0.631%	0.744
Highest 10% ESG ratings	49	0.413%	0.872	-0.174%	-0.270
Difference		*0.244%*	*0.229*	*0.805%*	*0.756*
January 23, 2014					
Lowest 10% ESG ratings	50	-0.270%	-0.714	-0.916%	-1.374
Highest 10% ESG ratings	48	0.182%	0.529	0.025%	0.046
Difference		*-0.452%*	*-0.523*	*-0.941%*	*-1.089*
December 12, 2015*					
Lowest 10% ESG ratings	51	-0.669%	-1.871*	0.958%	1.283
Highest 10% ESG ratings	50	0.166%	0.556	0.351%	1.075
Difference		*-0.836%*	*-1.018*	*0.607%*	*0.740*
November 4, 2016					
Lowest 10% ESG ratings	51	-0.475%	-1.146	-2.672%	-3.896***
Highest 10% ESG ratings	51	0.020%	0.075	-1.717%	-3.262***
Difference		*-0.495%*	*-0.573*	*-0.955%*	*-1.105*
December 12, 2017					
Lowest 10% ESG ratings	56	-0.391%	-1.493	-0.237%	-0.411
Highest 10% ESG ratings	55	-0.278%	-0.913	-0.079%	-0.207
Difference		*-0.114%*	*-0.164*	*-0.158%*	*-0.228*
November 28, 2018					
Lowest 10% ESG ratings	77	1.344%	4.076***	2.027%	4.154***
Highest 10% ESG ratings	76	0.154%	0.620	0.623%	1.335
Difference		*1.191%*	*1.763***	*1.404%*	*2.079***
December 11, 2019					
Lowest 10% ESG ratings	75	0.420%	1.325	-1.399%	-2.415**
Highest 10% ESG ratings	74	0.926%	3.384***	-0.601%	-1.404
Difference		*-0.505%*	*-0.700*	*-0.798%*	*-1.106*
October 7, 2020					
Lowest 10% ESG ratings	28	0.274%	0.485	-0.068%	-0.061
Highest 10% ESG ratings	27	0.234%	0.422	-0.016%	-0.022
Difference		*0.040%*	*0.030*	*-0.051%*	*-0.038*

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For the tenth event window (October 7, 2020), no significant reactions are shown for both portfolios in both event windows. In the three-day event window, the reaction of the portfolio of socially irresponsible firms is more positive than that of the portfolio of socially responsible firms. In the seven-day event window, the reaction of the socially irresponsible firms is more negative than that of the socially responsible firms. However, the differences in both event windows are insignificant.

Overall, nine of the ten events show no significant differences between the cumulative average abnormal returns of the two portfolios for socially responsible and irresponsible firms. In half of the events, the portfolios of socially irresponsible firms show a lower reaction to the announcement than the portfolios of socially responsible firms. However, when testing whether the difference between the reactions of the two portfolios is significantly different than zero, most results are insignificant. Only the eighth event shows a significantly higher reaction from socially irresponsible firms. This is the exact opposite of the hypothesis. Therefore, the first part of the second hypothesis cannot be accepted.

5.2.2 Regression analysis results

To test the second part of the second hypothesis, stating that the negative effect on the stock returns of socially irresponsible firms is mainly driven by the environmental (E) pillar of the ESG rating when a new environmental policy is announced, several regression models using panel data are established.

First, regression models measuring the effect of the ESG rating as a whole are established to determine whether there is indeed a negative effect on the stock ratings of the most socially irresponsible firms. The results of these models can be found in Table F.6 in Appendix F. The main variable of interest is the interaction term between the dummy variable indicating whether a firm is part of the 10% lowest ESG rating and the ESG rating as a whole. Columns 1 and 2 show the results of the regression models including the abnormal returns as the dependent variable. The interaction term has a negative effect on the abnormal returns, which is in line with the expectations. However, the effect is insignificant. Columns 3 and 4 show the results of the regressions including the CAR of the three-day event window as the dependent variable. The interaction term shows a slightly positive relation in the model including control variables, which contradicts the results of the models in columns 1 and 2. However, the effect is again insignificant. Columns 5 and 6 show that the interaction term is more negative than that of the models with the abnormal return as dependent variable. Yet, the effect is again insignificant. The results do not confirm that there is a significantly negative effect on the stock returns of socially irresponsible firms when a new environmental policy is announced. Nevertheless, it might still be interesting to look at the effect of the separate E, S, and G pillars due to the slightly negative effect in four of the models.

Table 12 shows the results of the regression models in which the total ESG rating is split up into its three components, environment (E), social (S), and corporate governance (G), to measure the separate effects of the pillars. In these models, only the sample of socially irresponsible firms is included. This explains the lower number of observations. The main variables of interest are the coefficients of the separate E, S, and G ratings. It is expected that the E pillar has the most negative effect when new environmental policies are announced.

Table 12: Regression models measuring the effect of the separate ESG pillars of socially irresponsible firms
This table shows the results of the regression models using panel data measuring the effect of the separate ESG pillars on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *E, S,* and *G* are independent variables measuring the effect of the separate E, S, and G pillars. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the model. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
E	0.0000	0.0000	-0.0001	-0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)
S	-0.0000	0.0000	0.0002	0.0002	-0.0002	-0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)
G	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Size		0.0001		0.0001		0.0006
		(0.0006)		(0.0006)		(0.0012)
Leverage		-0.0072		0.0001		-0.0045
		(0.0047)		(0.0058)		(0.0103)
B/M		-0.0044		0.0101		0.0989**
		(0.0274)		(0.0317)		(0.0459)
ROA		-0.0044		0.0128		0.0304
		(0.0122)		(0.0167)		(0.0274)
Constant	-0.0052	-0.0047	-0.0206***	-0.0224*	-0.0186	-0.0349
	(0.0035)	(0.0101)	(0.0058)	(0.0117)	(0.0141)	(0.0221)
Observations	502	495	502	495	502	495
Groups	174	172	174	172	174	172
R^2	0.0745	0.0794	0.0972	0.0989	0.0972	0.1085
Adjusted R^2	0.0320	0.0283	0.0557	0.0488	0.0557	0.0590
Hausman	0.7208	0.3315	0.2324	0.0565	0.8544	0.9510
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Columns 1 and 2 show the results of the regression models with the abnormal returns as the dependent variable. The constants of both models are negative but insignificant. The results show that none of the separate E, S, and G pillars has a significant effect on the abnormal returns. Moreover, none of the control variables has a significant effect. Columns 3 and 4 show the results of the regression models with the CAR calculated over the three-day event window as the dependent variable. In these models, the constants are both significantly negative. However, the significance decreases when the control variables are included. The estimates in column 3 show that the E and G ratings have a negative effect of -0.0001 on the CAR, though insignificant. The S pillar has an insignificantly positive effect. From the control variables, no values are significant. Columns 5 and 6 show the results of the regression models with the CAR calculated over the seven-day event window as the dependent variable. The constants of both models are negative but insignificant. In these models, the S and G pillars show a negative effect on the dependent variable. Surprisingly, the E pillar shows a slightly positive effect. This is not in line with the hypothesis. However, none of the values shows significance. The control variable B/M has a significantly positive effect on the CAR, implying that firms with a higher book-to-market ratio have higher returns in the seven-day event window.

In conclusion, the regression models measuring the effect of the separate ESG pillars on the stock returns of socially irresponsible firms cannot confirm the expectation that the negative effect is mainly driven by the environmental (E) pillar. The models measuring the effect of the ESG rating as a whole do not show a significantly negative effect on the stock ratings of socially irresponsible firms. Moreover, the estimates show that the separate pillars do not have a significant effect on the stock returns in all models. Besides, the E pillar does not have the most negative effect on the returns, contradicting the expectations. Therefore, the second part of the second hypothesis cannot be accepted.

5.3 Influence of public attention

To investigate the third hypothesis, stating that a higher level of public attention to environmental issues (part one) and socially responsible investing (part two) leads to higher stock returns of firms with a high ESG rating and lower stock returns of firms with a low ESG rating when a new environmental policy is announced, regression models using panel data are constructed. The dependent variables in the models are the abnormal returns and the CARs calculated over the event windows [-1, 1] and [-3, 3]. The main variables of interest are the interaction terms between the level of standardised seven-day average public attention to a particular search term and the dummy variables indicating whether a firm is among the 10% lowest or highest ESG ratings. The effect of the search terms on stock returns is also interesting.

5.3.1 Environmental issues

The results of the regression models for the different search terms related to environmental issues can be found in Table F.7 to F.11 in Appendix F. The effects of the search terms on the stock returns are significant at the 1% significance level in all models. However, the sign and magnitude differ per search term. The search term ‘global warming’ leads to a decrease in AR, CAR [-1, 1], and CAR [-3, 3] of -0.32%, -1.82%, and -1.68%, respectively. A higher level of public attention to ‘environmental pollution’ also has a negative effect of -0.13%, -0.83%, and -0.73%, respectively. A higher level of public attention to the other three search terms has a positive effect on the stock market. An increase in public attention to the search term ‘climate change’ leads to an increase in AR, CAR [-1, 1], and CAR [-3, 3] of 0.18%, 1.01%, and 0.92%, respectively. For ‘sustainability’, the effect is smaller, namely 0.10%, 0.60%, and 0.57%, respectively. More public attention to ‘environmental governance’ shows an increase in AR, CAR [-1, 1], and CAR [-3, 3] of 0.15%, 0.30%, and 0.56%, respectively. In summary, the largest negative effect on the stock returns when a new environmental policy is announced comes from the search term ‘global warming’ and the largest positive effect from ‘climate change’.

For the search term ‘global warming’, the interaction term for low ESG firms shows a positive effect. However, this effect is only slightly significant in the model with CAR [-3, 3] as the dependent variable including the control variables. The interaction term for high ESG firms shows a slightly negative effect in the models with AR as the dependent variable and a positive effect in the other models. Yet, only the coefficient for the model with CAR [-1, 1] as the dependent variable excluding control variables is slightly significant. Overall, the coefficients of the interaction term for high ESG firms are higher only for the models with CAR [-1, 1] as the dependent variable, which is not in line with the hypothesis. For the search term ‘climate change’, the interaction term for low ESG firms shows a negative effect, except for the model with CAR [-3, 3] as the dependent variable including control variables. However, all estimates are insignificant. The coefficients of the interaction term for high ESG firms show a similar pattern and are only higher in the models with AR as the dependent variable. This implies the opposite of what is expected in the hypothesis. For the search term ‘sustainability’, the combined effect of public attention and low ESG rating is slightly above or below zero and insignificant in the models with AR and CAR [-1, 1] as the dependent variable. For the models with CAR [-3, 3], the effect is negative but insignificant. The effect of public attention combined with a high ESG rating is positive in the models with AR as the dependent variable, but negative in the other models. The negative effect on CAR [-1, 1] is significant at the 5% level. This implies that a higher level of public attention to ‘sustainability’ leads to a decrease of -0.37% in the stock returns of firms with a high ESG rating when a new environmental policy is announced. The coefficients of the interaction term for high ESG firms are higher than those for low ESG firms in the models with AR or CAR [-3, 3] as dependent variable. This is in line with the hypothesis. However, the values are insignificant. For the search term ‘environmental pollution’, the interaction term for firms with a low ESG rating shows a negative effect. Only the coefficients of the first three models are significant. The interaction term for firms with a high ESG rating also shows a negative effect. For the first two models, the coefficient is smaller than that for the interaction term for low ESG firms. For the other models, the effect is larger, which is not in line with the hypothesis. Yet, none of the coefficients is significant. For the search term ‘environmental governance’, the interaction terms for low and high ESG firms show no significant effect on the stock returns. Moreover, the coefficients for low ESG firms are only lower than the coefficients for high ESG firms in the models with CAR [-1, 1] as the dependent variable. This is not in line with the hypothesis.

From the control variables, size shows a significantly positive in nearly all the models. This implies that larger firms experience higher stock returns when a new environmental policy is announced. Only the model measuring the effect of public attention to ‘environmental pollution’ with CAR [-1, 1] as the dependent variable is insignificant. However, in this model, the control variable leverage has a positive effect on return, significant at the 5% level. Furthermore, firms with a higher ROA experience a decrease in CAR in the three-day event window, except for the model for the search term ‘environmental pollution’.

Table 13: Regression models measuring the effect of the standardised seven-day averaged aggregate public attention to environmental issues

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged aggregate public attention to environmental issues on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Aggregate SGSVI* and *ESG_high*Aggregate SGSVI* are interaction terms measuring the effect of the aggregate public attention to environmental issues for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Aggregate SGSVI	0.0014***	0.0013***	0.0072***	0.0072***	0.0069***	0.0065***
	(0.0004)	(0.0004)	(0.0006)	(0.0007)	(0.0010)	(0.0011)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0011	0.0010
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Aggre-	-0.0005	-0.0005	-0.0006	-0.0005	-0.0007	-0.0006
gate SGSVI	(0.0009)	(0.0009)	(0.0015)	(0.0015)	(0.0021)	(0.0021)
ESG_high	0.0006	-0.0002	0.0022*	0.0005	0.0011	-0.0008
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0022)	(0.0023)
ESG_high*Aggre-	0.0001	0.0001	-0.0025*	-0.0025	-0.0008	-0.0004
gate SGSVI	(0.0007)	(0.0007)	(0.0015)	(0.0015)	(0.0022)	(0.0022)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0008		-0.0014
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0007		0.0117
		(0.0088)		(0.0130)		(0.0194)
ROA		-0.0037		-0.0143**		-0.0045
		(0.0040)		(0.0066)		(0.0104)
Constant	-0.0019**	-0.0056**	-0.0041***	-0.0146***	-0.0083***	-0.0241***
	(0.0009)	(0.0022)	(0.0013)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0234	0.0426	0.0494	0.0374	0.0409
Adjusted R^2	0.0167	0.0197	0.0397	0.0458	0.0345	0.0373
Hausman	0.9961	0.8441	0.9998	0.2490	0.9978	0.6735
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13 shows the results of the regression models for the aggregate standardised GSVI of search terms related to environmental issues. The estimates show that the aggregate standardised GSVI has a significantly positive effect on the stock returns in all models. This implies that a higher level of aggregate public attention to environmental issues leads to higher stock returns when the EU announces a new environmental policy. For the models with abnormal return as the dependent variable, the returns increase by 0.13% when the aggregate standardised GSVI increases. For the models with the CARs calculated over the three-day and seven-day window as dependent variables, the returns increase by

0.72% and 0.65%, respectively. The two interaction terms measuring the combined effect of public attention and low or high ESG rating have negative coefficients in all models, except those for high ESG rating with AR as the dependent variable. The estimates for low ESG firms are less negative in the models with CAR [-1, 1] and CAR [-3, 3] excluding control variables as the dependent variable. This contradicts the first part of the third hypothesis. In the other three models, the effect is as expected in the hypothesis. However, only the coefficients of the models with CAR [-1, 1] as the dependent variable excluding control variables are significant at the 1% level for high ESG firms. All other coefficients are insignificant. From the control variables, the variable size shows a significantly positive effect in line with the models for the separate search terms. This implies that larger firms experience higher stock returns when a new environmental policy is announced. Moreover, the ROA has a significantly negative effect on the CAR calculated over the three-day event window.

Overall, the results show that public attention to search terms related to environmental issues has a significant effect on the stock returns when a new environmental policy is announced. The search terms ‘global warming’ and ‘environmental pollution’ have a negative effect. The other three search terms, ‘climate change’, ‘sustainability’, and ‘environmental governance’, have a positive effect. The aggregate index has a positive effect. The significant effect of public attention is in line with research by El Ouadghiri et al. (2021). This research finds that a higher GSVI to the search terms ‘climate change’ and ‘pollution’ leads to higher (lower) returns for sustainability (conventional) indices.

From the interaction terms, no clear conclusion can be established as the coefficients are often insignificant, especially for the interaction term for low ESG firms. When comparing the coefficients for the interaction terms, the estimates for low ESG firms are often higher than those for high ESG firms. This is the exact opposite of the hypothesis. The results are not in line with previous research by Guo et al. (2020). This paper finds that heavily polluting firms experience larger decreases in returns when there is more public attention to environmental issues. However, only the search terms ‘environmental pollution’ and ‘environmental governance’ were considered in the paper. In conclusion, the first part of the third hypothesis cannot be accepted.

5.3.2 Socially responsible investing

The results of the regression models for the different search terms related to socially responsible investing can be found in Table F.12 to F.14 in Appendix F. The effects of the search terms on the stock returns are significant at the 1% significance level in all models. However, the sign and magnitude differ per search term. The search term ‘corporate social responsibility’ has a negative effect on the AR, CAR [-1, 1] and CAR [-3, 3] of -0.46%, -2.58%, and -2.38%, respectively. The other two search terms have a positive effect on the stock returns when new environmental policies are announced. A higher level of public attention to the search term ‘ESG’ leads to an increase of 0.09%, 0.53%, and 0.50%, respectively. For the search term ‘MSCI ESG’ the effect is larger, 0.20%, 1.09%, and 0.99%, respectively.

For the search term ‘corporate social responsibility’, the interaction term for firms with a low ESG rating does not show a significant effect. The models with AR and CAR [-1, 1] as dependent variables show a slightly negative effect, and those with CAR [-3, 3] show a positive effect. The interaction term for firms with a high ESG rating has a negative coefficient for all models. The estimates for the models with CAR [-1, 1] as the dependent variable are significant at the 5% level. Interestingly, nearly all estimates for low ESG firms are higher than those for high ESG firms, which contradicts the hypothesis. For the search term ‘ESG’, none of the models show a significant effect of the interaction terms on the returns. The estimates for low ESG firms are positive for the models with AR and CAR [-1, 1] and negative for those with CAR [-3, 3] as the dependent variable. The interaction term for high ESG firms is positive for the models with AR and CAR [-3, 3] as the dependent variables and negative for the others. Overall, four of the models have higher coefficients for the interaction term for firms with a high ESG rating. For the search term ‘MSCI ESG’, the combined effect of public attention and low ESG rating is negative for the models with AR as the dependent variable. The effect on CAR [-1, 1] is mixed. For CAR [-3, 3] it is positive. For high ESG firms, only the effect on CAR [-3, 3] is positive. The coefficients of the interaction term for high ESG firms are higher than those for low ESG firms in the models with AR and CAR [-3, 3] as dependent variables, which is in line with the hypothesis. However, none of the interaction terms show significance.

The control variable size has a significantly positive effect in all models. Moreover, in the models with CAR [-1, 1] as the dependent variable, the control variable ROA has a negative effect on the returns, significant at the 5% level.

Table 14 shows the results of the regression models for the aggregate standardised GSVI of search terms related to socially responsible investing. The coefficients of the aggregate standardised GSVI are positive and significant at the 1% level in all models. This implies that a higher level of public attention to socially responsible investing when a new environmental policy is announced leads to an increase in AR, CAR [-1, 1], or CAR [-3, 3] of 0.10%, 0.59%, or 0.54%, respectively. The interaction term measuring the effect of low ESG firms is positive for the models with AR and CAR [-1, 1] as the dependent variables. For the models with CAR [-3, 3], the coefficients are negative. However, all coefficients are insignificant. The interaction term measuring the effect of high ESG firms has a negative coefficient in the models with one of the CARs as the dependent variable. However, the effect is only significant in the models with CAR [-1, 1] as the dependent variable. When comparing the estimates for the two interaction terms, the coefficient for high ESG firms is higher than that for low ESG firms only in the models with AR as the dependent variable. This is not as expected in the second part of the third hypothesis. From the control variables, the variable size shows the same significantly positive effect as the models for the separate search terms. Thus, larger firms experience higher stock returns when a new environmental policy is announced. Moreover, the ROA has a significantly negative effect in the models with CAR [-1, 1] as the dependent variable.

Table 14: Regression models measuring the effect of the standardised seven-day averaged aggregate public attention to socially responsible investing

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged aggregate public attention to socially responsible investing on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Aggregate SGSVI* and *ESG_high*Aggregate SGSVI* are interaction terms measuring the effect of the aggregate public attention to socially responsible investing for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	AR	AR	CAR	CAR	CAR	CAR
			[-1, 1]	[-1, 1]	[-3, 3]	[-3, 3]
Aggregate SGSVI	0.0011***	0.0010***	0.0059***	0.0059***	0.0057***	0.0054***
	(0.0003)	(0.0003)	(0.0005)	(0.0006)	(0.0008)	(0.0009)
ESG_low	0.0007	0.0009	-0.0005	-0.0003	0.0011	0.0010
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Aggregate	0.0004	0.0004	0.0001	0.0003	-0.0003	-0.0008
SGSVI	(0.0008)	(0.0009)	(0.0014)	(0.0015)	(0.0022)	(0.0022)
ESG_high	0.0006	-0.0002	0.0020	0.0004	0.0011	-0.0008
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0022)	(0.0023)
ESG_high*Aggregate	0.0007	0.0006	-0.0027*	-0.0026*	-0.0012	-0.0009
SGSVI	(0.0008)	(0.0008)	(0.0014)	(0.0014)	(0.0022)	(0.0022)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0015
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0006		0.0116
		(0.0088)		(0.0129)		(0.0194)
ROA		-0.0036		-0.0143**		-0.0045
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0022**	-0.0060***	-0.0057***	-0.0163***	-0.0098***	-0.0255***
	(0.0009)	(0.0022)	(0.0014)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0234	0.0426	0.0494	0.0374	0.0410
Adjusted R^2	0.0167	0.0197	0.0397	0.0458	0.0345	0.0373
Hausman	0.9969	0.8962	1.0000	0.4305	0.9953	0.6751
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

To summarise, the results of the regression models show that a higher level of public attention to search terms related to socially responsible investing when new environmental policies are announced has a significant effect on the stock market. While the search term 'corporate social responsibility' has a negative effect on stock returns, the other two search terms, 'ESG' and 'MSCI ESG', have a positive effect. The aggregate index leads to an increase in the dependent variables. The main variables of interest are not in line with the hypothesis. In half of the models, the coefficient of the interaction term for high ESG firms is lower than that of the interaction term for low ESG firms. However, the variables are insignificant in nearly all models. While the coefficients of the interaction term for high ESG firms are significant in some of the models, those of the interaction term for low ESG firms are insignificant in all models. Therefore, the second part of the third hypothesis cannot be accepted.

5.4 Robustness checks

To determine whether the estimates from the applied methodology are robust, several checks are performed. The results of these robustness checks can be found in Appendix G.

For the first hypothesis, the normal returns in the event study can be determined in several ways. In the applied methodology, the market model was used. To determine the robustness of these estimates, the normal returns are also calculated using the Fama and French five-factor model. Table G.1 shows the results of the cross-sectional T-test testing the significance of the CAARs for the different sectors per event date when the normal returns are calculated with the Fama and French five-factor model. Most of the results are quite similar to the main results. Yet, there are some differences. For events 3 and 4, the results are larger and more significant. For events 6, 7, 9, and panel A of event 8, the estimates show less significance. Event 2, 5, 10, and panel B of event 8, show values similar to the main results. For the first event date, the calculated CAARs and the results from the T-test substantially differ from the main results. The overall conclusion remains robust against the findings in the robustness checks, as the market reaction to the announcement of environmental policies differs among sectors.

For the second hypothesis, the portfolios of socially responsible and irresponsible firms are constructed using different cut-off rates as a robustness check. In the main methodology, the lowest and highest 10% ESG ratings were included in the portfolios, and for robustness, the analysis is also performed with portfolios including the highest and lowest 5% and 20% ESG ratings. The results of the tests for the first part of the second hypothesis can be found in Table G.2 and G.3. While there are differences in the CAARs calculated for the portfolios with the different cut-off rates, the overall conclusion remains robust. No significant difference is found between the CAARs of the portfolio of socially responsible firms and the portfolio of socially irresponsible firms. For the second part of the second hypothesis, the regression models are constructed using the different cut-off rates. The results can be found in Table G.4 to G.7. For the 5% and 20% cut-off rates, again no significant effect is found for the interaction term between ESG rating and firms being socially irresponsible. Moreover, the E pillar again does not show the most negative effect on the stock returns of socially irresponsible firms.

To further investigate the problem of endogeneity due to simultaneous causality between stock returns and ESG rating, Granger causality tests are performed. To perform such tests, the data must be stationary. To test this, the Levin-Lin-Chu (2002) test is performed. The results can be found in Table G.8 and show that the dependent variables are stationary. Thus, the Granger causality tests can be performed. The results can be found in Table 15. The null hypothesis of the Granger causality test states that the selected variable does not Granger cause the dependent variable. The results show a significant test statistic in four of the six tests. The first two tests show that the ESG rating Granger causes the abnormal returns on the event dates and vice versa. This fuels the simultaneity issue. The other four tests show that the three-day and seven-day CARs Granger cause ESG rating, but not the other way around. This could be an explanation for the lack of effect of ESG rating on the stock returns. This shows that the issue of endogeneity due to simultaneous causality is present in this research. Therefore, the results should be interpreted with caution. Moreover, future research could include solutions to this problem such as instrumental variable analysis with two-stage least squares (2SLS) regressions.

Table 15: Results of the Granger causality test between the return variables and ESG rating

Dependent variable	Excluded variable	HPJ Wald test	P-value
AR	ESG	8.396	0.004***
ESG	AR	60.503	0.000***
CAR [-1, 1]	ESG	2.067	0.151
ESG	CAR [-1, 1]	30.665	0.000***
CAR [-3, 3]	ESG	2.139	0.144
ESG	CAR [-3, 3]	34.560	0.000***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For the third hypothesis, the regression models are constructed with the standardised two-weeks averaged GSVI instead of the standardised seven-day averaged index. For search terms related to environmental issues, the results of the robustness check can be found in Table G.9 to G.14. The results show that the different search terms have a similar effect on the stock returns as in the applied methodology, except for 'environmental governance'. Whereas the effect of this search term was significantly positive in the main results, it is significantly negative in the robustness check. The estimates for the interaction terms show slightly different effects for some models. However, most coefficients are again insignificant. The most substantial differences occur between the models for the search term 'environmental governance'. An explanation for this is that for the seven-day average public attention to 'environmental governance' only one event showed an index different than zero. For the two weeks averaged public attention, more than one event showed an index different than zero. Overall, the same conclusion can be drawn for the first part of the third hypothesis based on the robustness checks. The results of the robustness check for search terms related to socially responsible investing can be found in Table G.15 to G.18. The different search terms influence stock returns with the same sign as in the main results. However, the magnitude differs for two of the search terms. Specifically, 'corporate social responsibility' has a higher negative effect and 'MSCI ESG' has a lower positive effect. While there are some differences in the estimates for the interaction terms, the coefficients are again mostly insignificant. Overall, the conclusion for the second part of the third hypothesis based on the robustness checks remains the same as in the main results.

6 Conclusion and Discussion

6.1 Conclusion

This paper researches the impact of announcements of new environmental policies by the EU on the stock market. Moreover, the influence of ESG rating and public attention on this effect is considered. The paper contributes to the existing literature by shedding more light on the relationship between environmental regulation and stock market performance. Besides, it is the first paper to analyse this relation while also considering the influence of both ESG rating and public attention. In this research, ten announcements of environmental policies by the EU over the years 2011 to 2020 are analysed. To determine the market reaction, the share prices of all listed firms in the EU with a reported ESG rating in the Thomson Reuters database are collected. Following the research by Da et al. (2011), the GSVI is used as proxy for public attention. The research question to which this paper aims to construct an answer is as follows: *'How does the stock market react to announcements of new environmental policies by the EU, and is this reaction influenced by ESG rating and public attention?'*.

The research question is addressed by analysing several hypotheses. The first hypothesis states that the market reaction to the announcement of new environmental policies by the EU differs among sectors. To examine this hypothesis, an event study is conducted. The results of the event study and the cross-sectional T-test confirm the existence of a sector-by-sector reaction to the announcements of new environmental policies by the EU, which is in line with research by Ramiah et al. (2013), Pham et al. (2019), and Birindelli and Chiappini (2021). In the three-day event window ([-1, 1]), there are 22 positive, 30 negative, and 58 insignificant reactions. In the seven-day event window ([-3, 3]), there are 10 positive, 37 negative, and 63 insignificant reactions. This shows that announcements of new environmental policies by the EU are mainly perceived to have negative consequences on companies when insignificant reactions are not regarded. The most affected sectors, either positively or negatively, are the Materials, Consumer Discretionary, and Industrials sectors. While there are some differences in the estimates from the robustness check where the normal returns are calculated with the Fama and French five-factor model, the overall conclusion remains robust.

The second hypothesis considers the influence of ESG rating and is split into two parts. The first part of the second hypothesis states that the stock returns of socially irresponsible firms are more negatively affected by announcements of new environmental policies than the stock returns of socially responsible firms. Using the event study, the CAARs are calculated for two portfolios consisting of firms with either the 10% lowest or highest ESG ratings. For half of the events, the portfolio of socially irresponsible firms shows a lower reaction to the announcement than the portfolio of socially responsible firms. However, the results of the T-test testing the significance of the difference between the two CAARs show no significance. Therefore, the hypothesis is rejected. This conclusion remains robust in the robustness check where the portfolios are constructed at different cut-off rates (5% and 20%). The second part of the second hypothesis states that the negative effect on the stock returns of socially irresponsible firms is mainly driven by the environmental (E) pillar of the ESG rating when a new environmental policy is announced. This is analysed using regression models with panel data. While the results of the regression models considering the ESG rating as a whole do show a mainly negative effect of the interaction term between ESG rating and being a socially irresponsible firm on the dependent variables, the coefficients are insignificant. Thus, the results do not confirm that ESG rating has a negative effect on stock returns when a firm is socially irresponsible. Moreover, the results of the regression models measuring the effect of the separate ESG pillars on the stock returns of socially irresponsible firms do not show a significantly more negative effect of the E pillar. This leads to the rejection of the second part of the second hypothesis. Thus, ESG rating does not seem to have a significant influence on the market reaction to announcements of new environmental policies by the EU. This conclusion remains robust in the robustness check. The insignificant effect of ESG rating is in line with research by Bauer et al. (2007), Renneboog et al. (2008), and Mollet and Ziegler (2014). To investigate the problem of endogeneity caused by simultaneous causality, Granger causality tests are also performed as robustness checks. These show that the abnormal returns on the event dates and ESG rating Granger cause each other and that both CARs Granger cause ESG rating. Therefore, it is recommended to consider solutions to the endogeneity problem such as instrumental variable analysis with 2SLS regressions in future research on this topic.

The third hypothesis considers the influence of public attention to the environment. This hypothesis is again split into two parts. To analyse the two parts of the hypothesis, regression models using panel data including an interaction effect are constructed. The first part of the third hypothesis states that a higher level of public attention to environmental issues leads to higher stock returns of firms with a high ESG rating and lower stock returns of firms with a low ESG rating when a new environmental policy is announced. The regression models show that public attention to the different search terms related to environmental issues has a significant effect on the stock returns. This effect is negative for the search terms ‘global warming’ and ‘environmental pollution’. It is positive for the search terms ‘climate change’, ‘sustainability’, and ‘environmental governance’, and the aggregate index of all search terms. No clear conclusion can be drawn based on the interaction terms. Most of the estimates for low ESG firms are higher than those for high ESG firms, which contradicts the hypothesis. However, the coefficients are often insignificant. Therefore, the first part of the third hypothesis is rejected. This effect is not in line with research by Guo et al. (2020), which finds that heavily polluting firms have a more negative effect on returns when there is a higher level of public attention to environmental issues. However, this thesis identifies heavily polluting firms in a different way than the paper by Guo et al. (2020), which could explain the difference. Guo et al. (2020) only include firms from industries that are identified as heavily polluting based on criteria from the Environmental Protection of China (MEPC).

The second part of the third hypothesis states that a higher level of public attention to socially responsible investing leads to higher stock returns of firms with a high ESG rating and lower stock returns of firms with a low ESG rating when a new environmental policy is announced. The results of these models show that public attention to the different search terms related to socially responsible investing has a significant effect on the stock returns. While the search term 'corporate social responsibility' has a negative effect, the search terms 'ESG' and 'MSCI ESG', and the aggregate index have a positive effect on the stock returns. The interaction terms do not lead to a consistent conclusion. Half of the coefficients of the interaction term for low ESG firms are higher than those for high ESG firms, which contradicts the hypothesis. However, nearly all estimates are insignificant. Therefore, the second part of the third hypothesis is also rejected. In the robustness checks for hypothesis 3, the standardised two-week averaged GSVI is considered. The conclusions of both parts of the hypothesis remain robust in these checks.

In conclusion, only the first hypothesis can be accepted. This implies that when new environmental policies are announced by the EU, the stock market shows a sector-by-sector reaction. Overall, negative reactions are more common than positive reactions in this sample. Moreover, the results show that ESG rating does not have a significant influence on the stock market reaction. While public attention to either environmental issues or socially responsible investing does have a significant influence on the stock market, there is no evidence of a combined effect with ESG rating. The finding that announcements of new environmental policies by the EU mainly lead to a negative stock market reaction comes with interesting strategic possibilities. For example, policymakers could introduce reward schemes for firms that voluntarily adopt environmental policies. This could decrease the negative effect driven by investors' concern of high compliance costs for EU policies. Moreover, the significant effect of public attention on stock returns suggests that understanding public attention could be useful in establishing policies to promote environmentally friendly financial mechanisms.

6.2 Discussion

In this subsection, the limitations of the paper and recommendations for future research are discussed.

There are several limitations to this research. First, the data used in the regression models is non-normally distributed. While this is less of a problem since according to the Central Limit Theorem (Kwak and Kim, 2017), the data is approximately normally distributed due to the large sample size, it could still decrease the reliability of the results. Moreover, most of the models have a low adjusted R-squared, which means that the independent variables did not explain the variation of the dependent variable well. This should be considered when interpreting the results. To increase the adjusted R-squared, more independent variables could be added to the models. However, one should carefully establish which variables to add.

Secondly, in event studies, all firms with firm-specific events on the event dates, such as the release of financial information, should be removed from the sample. However, due to the large number of firms in the sample, checking all firms for firm-specific events would have been beyond the scope of this paper. Therefore, the calculated (cumulative average) abnormal returns could be influenced by a firm's reaction to a firm-specific event. Also, regarding the event study, some of the selected announcements might have been anticipated by the market. In this case, the market reaction is spread over a wider period surrounding the event. It could be interesting to conduct the event study over wider event windows in future research. Moreover, future research could consider the long-term implications of environmental policies implemented by the EU.

Thirdly, there are some limitations regarding the ESG data. While all other metrics in this paper are reported daily or weekly, the ESG ratings from the Thomson Reuters database are reported yearly. The results would have been more accurate if the ESG ratings were available at a more frequent level. Moreover, the choice of database has a major influence on the results of the analysis, as there are differences in rating methods for each database. This makes it difficult to use ESG ratings in empirical analysis. Berg, Koelbel, and Rigobon (2019) find that there is a great divergence between different sources for ESG ratings. According to them, this makes finding two databases that measure firm attributes in the same way nearly impossible. This leads to firms being among the top-rated firms according to one rating agency but being in the bottom rated firms according to another. Moreover, Halbritter and Dorfleitner (2015) show that the choice of ESG database has a significant impact on the results of their research. Future research could consider analysis of data from different ESG rating agencies to estimate the reliability of the findings. Another problem with ESG data is greenwashing, where companies pretend to be more sustainable than they truly are. Future research could add a control variable that is independent of the resources used by firms to obtain ESG ratings but is a direct and objective measure of how sustainable a company is, such as GHG emissions (Drempetic et al., 2020).

Lastly, there are some limitations regarding the GSVI data. First, Google Trends does not provide data for the EU as a whole. Therefore, the values had to be computed manually. This has led to an unweighted average, while this should have been corrected for country size. Moreover, Vozlyublennaia (2014) argues that the choice of search terms is arbitrary. This could lead to the problem of too much unrelated noise in the GSVI data that is used as a proxy for public attention. However, this biases the outcomes of the analysis towards no significant relation. Therefore, it is not much of a concern. Still, the results must be interpreted with some caution.

Some more recommendations for future research can be given, besides those mentioned regarding the limitations. First, an extended analysis of the effect of public attention would be interesting due to the significant effect on the stock returns. One factor that could be analysed is the long-term attention effect, as this paper only considers the stock returns over the short-term event windows [-1, 1] and [-3, 3]. Moreover, it would be interesting to compare the relationship with public attention to that with investor attention, as this is more representative of trading behaviour. This analysis could be performed for different kinds of investors, using the GSVI of company names and tickers as a proxy for attention from retail investors and Bloomberg searches as a proxy for attention from institutional investors (Ben-Rephael et al., 2017). The research could also be extended by analysing various sources of attention, such as social media outlets or newspaper articles on environmental issues. Lastly, it could be interesting to analyse specific green equity indices or bonds instead of the complete EU stock market.

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Appendix

A. ESG Rating

Table A.1: Overview of the three main pillars of the ESG rating
This table gives an overview of the three main pillars of the ESG rating as provided by Thomson Reuters and their respective categories. Per category, the weights in the total ESG rating and the definition are given.

Pillar	Category	Weights	Definition
Environmental	Resource Use	11%	Resource Use Score reflects a company's performance and capacity to reduce the use of materials, energy, or water, and to find more eco-efficient solutions by improving supply chain management.
	Emissions	12%	Emissions Score measures a company's commitment to and effectiveness in reducing environmental emission in the production and operational processes.
	Innovation	11%	Environmental Innovation Score reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed products.
Social	Workforce	16%	Workforce Score measures a company's effectiveness towards job satisfaction, healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.
	Human Rights	4.50%	Human Rights Score measures a company's effectiveness in respecting the fundamental human rights conventions.
	Community	8%	Community Score measures the company's commitment to being a good citizen, protecting public health and respecting business ethics.
	Product Responsibility	7%	Product Responsibility Score reflects a company's capacity to produce quality goods and services, incorporating the customer's health and safety, integrity, and data privacy.
Governance	Management	19%	Management Score measures a company's commitment to and effectiveness in following best practice corporate governance principles.
	Shareholders	7%	Shareholders Score measures a company's effectiveness in the equal treatment of shareholders and the use of anti-takeover devices.
	CSR Strategy	4.50%	CSR Strategy Score reflects a company's practices to communicate that it incorporates the economic (financial), social and environmental dimensions in its day-to-day decision-making processes.
Total		100	

Source: https://libguides.eur.nl/edsc-manuals/blog/new-thomson-reuters-esg-scores-added-to-datastream

B. Variable definition

Table B.1: Summary of all variables used in the analysis of this paper

Variable	Definition	Computation	Source
Stock market variables			
AR	The abnormal returns on the day of the announcement of a new environmental policy, calculated with the market model.	$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}), t \in [t_1, t_2]$	The stock prices come from Eikon Datastream. The Euro Stoxx 600 index is taken as benchmark for the market index.
CAR [-1, 1] or [-3, 3]	The cumulative abnormal returns calculated over the three-day or seven-day event window.	$CAR_{it} = CAR_{i(t_1,t_2)} = \sum_{t_1}^{t_2} AR_{it}, where\ t = t_2 - t_1$	
CAAR [-1, 1] or [-3, 3]	The cumulative average abnormal returns calculated for different portfolios over the three-day or seven-day event window.	$CAAR_t = \frac{\sum_t^N CAR_{it}}{N}$	
ESG variables			
ESG	ESG rating	See Appendix A	Thomson Reuters ESG database
ESG_low	Dummy variable that equals 1 if the firm is among the 10% lowest ESG ratings, and 0 otherwise.		
ESG_high	Dummy variable that equals 1 if the firm is among the 10% highest ESG ratings, and 0 otherwise.		
E	Environmental rating	See Appendix A	
S	Social rating		
G	Corporate Governance rating		
Public attention variables			
SGSVI	The standardised seven-day averaged GSVI of each selected search term related to environmental issues or socially responsible investing, and the aggregate index.	$SGSVI_t = \frac{GSVI_t - \frac{1}{n}\sum_{i=1}^{n} GSVI_i}{\sigma_{GSVI}}$	Google Trends
Control variables			
Size	The size of the firm.	Logarithmic value of total assets.	Eikon Datastream
Leverage	Financial leverage	Sum of short-term and long-term debt divided by total assets	
BM	Book-to-market ratio	Book value of equity divided by the market value of equity	
ROA	Return on assets	Net income divided by total assets	

C. Jarque-Bera tests for normality

Table C.1: Jarque-Bera test for normality of the complete data sample

Variable	Jarque-Bera (Chi^2)	P-value
Panel A. Financial data		
Stock returns	540,000	0.000
Market return	10,000,000	0.000
Panel B. ESG data		
ESG	56,000	0.000
E	87,000	0.000
S	99,000	0.000
G	49,000	0.000
Panel C. Seven-day averaged SGSVI environmental issues		
Global warming	682.0	0.000
Climate change	898.8	0.000
Sustainability	465.3	0.000
Environmental pollution	1,171	0.000
Environmental governance	20,000	0.000
Aggregate SGSVI	676.4	0.000
Panel D. Seven-day averaged SGSVI socially responsible investing		
Corporate social responsibility	7,114	0.000
ESG	2,535	0.000
MSCI ESG	1,362	0.000
Aggregate SGSVI	739.7	0.000
Panel E. Control variables		
Size	32,000	0.000
Leverage	87,000	0.000
B/M	54,000,000	0.000
ROA	3,900,000	0.000

Table C.2: Jarque-Bera test for normality of the variables included in the regression models

Variable	Jarque-Bera (Chi^2)	P-value
Panel A. Financial data		
Stock returns	1,416	0.000
Market return	393.2	0.000
Abnormal returns	4,123	0.000
CAR [-1, 1]	4,123	0.000
CAR [-3, 3]	7,131	0.000
Panel B. ESG data		
ESG	213.8	0.000
E	332.4	0.000
S	378.8	0.000
G	188.7	0.000
Panel C. Seven-day averaged SGSVI for environmental issues		
Global warming	682	0.000
Climate change	898.8	0.000
Sustainability	465.3	0.000
Environmental pollution	1,171	0.000
Environmental governance	20,000	0.000
Aggregate SGSVI	676.4	0.000
Panel D. Seven-day averaged SGSVI for socially responsible investing		
Corporate social responsibility	7,114	0.000
ESG	2,535	0.000
MSCI ESG	1,362	0.000
Aggregate SGSVI	739.7	0.000
Panel E. Control variables		
Size	121.3	0.000
Leverage	329.2	0.000
B/M	180,000	0.000
ROA	15,000	0.000

Table C.3: Jarque-Bera test for normality of the (C)ARs calculated for the different event windows

	Jarque-Bera (Chi^2)	P-value
Panel A. Abnormal return		
[-1, 1]	11,000	0.000
[-3, 3]	24,000	0.000
Panel B. Cumulative abnormal return		
[-1, 1]	4,123	0.000
[-3, 3]	7,131	0.000

Table C.4: Jarque-Bera test for normality of the CAARs calculated for the different events

	Jarque-Bera (Chi^2)	P-value
CAAR [-1, 1]	0.4782	0.7873
CAAR [-3, 3]	0.1893	0.9097

Table C.5: Jarque-Bera test for normality of the sector CAARs calculated for the different events

	Jarque-Bera (Chi^2)	P-value
CAAR [-1, 1]	0.2662	0.8754
CAAR [-3, 3]	0.4218	0.8099

Table C.6: Jarque-Bera test for normality of the CAARs calculated for the portfolios of socially responsible and irresponsible firms

	Jarque-Bera (Chi^2)	P-value
Panel A. Socially irresponsible firms (ESG rank 1)		
CAAR [-1, 1]	0.1186	0.9424
CAAR [-3, 3]	0.3918	0.8221
Panel B. Socially responsible firms (ESG rank 10)		
CAAR [-1, 1]	0.6791	0.7121
CAAR [-3, 3]	1.4200	0.4917

D. Correlation matrices

Table D.1: Correlation matrix of the variables included in the regression models to estimate the influence of ESG rating on the stock returns

	AR	CAR [-1, 1]	CAR [-3, 3]	ESG	E	S	G	ESG_low	Size	Leverage	BM	ROA
AR	1.000											
CAR [-1, 1]	0.523	1.000										
CAR [-3, 3]	0.348	0.626	1.000									
ESG	0.003	0.033	-0.016	1.000								
E	0.012	0.030	-0.022	0.852	1.000							
S	-0.000	0.041	-0.014	0.899	0.764	1.000						
G	-0.004	0.014	-0.005	0.707	0.410	0.451	1.000					
ESG_low	0.011	-0.004	0.009	-0.626	-0.538	-0.598	-0.427	1.000				
Size	0.026	0.066	0.041	0.469	0.510	0.385	0.330	-0.075	1.000			
Leverage	0.008	0.014	0.002	0.062	0.061	0.022	0.052	-0.023	0.141	1.000		
BM	-0.025	-0.016	-0.004	-0.231	-0.179	-0.208	-0.200	0.068	-0.218	-0.007	1.000	
ROA	-0.014	-0.041	-0.013	-0.003	-0.013	0.035	-0.039	-0.007	-0.115	-0.238	-0.107	1.000

Table D.2: Correlation matrix of the variables included in the regression models to estimate the influence of public attention to environmental issues on the stock returns

	AR	CAR [-1, 1]	CAR [-3, 3]	ESG_ low	ESG_ high	Global Warming	Climate Change	Sustain -ability	Environ- mental Pollution	Environ- mental Governance	Aggre- gate SGSVI	Size	Leve- rage	BM	ROA
AR	1.000														
CAR [-1, 1]	0.523	1.000													
CAR [-3, 3]	0.348	0.626	1.000												
ESG_low	0.011	-0.004	0.009	1.000											
ESG_high	0.010	0.022	0.007	-0.063	1.000										
Global Warming	0.054	-0.032	0.056	0.022	0.022	1.000									
Climate Change	0.034	0.115	0.073	0.019	0.019	-0.261	1.000								
Sustainability	0.019	0.162	0.069	-0.001	-0.001	-0.417	0.460	1.000							
Environmental Pollution	-0.047	-0.048	-0.001	-0.007	-0.008	-0.183	-0.198	-0.071	1.000						
Environmental Governance	0.026	0.011	0.052	-0.006	-0.006	0.479	-0.341	-0.090	-0.194	1.000					
Aggregate SGSVI	0.048	0.160	0.109	0.019	0.019	-0.126	0.866	0.768	-0.151	-0.150	1.000				
Size	0.026	0.066	0.041	-0.075	0.345	-0.028	0.063	0.071	-0.020	-0.027	0.074	1.000			
Leverage	0.008	0.014	0.002	-0.023	-0.006	-0.022	0.010	0.043	-0.005	0.011	0.024	0.141	1.000		
BM	-0.025	-0.016	-0.004	0.068	-0.110	0.004	-0.082	-0.056	0.042	0.053	-0.085	-0.218	-0.007	1.000	
ROA	-0.014	-0.041	-0.013	-0.007	0.006	0.019	0.020	-0.023	-0.006	-0.030	0.006	-0.115	-0.238	-0.107	1.000

Table D.3: Correlation matrix of the variables included in the regression models to estimate the influence of public attention to socially responsible investing on the stock returns

	AR	CAR [-1, 1]	CAR [-3, 3]	ESG_low	ESG_high	Corporate social responsibility	ESG	MSCI ESG	Aggregate SGSVI	Size	Leverage	BM	ROA
AR	1.000												
CAR [-1, 1]	0.523	1.000											
CAR [-3, 3]	0.348	0.626	1.000										
ESG_low	0.011	-0.004	0.009	1.000									
ESG_high	0.010	0.022	0.007	-0.063	1.000								
Corporate social responsibility	0.072	0.086	0.117	0.047	0.047	1.000							
ESG	0.030	0.132	0.061	-0.017	-0.018	-0.272	1.000						
MSCI ESG	0.059	0.122	0.067	0.027	0.026	0.286	0.533	1.000					
Aggregate SGSVI	0.067	0.178	0.123	0.007	0.006	0.247	0.864	0.680	1.000				
Size	0.026	0.066	0.041	-0.075	0.345	0.014	0.058	0.064	0.066	1.000			
Leverage	0.008	0.014	0.002	-0.023	-0.006	-0.028	0.067	0.040	0.050	0.141	1.000		
BM	-0.025	-0.016	-0.004	0.068	-0.110	-0.025	-0.032	-0.065	-0.048	-0.218	-0.007	1.000	
ROA	-0.014	-0.041	-0.013	-0.007	0.006	0.046	-0.064	-0.007	-0.037	-0.115	-0.238	-0.107	1.000

E. Q-Q plots

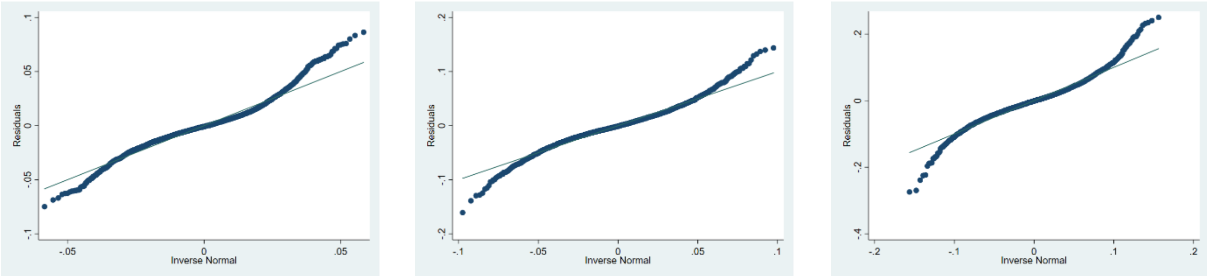

Figure E.1: Q-Q plots for the regression models measuring the effect of ESG rating as a whole
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

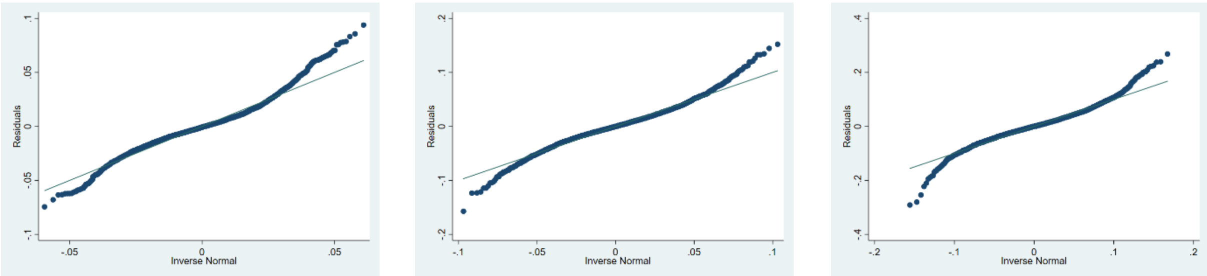

Figure E.2: Q-Q plots for the regression models measuring the effect of the separate E, S, and G pillars
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

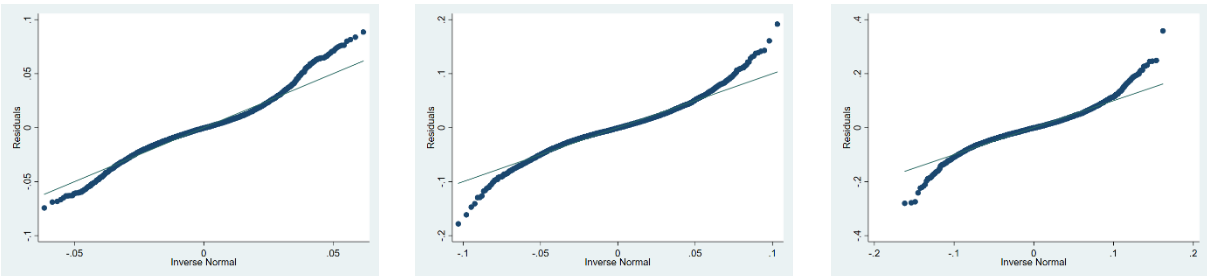

Figure E.3: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'global warming'
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

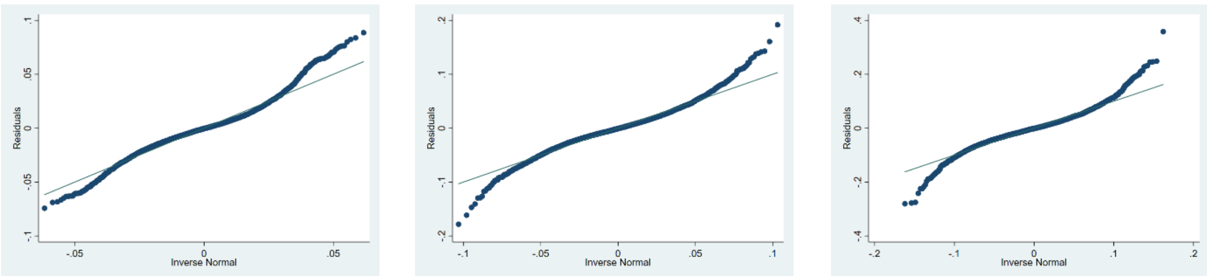

Figure E.4: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'climate change'
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

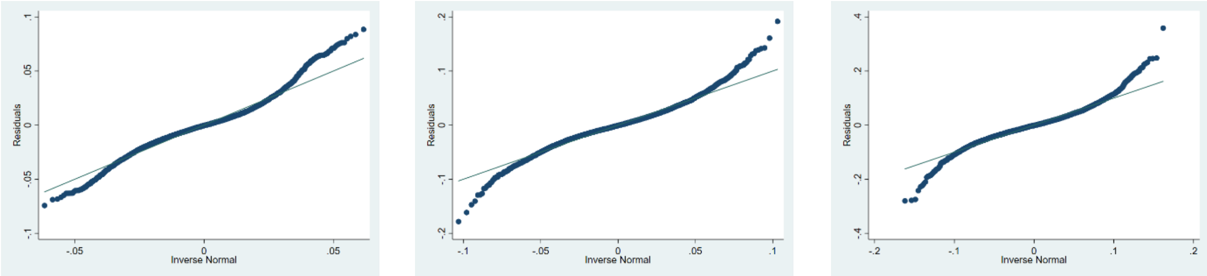

Figure E.5: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'sustainability'

The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

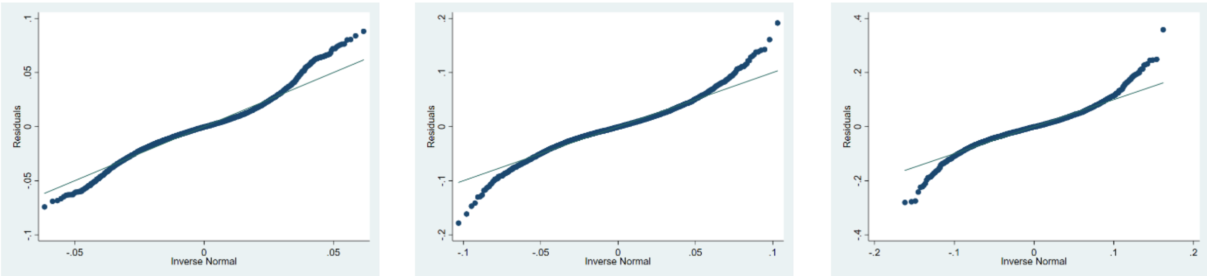

Figure E.6: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'environmental pollution'

The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

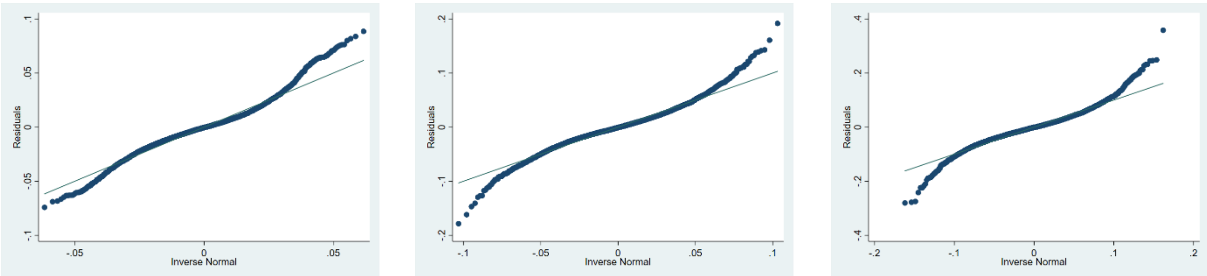

Figure E.7: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'environmental governance'

The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

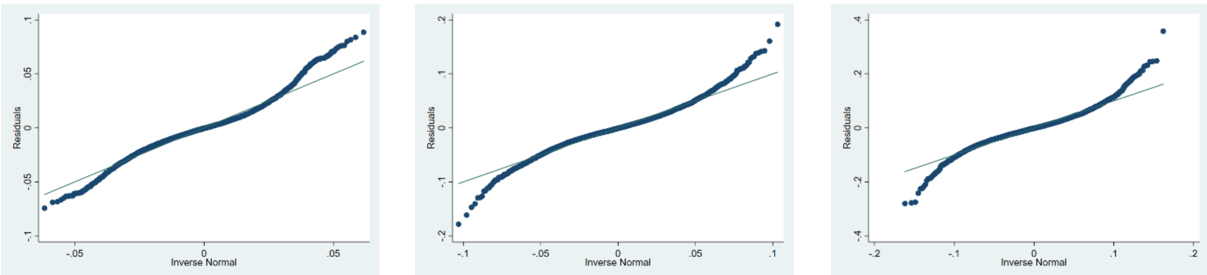

Figure E.8: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged aggregate public attention to environmental issues

The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

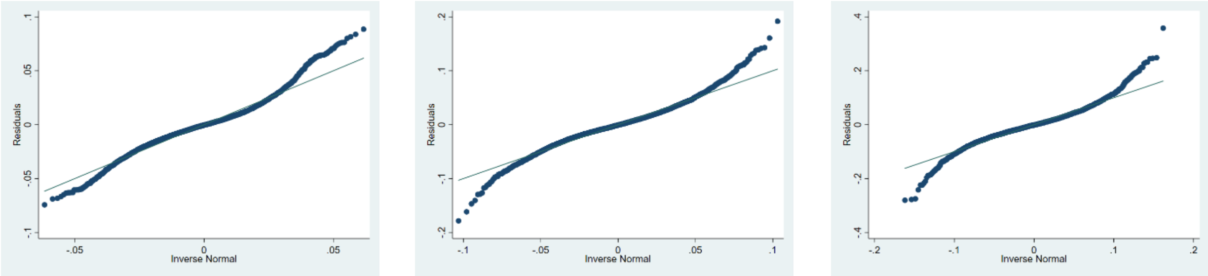

Figure E.9: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'corporate social responsibility'
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

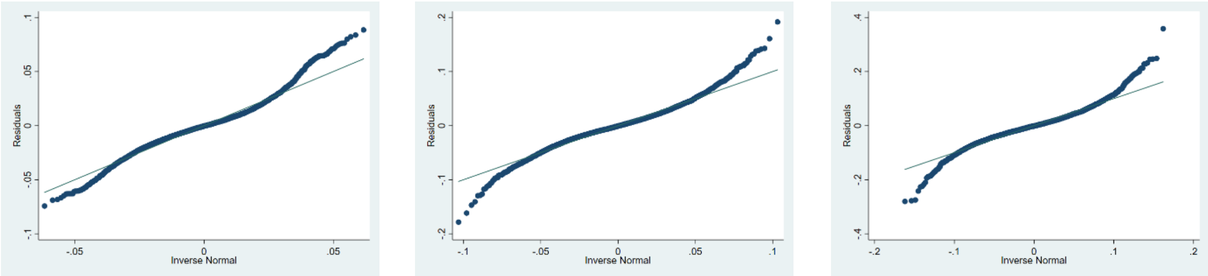

Figure E.10: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'ESG'
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

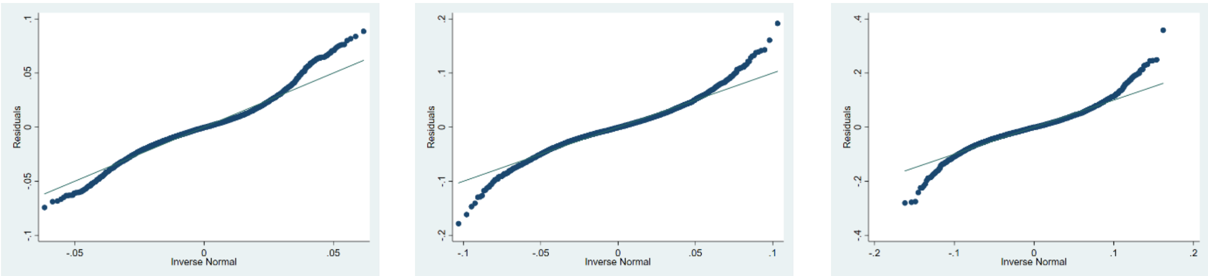

Figure E.11: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'MSCI ESG'
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

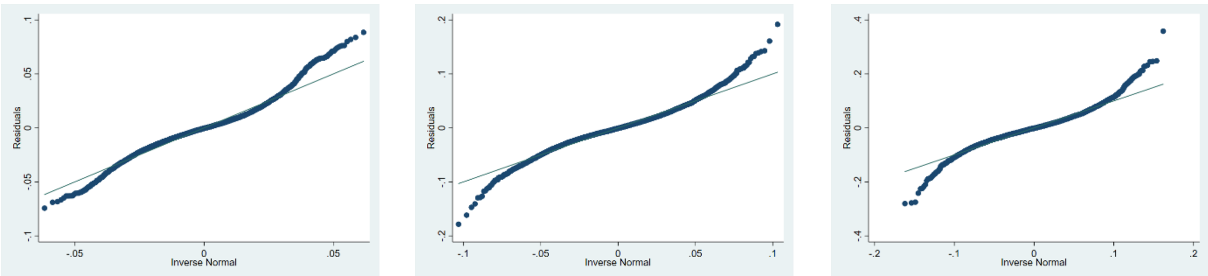

Figure E.12: Q-Q plots for the regression models measuring the effect of the standardised seven-day averaged aggregate public attention to socially responsible investing
The left plot shows the regression model with AR on the event date as the dependent variable. The middle and right plots show those with the three-day CAR and seven-day CAR, respectively. All plots are including the control variables.

F. Results

Table F.1: Descriptive statistics for the variables included in the regression models

Variable	Obs.	Mean	Std. Dev.	Min	Med.	Max	Skew-ness	Kurto-sis
Panel A. Financial data								
Stock returns	8,940	-0.003	0.019	-0.060	-0.001	0.064	0.037	4.948
Market return	8,940	-0.004	0.009	-0.019	-0.004	0.012	0.021	1.973
Abnormal returns	8,940	-0.000	0.016	-0.073	0.000	0.086	0.422	6.218
CAR [-1, 1]	8,940	-0.001	0.028	-0.177	0.000	0.189	0.187	6.306
CAR [-3, 3]	8,940	-0.004	0.043	-0.315	-0.001	0.354	0.149	7.365
Panel B. ESG data								
ESG	5,319	55.329	20.630	0.630	57.260	97.060	-0.410	2.459
E	5,319	53.034	27.570	0.000	57.103	98.842	-0.398	2.069
S	5,319	61.766	22.852	0.140	65.982	98.623	-0.635	2.692
G	5,323	49.986	22.139	0.870	50.531	97.732	-0.046	2.082
Panel C. Seven-day averaged SGSVI for environmental issues								
Global warming	8,940	0.000	1.000	-1.782	0.388	1.436	-0.434	1.962
Climate change	8,940	-0.000	1.000	-1.521	-0.116	1.296	0.004	1.447
Sustainability	8,940	-0.000	1.000	-1.477	-0.143	2.070	0.512	2.553
Environmental pollution	8,940	0.000	1.000	-1.283	-0.210	2.301	0.877	3.262
Environmental governance	8,940	-0.000	1.000	-0.333	-0.333	3.000	2.667	8.111
Aggregate SGSVI	8,940	0.000	1.000	-1.581	-0.125	1.345	0.023	1.653
Panel D. Seven-day averaged SGSVI for socially responsible investing								
Corporate social responsibility	8,940	0.000	1.000	-1.035	-0.190	2.704	1.782	5.529
ESG	8,940	-0.000	1.000	-0.966	-0.259	2.385	1.266	3.625
MSCI ESG	8,940	0.000	1.000	-0.812	-0.588	2.225	0.949	2.760
Aggregate SGSVI	8,940	-0.000	1.000	-1.191	-0.065	1.863	0.475	1.959
Panel E. Control variables								
Size	7,947	15.224	1.967	10.432	15.078	20.532	0.300	3.082
Leverage	7,886	0.259	0.173	0.000	0.247	0.754	0.485	2.754
BM	7,843	0.014	0.030	-0.001	0.004	0.205	4.380	25.108
ROA	7,945	0.034	0.074	-0.303	0.033	0.283	-0.859	9.473

Table F.2: Descriptive statistics for the CAARs calculated for each event over the different event windows

	Obs.	Mean	Std. Dev.	Min	Med.	Max	Skew-ness	Kurto-sis
CAAR [-1, 1]	10	-0.001	0.006	-0.010	-0.003	0.007	0.289	2.097
CAAR [-3, 3]	10	-0.004	0.009	-0.018	-0.004	0.010	-0.148	2.394

Table F.3: Overview of the different sectors in the sample and the number of companies per sector

Sector	Number of companies
Energy	44
Materials	70
Industrials	173
Consumer Discretionary	76
Consumer Staples	39
Health Care	62
Financials	136
Information Technology	50
Communication Services	54
Utilities	35
Real Estate	41
Total	780

Table F.4: Descriptive statistics for the CAARs calculated for the different industries for each event over the event windows

	Obs.	Mean	Std. Dev.	Min	Med.	Max	Skew-ness	Kurto-sis
CAAR [-1, 1]	110	-0.002	0.007	-0.022	-0.002	0.013	-0.074	2.809
CAAR [-3, 3]	110	-0.005	0.010	-0.029	-0.004	0.020	-0.134	2.859

Table F.5: Descriptive statistics for the CAARs calculated for the portfolios of socially responsible and irresponsible firms over the event windows

	Obs.	Mean	Std. Dev.	Min	Med.	Max	Skew-ness	Kurto-sis
Panel A. Socially irresponsible firms								
CAAR [-1, 1]	10	-0.002	0.009	-0.019	-0.003	0.013	-0.265	3.056
CAAR [-3, 3]	10	-0.003	0.015	-0.027	-0.002	0.020	-0.138	2.070
Panel B. Socially responsible firms								
CAAR [-1, 1]	10	0.001	0.005	-0.008	0.002	0.009	-0.517	3.750
CAAR [-3, 3]	10	-0.003	0.008	-0.017	-0.001	0.006	-0.900	2.590

Table F.6: Regression models measuring the effect of ESG rating as a whole

This table shows the results of the regression models using panel data measuring the effect of the ESG rating as a whole on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG* is an independent variable measuring the effect of the ESG rating as a whole. *ESG_low* is a dummy variable representing whether a firm is part of the 10% lowest ESG ratings. *ESG_low*ESG* is the interaction term measuring the effect of ESG rating for firms within the 10% lowest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	AR	AR	CAR	CAR	CAR	CAR
			[-1, 1]	[-1, 1]	[-3, 3]	[-3, 3]
ESG	0.0000	0.0000	0.0000	0.0000	-0.0001*	-0.0002*
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
ESG_low	0.0014	0.0016	0.0008	-0.0047	0.0045	-0.0040
	(0.0026)	(0.0027)	(0.0032)	(0.0060)	(0.0056)	(0.0085)
ESG_low*ESG	-0.0000	-0.0001	-0.0001	0.0001	-0.0004	-0.0005
	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0003)	(0.0004)
Size		-0.0001		-0.0048**		-0.0052
		(0.0002)		(0.0024)		(0.0037)
Leverage		0.0010		0.0059		0.0016
		(0.0018)		(0.0074)		(0.0117)
BM		-0.0245*		0.0734		0.1482*
		(0.0137)		(0.0465)		(0.0837)
ROA		-0.0092		-0.0151		-0.0272
		(0.0064)		(0.0135)		(0.0212)
Constant	-0.0046***	-0.0019	-0.0153***	0.0612*	-0.0175***	0.0742
	(0.0017)	(0.0036)	(0.0025)	(0.0353)	(0.0038)	(0.0561)
Observations	4739	4676	4739	4676	4739	4676
Groups	757	754	757	754	757	754
R^2	0.0306	0.0335	0.0471	0.0406	0.0462	0.0517
Adjusted R^2	0.0262	0.0284	0.0426	0.0373	0.0417	0.0485
Hausman test	0.8933	0.2651	0.4414	0.0252	0.2844	0.0160
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.7: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'global warming'

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'global warming' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Global warming* and *ESG_high*Global warming* are interaction terms measuring the effect of public attention to 'global warming' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Global warming	-0.0036***	-0.0032***	-0.0183***	-0.0182***	-0.0177***	-0.0168***
	(0.0009)	(0.0010)	(0.0016)	(0.0018)	(0.0025)	(0.0028)
ESG_low	0.0007	0.0009	-0.0005	-0.0003	0.0008	0.0004
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0021)	(0.0021)
ESG_low*Global	0.0001	0.0001	0.0003	0.0003	0.0037	0.0049*
warming	(0.0010)	(0.0011)	(0.0016)	(0.0017)	(0.0028)	(0.0027)
ESG_high	0.0006	-0.0001	0.0017	0.0001	0.0008	-0.0011
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0022)	(0.0023)
ESG_high*Global	-0.0001	-0.0003	0.0029*	0.0024	0.0033	0.0028
warming	(0.0009)	(0.0009)	(0.0016)	(0.0015)	(0.0023)	(0.0022)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0009		-0.0014
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0126		0.0001		0.0122
		(0.0088)		(0.0129)		(0.0194)
ROA		-0.0037		-0.0145**		-0.0048
		(0.0040)		(0.0066)		(0.0104)
Constant	-0.0065***	-0.0098***	-0.0272***	-0.0377***	-0.0304***	-0.0451***
	(0.0015)	(0.0025)	(0.0026)	(0.0045)	(0.0040)	(0.0069)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0195	0.0234	0.0426	0.0493	0.0379	0.0417
Adjusted R^2	0.0166	0.0196	0.0397	0.0457	0.0350	0.0380
Hausman	0.9910	0.4447	0.9998	0.2544	0.9973	0.6461
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.8: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'climate change'

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'climate change' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Climate change* and *ESG_high*Climate change* are interaction terms measuring the effect of public attention to 'climate change' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Climate change	0.0020***	0.0018***	0.0101***	0.0101***	0.0097***	0.0092***
	(0.0005)	(0.0005)	(0.0009)	(0.0010)	(0.0014)	(0.0015)
ESG_low	0.0007	0.0010	-0.0005	-0.0002	0.0011	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Climate change	-0.0007	-0.0006	-0.0006	-0.0005	-0.0000	0.0003
	(0.0010)	(0.0010)	(0.0014)	(0.0015)	(0.0021)	(0.0022)
ESG_high	0.0006	-0.0001	0.0021*	0.0005	0.0011	-0.0009
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0022)	(0.0023)
ESG_high*Climate change	-0.0003	-0.0002	-0.0018	-0.0017	-0.0002	0.0002
	(0.0007)	(0.0007)	(0.0014)	(0.0014)	(0.0020)	(0.0020)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0008		-0.0014
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0127		0.0007		0.0116
		(0.0088)		(0.0129)		(0.0194)
ROA		-0.0036		-0.0143**		-0.0045
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0019**	-0.0056**	-0.0041***	-0.0147***	-0.0083***	-0.0242***
	(0.0009)	(0.0022)	(0.0013)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0234	0.0424	0.0492	0.0374	0.0409
Adjusted R^2	0.0167	0.0197	0.0396	0.0456	0.0345	0.0373
Hausman	0.9969	0.8913	0.9999	0.2971	0.9956	0.6574
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.9: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'sustainability'

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'sustainability' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Sustainability* and *ESG_high*Sustainability* are interaction terms measuring the effect of public attention to 'sustainability' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	AR	AR	CAR	CAR	CAR	CAR
			[-1, 1]	[-1, 1]	[-3, 3]	[-3, 3]
Sustainability	0.0011***	0.0010***	0.0060***	0.0060***	0.0059***	0.0057***
	(0.0003)	(0.0003)	(0.0005)	(0.0006)	(0.0008)	(0.0009)
ESG_low	0.0007	0.0009	-0.0005	-0.0003	0.0011	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*	0.0003	0.0003	-0.0001	0.0000	-0.0033	-0.0042
sustainability	(0.0008)	(0.0009)	(0.0014)	(0.0015)	(0.0027)	(0.0026)
ESG_high	0.0006	-0.0002	0.0020	0.0004	0.0011	-0.0008
	(0.0008)	(0.0008)	(0.0012)	(0.0014)	(0.0021)	(0.0023)
ESG_high*	0.0008	0.0008	-0.0039**	-0.0037**	-0.0029	-0.0024
sustainability	(0.0009)	(0.0009)	(0.0016)	(0.0016)	(0.0021)	(0.0020)
Size		0.0002*		0.0007***		0.0009***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0016
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0007		0.0117
		(0.0088)		(0.0130)		(0.0194)
ROA		-0.0036		-0.0143**		-0.0048
		(0.0040)		(0.0066)		(0.0104)
Constant	-0.0025***	-0.0062***	-0.0070***	-0.0175***	-0.0111***	-0.0262***
	(0.0009)	(0.0022)	(0.0014)	(0.0039)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0235	0.0429	0.0497	0.0377	0.0414
Adjusted R^2	0.0167	0.0198	0.0400	0.0461	0.0349	0.0378
Hausman	0.9986	0.9084	1.0000	0.3994	0.9997	0.6826
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.10: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'environmental pollution'

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'environmental pollution' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Environmental pollution* and *ESG_high*Environmental pollution* are interaction terms measuring the effect of public attention to 'environmental pollution' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Environmental	-0.0015***	-0.0013***	-0.0079***	-0.0083***	-0.0078***	-0.0073***
pollution	(0.0004)	(0.0004)	(0.0007)	(0.0009)	(0.0011)	(0.0012)
ESG_low	0.0006	0.0008	-0.0006	0.0011	0.0011	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0019)	(0.0020)	(0.0021)
ESG_low*Environ-	-0.0021**	-0.0022**	-0.0022*	-0.0010	-0.0005	-0.0010
mental pollution	(0.0010)	(0.0010)	(0.0013)	(0.0013)	(0.0023)	(0.0023)
ESG_high	0.0006	-0.0002	0.0019	0.0009	0.0010	-0.0010
	(0.0008)	(0.0008)	(0.0013)	(0.0022)	(0.0022)	(0.0023)
ESG_high*Environ-	-0.0008	-0.0009	-0.0025	-0.0024	-0.0015	-0.0018
mental pollution	(0.0009)	(0.0009)	(0.0017)	(0.0018)	(0.0021)	(0.0021)
Size		0.0002*		-0.0003		0.0010***
		(0.0001)		(0.0018)		(0.0003)
Leverage		0.0006		0.0107**		-0.0014
		(0.0012)		(0.0052)		(0.0031)
BM		-0.0128		0.0348		0.0114
		(0.0087)		(0.0266)		(0.0194)
ROA		-0.0038		-0.0017		-0.0045
		(0.0040)		(0.0097)		(0.0104)
Constant	0.0002	-0.0038*	0.0066***	0.0100	0.0019	-0.0145**
	(0.0010)	(0.0023)	(0.0016)	(0.0274)	(0.0026)	(0.0062)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0205	0.0244	0.0428	0.0503	0.0374	0.0410
Adjusted R^2	0.0176	0.0207	0.0400	0.0480	0.0346	0.0374
Hausman	0.9976	0.5447	0.9874	0.0051	0.9981	0.4386
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.11: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'environmental governance'

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'environmental governance' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Environmental governance* and *ESG_high*Environmental governance* are interaction terms measuring the effect of public attention to 'environmental governance' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Environmental	0.0015***	0.0015***	0.0031***	0.0030***	0.0056***	0.0056***
governance	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0007)	(0.0007)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0012	0.0010
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Environ-	0.0006	0.0005	-0.0008	-0.0007	0.0027	0.0028
mental governance	(0.0009)	(0.0009)	(0.0017)	(0.0017)	(0.0024)	(0.0024)
ESG_high	0.0006	-0.0002	0.0020	0.0003	0.0010	-0.0009
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*Environ-	0.0005	0.0003	0.0008	0.0001	-0.0016	-0.0023
mental governance	(0.0008)	(0.0008)	(0.0014)	(0.0013)	(0.0021)	(0.0021)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0008		-0.0014
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0127		0.0004		0.0116
		(0.0088)		(0.0130)		(0.0194)
ROA		-0.0037		-0.0142**		-0.0045
		(0.0040)		(0.0066)		(0.0104)
Constant	-0.0030***	-0.0065***	-0.0112***	-0.0220***	-0.0142***	-0.0297***
	(0.0010)	(0.0022)	(0.0015)	(0.0040)	(0.0024)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0234	0.0423	0.0491	0.0376	0.0413
Adjusted R^2	0.0167	0.0197	0.0394	0.0455	0.0348	0.0376
Hausman	0.9621	0.7330	1.0000	0.4968	0.9810	0.6364
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.12: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'corporate social responsibility'

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'corporate social responsibility' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Corporate social responsibility* and *ESG_high*Corporate social responsibility* are interaction terms measuring the effect of public attention to 'corporate social responsibility' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Corporate social	-0.0051***	-0.0046***	-0.0260***	-0.0258***	-0.0250***	-0.0238***
responsibility	(0.0013)	(0.0014)	(0.0023)	(0.0026)	(0.0036)	(0.0039)
ESG_low	0.0008	0.0010	-0.0005	-0.0002	0.0008	0.0006
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0021)	(0.0021)
ESG_low*Corporate	-0.0004	-0.0004	-0.0002	-0.0004	0.0014	0.0019
social responsibility	(0.0009)	(0.0010)	(0.0013)	(0.0013)	(0.0019)	(0.0019)
ESG_high	0.0006	-0.0001	0.0025**	0.0009	0.0015	-0.0004
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*Corporate	-0.0002	-0.0004	-0.0026**	-0.0032**	-0.0021	-0.0026
social responsibility	(0.0007)	(0.0007)	(0.0013)	(0.0013)	(0.0021)	(0.0021)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0008		-0.0013
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0007		0.0115
		(0.0088)		(0.0130)		(0.0195)
ROA		-0.0036		-0.0142**		-0.0046
		(0.0040)		(0.0066)		(0.0104)
Constant	-0.0054***	-0.0087***	-0.0217***	-0.0322***	-0.0252***	-0.0404***
	(0.0013)	(0.0024)	(0.0021)	(0.0042)	(0.0034)	(0.0065)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0234	0.0426	0.0497	0.0376	0.0413
Adjusted R^2	0.0167	0.0197	0.0398	0.0461	0.0347	0.0376
Hausman	0.9989	0.9076	0.9943	0.4874	0.9605	0.5894
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.13: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'ESG'

This table shows the results of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'ESG' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*ESG* and *ESG_high*ESG* are interaction terms measuring the effect of public attention to 'ESG' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
ESG	0.0010***	0.0009***	0.0054***	0.0053***	0.0052***	0.0050***
	(0.0003)	(0.0003)	(0.0005)	(0.0005)	(0.0007)	(0.0008)
ESG_low	0.0007	0.0010	-0.0005	-0.0002	0.0010	0.0008
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*ESG	0.0008	0.0008	0.0001	0.0005	-0.0015	-0.0025
	(0.0008)	(0.0009)	(0.0014)	(0.0014)	(0.0026)	(0.0026)
ESG_high	0.0007	-0.0001	0.0019	0.0003	0.0011	-0.0007
	(0.0007)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0022)
ESG_high*ESG	0.0010	0.0010	-0.0010	-0.0004	0.0004	0.0013
	(0.0009)	(0.0009)	(0.0014)	(0.0014)	(0.0021)	(0.0021)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0016
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0127		0.0005		0.0113
		(0.0088)		(0.0129)		(0.0194)
ROA		-0.0036		-0.0142**		-0.0047
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0026***	-0.0063***	-0.0075***	-0.0182***	-0.0116***	-0.0271***
	(0.0009)	(0.0022)	(0.0014)	(0.0040)	(0.0023)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0197	0.0236	0.0422	0.0491	0.0374	0.0411
Adjusted R^2	0.0168	0.0199	0.0394	0.0455	0.0346	0.0375
Hausman	0.9981	0.9094	1.0000	0.4621	0.9987	0.7071
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F.14: Regression models measuring the effect of the standardised seven-day averaged public attention to the search term 'MSCI ESG'

This table shows the **r**esults of the regression models using panel data measuring the effect of the standardised seven-day averaged public attention to the search term 'MSCI ESG' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*MSCI ESG* and *ESG_high*MSCI ESG* are interaction terms measuring the effect of public attention to 'MSCI ESG' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	AR	AR	CAR	CAR	CAR	CAR
			[-1, 1]	[-1, 1]	[-3, 3]	[-3, 3]
MSCI ESG	0.0022***	0.0020***	0.0109***	0.0109***	0.0104***	0.0099***
	(0.0005)	(0.0006)	(0.0010)	(0.0011)	(0.0015)	(0.0017)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0011	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*MSCI	-0.0003	-0.0002	-0.0001	0.0001	0.0003	0.0007
ESG	(0.0007)	(0.0007)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_high	0.0006	-0.0002	0.0020	0.0003	0.0009	-0.0011
	(0.0008)	(0.0008)	(0.0012)	(0.0014)	(0.0022)	(0.0023)
ESG_high*MSCI	-0.0002	-0.0001	-0.0003	-0.0002	0.0017	0.0021
ESG	(0.0006)	(0.0006)	(0.0012)	(0.0012)	(0.0019)	(0.0019)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0008		-0.0014
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0004		0.0115
		(0.0088)		(0.0130)		(0.0195)
ROA		-0.0037		-0.0143**		-0.0044
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0018**	-0.0055**	-0.0033**	-0.0141***	-0.0076***	-0.0237***
	(0.0009)	(0.0022)	(0.0013)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0234	0.0422	0.0490	0.0374	0.0411
Adjusted R^2	0.0167	0.0196	0.0394	0.0454	0.0346	0.0374
Hausman	0.9895	0.8743	0.9999	0.3990	0.9894	0.6245
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

G. Robustness checks

Table G.1: T-test for statistical significance of the CAARs of the different events when the normal returns are calculated using the Fama and French five-factor model

This table shows the results of the robustness check for T-test testing whether the CAARs for the different events are significantly different from zero. The second and the fourth columns show the CAARs calculated over the different event windows for each event. Columns three and five show the respective test statistics following the T-test and their significance.

		Panel A [-1, 1]		**Panel B [-3, 3]**	
	Obs.	**CAARs**	**T-statistic**	**CAARs**	**T-statistic**
December 11, 2011*					
Energy	44	0.770%	1.887*	0.433%	0.591
Materials	70	0.422%	1.504	0.209%	0.507
Industrials	173	0.603%	2.314**	0.506%	1.270
Consumer Discretionary	76	1.335%	4.237***	1.588%	2.894***
Consumer Staples	39	0.828%	2.107**	0.883%	1.605
Health Care	62	0.486%	1.467	0.679%	1.273
Financials	136	1.114%	5.150***	0.127%	0.318
Information Technology	50	0.729%	2.007**	0.459%	0.931
Communication Services	54	1.831%	4.442***	1.041%	1.697*
Utilities	35	-0.263%	-0.369	-0.128%	-0.154
Real Estate	41	0.474%	1.079	-0.599%	-0.904
November 29, 2012					
Energy	44	-0.213%	-0.403	0.015%	0.029
Materials	70	-0.321%	-1.057	-0.415%	-0.955
Industrials	173	-0.093%	-0.421	-0.101%	-0.297
Consumer Discretionary	76	0.384%	1.759*	0.401%	1.155
Consumer Staples	39	-0.171%	-0.453	0.098%	0.201
Health Care	62	0.180%	0.605	0.243%	0.653
Financials	136	0.155%	0.656	-0.034%	-0.094
Information Technology	50	-0.205%	-0.461	-0.013%	-0.023
Communication Services	54	0.110%	0.232	0.723%	1.046
Utilities	35	-0.376%	-0.718	-0.126%	-0.239
Real Estate	41	0.008%	0.025	-0.064%	-0.102
April 16, 2013					
Energy	44	-1.010%	-2.399**	-1.528%	-2.719***
Materials	70	-1.170%	-3.960***	-1.418%	-2.429**
Industrials	173	-1.237%	-4.590***	-1.887%	-4.787***
Consumer Discretionary	76	-1.367%	-3.889***	-1.983%	-3.575***
Consumer Staples	39	-1.249%	-3.133***	-1.924%	-3.213***
Health Care	62	-1.465%	-3.691***	-1.045%	-2.098**
Financials	136	-1.754%	-6.846***	-2.036%	-5.728***
Information Technology	50	-0.762%	-1.805*	-1.094%	-2.266**
Communication Services	54	-2.587%	-5.722***	-2.224%	-3.287***
Utilities	35	-1.663%	-2.977***	-1.041%	-1.177
Real Estate	41	-0.732%	-1.418	-1.264%	-1.785*

January 23, 2014					
Energy	44	-1.626%	-4.177***	-1.044%	-2.141**
Materials	70	-1.444%	-4.375***	-1.577%	-2.940***
Industrials	173	-1.168%	-5.037***	-1.178%	-3.481***
Consumer Discretionary	76	-1.625%	-5.314***	-1.687%	-3.569***
Consumer Staples	39	-2.145%	-3.540***	-1.681%	-2.269**
Health Care	62	-1.245%	-5.369***	-0.890%	-1.888*
Financials	136	-1.500%	-5.765***	-1.454%	-3.668***
Information Technology	50	-1.941%	-5.822***	-2.177%	-3.695***
Communication Services	54	-0.809%	-2.184**	-1.826%	-3.159***
Utilities	35	-0.859%	-1.308	-0.928%	-1.447
Real Estate	41	-1.833%	-4.599***	-1.452%	-2.465**
December 12, 2015*					
Energy	44	-1.029%	-3.044***	0.017%	0.030
Materials	70	-0.639%	-1.679*	0.046%	0.066
Industrials	173	-0.833%	-3.806***	0.111%	0.285
Consumer Discretionary	76	-0.347%	-1.310	0.491%	1.146
Consumer Staples	39	-0.357%	-1.171	0.520%	0.976
Health Care	62	-0.915%	-3.250***	-0.146%	-0.289
Financials	136	-0.417%	-2.069**	0.485%	1.384
Information Technology	50	-0.879%	-2.222**	-0.578%	-1.155
Communication Services	54	-0.779%	-1.914*	0.299%	0.480
Utilities	35	-0.518%	-1.533	0.490%	0.719
Real Estate	41	-0.723%	-1.353	-0.066%	-0.073
November 4, 2016					
Energy	44	0.711%	2.721***	0.294%	0.542
Materials	70	-0.015%	-0.056	-0.655%	-1.400
Industrials	173	-0.085%	-0.419	-1.256%	-4.070***
Consumer Discretionary	76	0.088%	0.299	-1.652%	-3.177***
Consumer Staples	39	0.623%	1.445	0.377%	0.442
Health Care	62	0.198%	0.599	-1.606%	-3.234***
Financials	136	0.313%	1.409	-1.073%	-2.575**
Information Technology	50	0.337%	1.265	-1.195%	-2.712***
Communication Services	54	-0.209%	-0.613	-0.312%	-0.462
Utilities	35	0.531%	1.360	-0.650%	-0.815
Real Estate	41	0.040%	0.075	-1.242%	-1.516
December 12, 2017					
Energy	44	-0.295%	-1.052	0.332%	0.756
Materials	70	-0.355%	-1.264	0.116%	0.271
Industrials	173	-0.201%	-1.116	1.100%	3.420***
Consumer Discretionary	76	-0.085%	-0.288	0.437%	0.778
Consumer Staples	39	-0.257%	-0.772	0.424%	0.922
Health Care	62	-0.345%	-0.946	0.342%	0.596
Financials	136	0.040%	0.160	0.884%	2.460**
Information Technology	50	-0.121%	-0.442	1.069%	1.986**
Communication Services	54	-0.122%	-0.304	0.605%	0.951
Utilities	35	-0.373%	-0.858	0.615%	0.935
Real Estate	41	-0.372%	-1.093	1.443%	2.501**

November 28, 2018					
Energy	44	-0.246%	-0.599	0.429%	0.847
Materials	70	0.045%	0.139	1.561%	2.996***
Industrials	173	-0.007%	-0.031	1.380%	3.781***
Consumer Discretionary	76	0.031%	0.092	1.668%	3.255***
Consumer Staples	39	0.067%	0.173	1.070%	1.927*
Health Care	62	-0.255%	-0.620	1.204%	2.045**
Financials	136	0.283%	1.235	1.961%	4.581***
Information Technology	50	0.107%	0.284	1.681%	2.724***
Communication Services	54	-0.331%	-0.970	1.774%	3.529***
Utilities	35	0.101%	0.320	1.905%	3.298***
Real Estate	41	0.440%	0.901	2.597%	3.512***
December 11, 2019					
Energy	44	-0.392%	-1.483	-0.506%	-1.009
Materials	70	-0.478%	-1.340	-0.586%	-1.126
Industrials	173	-0.394%	-1.911*	-0.475%	-1.413
Consumer Discretionary	76	-0.235%	-0.864	-0.485%	-1.094
Consumer Staples	39	-0.517%	-1.250	-0.749%	-1.314
Health Care	62	-0.475%	-1.542	-1.035%	-1.556
Financials	136	-0.788%	-3.942***	-0.984%	-2.908***
Information Technology	50	-0.201%	-0.466	-0.191%	-0.359
Communication Services	54	-0.739%	-1.832*	-2.076%	-4.151***
Utilities	35	-0.561%	-1.406	-0.206%	-0.408
Real Estate	41	0.040%	0.118	-1.276%	-2.438**
October 7, 2020					
Energy	44	0.105%	0.254	0.962%	1.561
Materials	70	0.510%	1.567	0.468%	1.026
Industrials	173	0.952%	3.853***	-0.075%	-0.181
Consumer Discretionary	76	0.710%	2.033**	-0.543%	-1.372
Consumer Staples	39	-0.039%	-0.100	-0.271%	-0.383
Health Care	62	0.331%	0.957	-0.207%	-0.301
Financials	136	0.715%	2.655***	0.278%	0.660
Information Technology	50	0.666%	1.715*	-0.430%	-0.580
Communication Services	54	0.933%	2.376**	-0.175%	-0.299
Utilities	35	0.589%	1.286	1.144%	1.806*
Real Estate	41	0.661%	1.197	-0.347%	-0.570

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.2: T-tests for statistical significance of the CAARs of the portfolios of socially responsible and irresponsible firms, measured at the 5% cut-off rate, and the difference in CAARs between the two portfolios of the different events
This table shows the results of the cross-sectional T-test testing whether the CAARs for the two portfolios of socially responsible and irresponsible firms are significantly different from zero per event. Moreover, the results of the T-test testing whether the difference between the CAARs is significantly different from zero are shown. The second and fourth columns show the CAARs calculated over the different event windows. Columns three and five show the respective test statistics from the T-tests and the statistical significance.

		Panel A [-1, 1]		Panel B [-3, 3]	
	Obs.	CAARs	T-statistic	CAARs	T-statistic
December 11, 2011*					
Lowest 5% ESG ratings	25	-2.097%	-3.660***	-1.867%	-1.446
Highest 5% ESG ratings	23	0.109%	0.179	-0.769%	-0.732
Difference		*-2.205%*	*-1.311**	*-1.097%*	*-0.653*
November 29, 2012					
Lowest 5% ESG ratings	25	-0.990%	-1.168	0.683%	0.552
Highest 5% ESG ratings	24	-0.063%	-0.120	-0.701%	-0.903
Difference		*-0.927%*	*-0.629*	*1.384%*	*0.939*
April 16, 2013					
Lowest 5% ESG ratings	25	0.070%	0.124	-0.059%	-0.057
Highest 5% ESG ratings	24	0.150%	0.230	-0.013%	-0.017
Difference		*-0.081%*	*-0.062*	*-0.045%*	*-0.035*
January 23, 2014					
Lowest 5% ESG ratings	25	-0.672%	-1.280	-1.394%	-1.518
Highest 5% ESG ratings	24	0.106%	0.167	0.304%	0.405
Difference		*-0.778%*	*-0.653*	*-1.698%*	*-1.425**
December 12, 2015*					
Lowest 5% ESG ratings	26	-0.053%	-0.116	2.004%	1.716*
Highest 5% ESG ratings	25	-0.180%	-0.355	-0.013%	-0.027
Difference		*0.127%*	*0.099*	*2.016%*	*1.580**
November 4, 2016					
Lowest 5% ESG ratings	26	-0.213%	-0.407	-2.303%	-2.038**
Highest 5% ESG ratings	25	0.399%	1.008	-1.200%	-1.475
Difference		*-0.611%*	*-0.436*	*-1.104%*	*-0.787*
December 12, 2017					
Lowest 5% ESG ratings	28	-0.413%	-1.200	-0.378%	-0.565
Highest 5% ESG ratings	27	-0.005%	-0.015	0.223%	0.408
Difference		*-0.407%*	*-0.469*	*-0.601%*	*-0.693*
November 28, 2018					
Lowest 5% ESG ratings	39	1.167%	2.665***	2.638%	3.631***
Highest 5% ESG ratings	38	-0.208%	-0.624	1.367%	1.961**
Difference		*1.374%*	*1.364**	*1.271%*	*1.261*
December 11, 2019					
Lowest 5% ESG ratings	38	0.244%	0.576	-1.811%	-2.008**
Highest 5% ESG ratings	37	1.091%	2.603***	-0.684%	-1.138
Difference		*-0.847%*	*-0.777*	*-1.127%*	*-1.034*
October 7, 2020					
Lowest 5% ESG ratings	14	0.650%	0.660	0.288%	0.202
Highest 5% ESG ratings	13	0.411%	0.474	0.247%	0.195
Difference		*0.239%*	*0.125*	*0.041%*	*0.021*

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.3: T-tests for statistical significance of the CAARs of the portfolios of socially responsible and irresponsible firms, measured at the 20% cut-off rate, and the difference in CAARs between the two portfolios of the different events
This table shows the results of the cross-sectional T-test testing whether the CAARs for the two portfolios of socially responsible and irresponsible firms are significantly different from zero per event. Moreover, the results of the T-test testing whether the difference between the CAARs is significantly different from zero are shown. The second and fourth columns show the CAARs calculated over the different event windows. Columns three and five show the respective test statistics from the T-tests and the statistical significance.

		Panel A [-1, 1]		Panel B [-3, 3]	
	Obs.	**CAARs**	**T-statistic**	**CAARs**	**T-statistic**
December 11, 2011*					
Lowest 20% ESG ratings	98	-1.427%	-4.273***	-1.593%	-2.475**
Highest 20% ESG ratings	97	-0.861%	-2.830***	-2.150%	-4.524***
Difference		*-0.566%*	*-0.706*	*0.557%*	*0.696*
November 29, 2012					
Lowest 20% ESG ratings	99	-0.305%	-0.861	0.542%	1.183
Highest 20% ESG ratings	98	-0.199%	-0.689	-0.516%	-1.164
Difference		*-0.106%*	*-0.166*	*1.058%*	*1.659***
April 16, 2013					
Lowest 20% ESG ratings	98	-0.092%	-0.225	0.094%	0.163
Highest 20% ESG ratings	98	-0.165%	-0.554	-0.762%	-1.781*
Difference		*0.073%*	*0.102*	*0.855%*	*1.191*
January 23, 2014					
Lowest 20% ESG ratings	100	-0.359%	-1.321	-0.817%	-1.710*
Highest 20% ESG ratings	99	0.006%	0.024	-0.212%	-0.568
Difference		*-0.365%*	*-0.601*	*-0.605%*	*-0.997*
December 12, 2015*					
Lowest 20% ESG ratings	102	-0.911%	-3.619***	0.329%	0.591
Highest 20% ESG ratings	101	0.084%	0.378	0.437%	1.493
Difference		*-0.994%*	*-1.575**	*-0.107%*	*-0.170*
November 4, 2016					
Lowest 20% ESG ratings	102	-0.316%	-1.147	-2.135%	-4.540***
Highest 20% ESG ratings	102	-0.219%	-0.969	-1.960%	-5.029***
Difference		*-0.097%*	*-0.159*	*-0.175%*	*-0.286*
December 12, 2017					
Lowest 20% ESG ratings	111	-0.580%	-2.862***	-0.375%	-0.811
Highest 20% ESG ratings	110	-0.465%	-2.169**	-0.369%	-1.139
Difference		*-0.115%*	*-0.204*	*-0.006%*	*-0.011*
November 28, 2018					
Lowest 20% ESG ratings	153	1.745%	7.507***	2.911%	7.668***
Highest 20% ESG ratings	153	0.438%	2.272**	0.574%	1.850*
Difference		*1.307%*	*2.666***	*2.337%*	*4.765****
December 11, 2019					
Lowest 20% ESG ratings	149	0.518%	2.301**	-1.180%	-3.235***
Highest 20% ESG ratings	147	0.435%	2.177**	-1.526%	-4.893***
Difference		*0.083%*	*0.172*	*0.346%*	*0.719*
October 7, 2020					
Lowest 20% ESG ratings	55	0.146%	0.357	-0.417%	-0.574
Highest 20% ESG ratings	55	0.549%	1.489	0.379%	0.797
Difference		*-0.403%*	*-0.464*	*-0.796%*	*-0.916*

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.4: Regression models measuring the effect of ESG rating as a whole for the 5% cut-off rate

This table shows the results of the regression models using panel data measuring the effect of the ESG rating as a whole on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG* is an independent variable measuring the effect of the ESG rating as a whole. *ESG_low* is a dummy variable representing whether a firm is part of the 5% lowest ESG ratings. *ESG_low*ESG* is the interaction term measuring the effect of ESG rating for firms within the 5% lowest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
ESG	0.0000	0.0000	0.0000	0.0001	-0.0000	-0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)
ESG_low	0.0010	0.0014	0.0000	-0.0087	0.0102	0.0083
	(0.0033)	(0.0033)	(0.0037)	(0.0058)	(0.0066)	(0.0068)
ESG_low*ESG	-0.0000	-0.0000	0.0000	0.0005	-0.0008	-0.0008
	(0.0002)	(0.0002)	(0.0003)	(0.0004)	(0.0006)	(0.0006)
Size		-0.0001		-0.0048**		0.0013***
		(0.0002)		(0.0024)		(0.0004)
Leverage		0.0010		0.0062		-0.0040
		(0.0018)		(0.0074)		(0.0036)
BM		-0.0244*		0.0739		-0.0184
		(0.0139)		(0.0470)		(0.0323)
ROA		-0.0093		-0.0150		-0.0164
		(0.0064)		(0.0135)		(0.0124)
Constant	-0.0044***	-0.0019	-0.0154***	0.0592*	-0.0190***	-0.0351***
	(0.0016)	(0.0036)	(0.0023)	(0.0349)	(0.0036)	(0.0071)
Observations	4739	4676	4739	4676	4739	4676
Groups	757	754	757	754	757	754
R^2	0.0307	0.0335	0.0471	0.0406	0.0460	0.0490
Adjusted R^2	0.0263	0.0284	0.0426	0.0373	0.0416	0.0437
Hausman test	0.7611	0.1466	0.2049	0.0412	0.7758	0.1121
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.5: Regression models measuring the effect of the separate ESG pillars of socially irresponsible firms, measured at the 5% cut-off rate

This table shows the results of the regression models using panel data measuring the effect of the separate ESG pillars on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *E, S,* and *G* are independent variables measuring the effect of the separate E, S, and G pillars. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
E	-0.0001	-0.0004	0.0001	0.0002	0.0001	0.0003
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0005)	(0.0005)
S	-0.0000	0.0004**	-0.0000	-0.0001	-0.0003	-0.0004
	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0003)	(0.0003)
G	-0.0001	0.0000	-0.0000	0.0001	0.0000	0.0002
	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0004)	(0.0004)
Size		0.0023		-0.0012		-0.0023
		(0.0086)		(0.0008)		(0.0017)
Leverage		-0.0009		0.0129		0.0130
		(0.0194)		(0.0087)		(0.0232)
BM		-0.1280		0.0479		0.1722***
		(0.0936)		(0.0304)		(0.0653)
ROA		0.0514		0.0591**		0.0703
		(0.0380)		(0.0241)		(0.0440)
Constant	-0.0023	-0.0371	-0.0238***	-0.0117	-0.0192	0.0006
	(0.0053)	(0.1213)	(0.0068)	(0.0151)	(0.0202)	(0.0325)
Observations	252	249	252	249	252	249
Groups	84	83	84	83	84	83
R^2	0.0842	0.0958	0.1516	0.1897	0.1275	0.1563
Adjusted R^2	0.0006	0.0334	0.0701	0.0948	0.0438	0.0575
Hausman	0.1244	0.0427	0.7769	0.6484	0.8753	0.9451
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.6: Regression models measuring the effect of ESG rating as a whole for the 20% cut-off rate

This table shows the results of the regression models using panel data measuring the effect of the ESG rating as a whole on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG* is an independent variable measuring the effect of the ESG rating as a whole. *ESG_low* is a dummy variable representing whether a firm is part of the 20% lowest ESG ratings. *ESG_low*ESG* is the interaction term measuring the effect of ESG rating for firms within the 20% lowest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	AR	AR	CAR	CAR	CAR	CAR
			[-1, 1]	[-1, 1]	[-3, 3]	[-3, 3]
ESG	-0.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
ESG_low	-0.0004	-0.0004	0.0009	-0.0030	0.0037	0.0008
	(0.0023)	(0.0023)	(0.0029)	(0.0060)	(0.0049)	(0.0050)
ESG_low*ESG	-0.0000	-0.0000	-0.0001	0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
Size		-0.0001		-0.0048**		0.0013***
		(0.0002)		(0.0023)		(0.0004)
Leverage		0.0010		0.0061		-0.0042
		(0.0018)		(0.0074)		(0.0036)
BM		-0.0243*		0.0742		-0.0157
		(0.0137)		(0.0470)		(0.0325)
ROA		-0.0092		-0.0150		-0.0160
		(0.0064)		(0.0134)		(0.0124)
Constant	-0.0031*	-0.0010	-0.0151***	0.0602*	-0.0190***	-0.0347***
	(0.0018)	(0.0037)	(0.0026)	(0.0352)	(0.0041)	(0.0072)
Observations	4739	4676	4739	4676	4739	4676
Groups	757	754	757	754	757	754
R^2	0.0308	0.0337	0.0472	0.0403	0.0457	0.0487
Adjusted R^2	0.0264	0.0286	0.0427	0.0370	0.0413	0.0433
Hausman test	0.9112	0.2542	0.4819	0.0256	0.7108	0.0990
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.7: Regression models measuring the effect of the separate ESG pillars of socially irresponsible firms, measured at the 20% cut-off rate

This table shows the results of the regression models using panel data measuring the effect of the separate ESG pillars on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *E, S,* and *G* are independent variables measuring the effect of the separate E, S, and G pillars. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
E	-0.0000	-0.0002*	0.0000	0.0000	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
S	-0.0000	0.0002**	0.0000	0.0000	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
G	-0.0001**	-0.0001	-0.0001*	-0.0001*	-0.0000	0.0000
	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Size		0.0010		0.0009*		0.0015
		(0.0030)		(0.0005)		(0.0010)
Leverage		0.0190*		-0.0036		-0.0066
		(0.0101)		(0.0040)		(0.0071)
BM		0.0607		-0.0254		0.0368
		(0.0594)		(0.0299)		(0.0491)
ROA		0.0300		0.0072		0.0128
		(0.0189)		(0.0125)		(0.0197)
Constant	-0.0048*	-0.0307	-0.0118***	-0.0238***	-0.0123	-0.0366**
	(0.0029)	(0.0443)	(0.0044)	(0.0092)	(0.0093)	(0.0168)
Observations	999	984	999	984	999	984
Groups	303	300	303	300	303	300
R^2	0.0426	0.0597	0.0780	0.0829	0.0636	0.0685
Adjusted R^2	0.0216	0.0442	0.0573	0.0579	0.0425	0.0432
Hausman	0.1480	0.0469	0.8557	0.3658	0.6093	0.1382
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.8: Levin-Lin-Chu test for stationarity of the dependent variables in the regression models

	T-statistic	P-value
AR	-4,000.000	0.000***
CAR [-1, 1]	-43,0000.000	0.000***
CAR [-3, 3]	-4,600.000	0.000***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.9: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'global warming'

This table shows the results of the regression models using panel data measuring the effect of the standardised two-week averaged public attention to the search term 'global warming' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Global warming* and *ESG_high*Global warming* are interaction terms measuring the effect of public attention to 'global warming' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Global warming	-0.0024***	-0.0022***	-0.0123***	-0.0122***	-0.0120***	-0.0114***
	(0.0006)	(0.0007)	(0.0011)	(0.0012)	(0.0017)	(0.0019)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0009	0.0007
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Global warming	0.0001	0.0000	-0.0006	-0.0007	0.0045	0.0052*
	(0.0009)	(0.0009)	(0.0016)	(0.0016)	(0.0030)	(0.0029)
ESG_high	0.0006	-0.0002	0.0020	0.0003	0.0011	-0.0008
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*Global warming	-0.0001	-0.0004	0.0013	0.0006	-0.0005	-0.0013
	(0.0008)	(0.0008)	(0.0015)	(0.0014)	(0.0023)	(0.0023)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0008		-0.0015
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0005		0.0115
		(0.0088)		(0.0130)		(0.0194)
ROA		-0.0036		-0.0142**		-0.0048
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0036***	-0.0071***	-0.0124***	-0.0231***	-0.0163***	-0.0315***
	(0.0010)	(0.0022)	(0.0016)	(0.0040)	(0.0025)	(0.0061)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0195	0.0234	0.0423	0.0491	0.0379	0.0417
Adjusted R^2	0.0166	0.0197	0.0395	0.0455	0.0351	0.0381
Hausman	0.9979	0.9014	1.0000	0.5343	0.9922	0.6805
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.10: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'climate change'

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged public attention to the search term 'climate change' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Climate change* and *ESG_high*Climate change* are interaction terms measuring the effect of public attention to 'climate change' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Climate change	0.0025***	0.0023***	0.0126***	0.0125***	0.0120***	0.0113***
	(0.0006)	(0.0007)	(0.0011)	(0.0013)	(0.0017)	(0.0019)
ESG_low	0.0007	0.0010	-0.0005	-0.0002	0.0010	0.0008
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Climate change	-0.0007	-0.0006	-0.0004	-0.0003	0.0014	0.0018
	(0.0009)	(0.0010)	(0.0014)	(0.0014)	(0.0022)	(0.0023)
ESG_high	0.0006	-0.0001	0.0020	0.0003	0.0010	-0.0010
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0022)	(0.0023)
ESG_high*Climate change	-0.0004	-0.0003	-0.0003	-0.0001	0.0015	0.0019
	(0.0006)	(0.0007)	(0.0013)	(0.0013)	(0.0018)	(0.0018)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0008		-0.0014
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0127		0.0004		0.0114
		(0.0088)		(0.0129)		(0.0195)
ROA		-0.0036		-0.0143**		-0.0045
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0019**	-0.0055**	-0.0038***	-0.0145***	-0.0080***	-0.0242***
	(0.0009)	(0.0022)	(0.0013)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0197	0.0234	0.0422	0.0490	0.0375	0.0411
Adjusted R^2	0.0168	0.0197	0.0394	0.0454	0.0346	0.0375
Hausman	0.9958	0.8898	0.9998	0.3300	0.9856	0.6039
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.11: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'sustainability'

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged public attention to the search term 'sustainability' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Sustainability* and *ESG_high*Sustainability* are interaction terms measuring the effect of public attention to 'sustainability' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Sustainability	0.0010***	0.0008***	0.0053***	0.0053***	0.0052***	0.0050***
	(0.0003)	(0.0003)	(0.0005)	(0.0005)	(0.0007)	(0.0008)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0011	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*	0.0010	0.0012	0.0007	0.0009	-0.0019	-0.0027
sustainability	(0.0008)	(0.0009)	(0.0014)	(0.0014)	(0.0024)	(0.0024)
ESG_high	0.0006	-0.0002	0.0020	0.0003	0.0010	-0.0008
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*	0.0010	0.0010	-0.0027*	-0.0024*	-0.0021	-0.0014
sustainability	(0.0009)	(0.0009)	(0.0015)	(0.0015)	(0.0021)	(0.0020)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0016
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0129		0.0005		0.0118
		(0.0087)		(0.0129)		(0.0194)
ROA		-0.0036		-0.0143**		-0.0047
		(0.0040)		(0.0066)		(0.0104)
Constant	-0.0023**	-0.0062***	-0.0064***	-0.0171***	-0.0106***	-0.0259***
	(0.0009)	(0.0022)	(0.0014)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0198	0.0237	0.0426	0.0494	0.0375	0.0411
Adjusted R^2	0.0169	0.0199	0.0397	0.0458	0.0347	0.0375
Hausman	0.9973	0.9227	1.0000	0.4619	0.9992	0.7060
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.12: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'environmental pollution'

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged public attention to the search term 'environmental pollution' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Environmental pollution* and *ESG_high*Environmental pollution* are interaction terms measuring the effect of public attention to 'environmental pollution' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Environmental	-0.0014***	-0.0012***	-0.0070***	-0.0074***	-0.0069***	-0.0065***
pollution	(0.0003)	(0.0004)	(0.0006)	(0.0008)	(0.0010)	(0.0011)
ESG_low	0.0007	0.0009	-0.0005	0.0011	0.0010	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0019)	(0.0020)	(0.0021)
ESG_low*Environ-	-0.0004	-0.0004	0.0003	0.0015	0.0020	0.0019
mental pollution	(0.0010)	(0.0010)	(0.0014)	(0.0015)	(0.0023)	(0.0022)
ESG_high	0.0006	-0.0002	0.0020	0.0010	0.0011	-0.0008
	(0.0008)	(0.0008)	(0.0013)	(0.0022)	(0.0021)	(0.0023)
ESG_high*Environ-	-0.0004	-0.0005	-0.0001	-0.0000	0.0002	-0.0002
mental pollution	(0.0007)	(0.0008)	(0.0015)	(0.0015)	(0.0023)	(0.0023)
Size		0.0002*		-0.0003		0.0010***
		(0.0001)		(0.0018)		(0.0003)
Leverage		0.0006		0.0106**		-0.0014
		(0.0012)		(0.0052)		(0.0031)
BM		-0.0127		0.0358		0.0117
		(0.0088)		(0.0266)		(0.0194)
ROA		-0.0037		-0.0017		-0.0044
		(0.0040)		(0.0097)		(0.0104)
Constant	-0.0011	-0.0049**	-0.0001	0.0029	-0.0045**	-0.0206***
	(0.0009)	(0.0022)	(0.0014)	(0.0270)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0196	0.0234	0.0422	0.0501	0.0375	0.0410
Adjusted R^2	0.0167	0.0197	0.0394	0.0478	0.0346	0.0374
Hausman	0.9990	0.7329	0.9606	0.0110	0.9958	0.4696
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.13: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'environmental governance'

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged public attention to the search term 'environmental governance' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Environmental governance* and *ESG_high*Environmental governance* are interaction terms measuring the effect of public attention to 'environmental governance' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Environmental	-0.0014***	-0.0012***	-0.0073***	-0.0072***	-0.0070***	-0.0067***
governance	(0.0004)	(0.0004)	(0.0007)	(0.0007)	(0.0010)	(0.0011)
ESG_low	0.0008	0.0010	-0.0004	-0.0001	0.0013	0.0011
	(0.0010)	(0.0010)	(0.0013)	(0.0013)	(0.0020)	(0.0020)
ESG_low*Environ-	-0.0013*	-0.0014*	-0.0014	-0.0015	-0.0021	-0.0014
mental governance	(0.0007)	(0.0008)	(0.0013)	(0.0014)	(0.0023)	(0.0023)
ESG_high	0.0007	-0.0001	0.0020	0.0003	0.0008	-0.0011
	(0.0008)	(0.0008)	(0.0012)	(0.0014)	(0.0021)	(0.0023)
ESG_high*Environ-	-0.0009	-0.0009	0.0002	0.0000	0.0023	0.0024
mental governance	(0.0007)	(0.0007)	(0.0014)	(0.0014)	(0.0021)	(0.0022)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0009		-0.0015
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0129		-0.0003		0.0115
		(0.0087)		(0.0129)		(0.0194)
ROA		-0.0039		-0.0147**		-0.0046
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0011	-0.0048**	0.0001	-0.0104***	-0.0043*	-0.0203***
	(0.0009)	(0.0022)	(0.0014)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0201	0.0239	0.0423	0.0492	0.0376	0.0412
Adjusted R^2	0.0172	0.0202	0.0395	0.0456	0.0348	0.0375
Hausman	0.8973	0.4432	0.9972	0.2279	0.9966	0.5429
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.14: Regression models measuring the effect of the standardised two-weeks averaged aggregate public attention to environmental issues

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged aggregate public attention to environmental issues on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Aggregate SGSVI* and *ESG_high*Aggregate SGSVI* are interaction terms measuring the effect of the aggregate public attention to environmental issues for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	AR	AR	CAR	CAR	CAR	CAR
			[-1, 1]	[-1, 1]	[-3, 3]	[-3, 3]
Aggregate SGSVI	0.0016***	0.0014***	0.0079***	0.0079***	0.0075***	0.0071***
	(0.0004)	(0.0004)	(0.0007)	(0.0008)	(0.0011)	(0.0012)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0010	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Aggre-	-0.0000	0.0000	-0.0002	0.0000	0.0013	0.0015
gate SGSVI	(0.0009)	(0.0009)	(0.0014)	(0.0014)	(0.0020)	(0.0021)
ESG_high	0.0006	-0.0002	0.0020	0.0004	0.0011	-0.0009
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0022)	(0.0023)
ESG_high*Aggre-	0.0001	0.0001	-0.0011	-0.0009	0.0002	0.0006
gate SGSVI	(0.0007)	(0.0007)	(0.0013)	(0.0013)	(0.0019)	(0.0019)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0013
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0005		0.0115
		(0.0088)		(0.0129)		(0.0195)
ROA		-0.0036		-0.0143**		-0.0044
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0020**	-0.0057***	-0.0046***	-0.0153***	-0.0087***	-0.0249***
	(0.0009)	(0.0022)	(0.0013)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0195	0.0233	0.0423	0.0491	0.0374	0.0410
Adjusted R^2	0.0166	0.0196	0.0394	0.0455	0.0346	0.0374
Hausman	0.9966	0.9020	1.0000	0.3638	0.9852	0.6268
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.15: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'corporate social responsibility'

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged public attention to the search term 'corporate social responsibility' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Corporate social responsibility* and *ESG_high*Corporate social responsibility* are interaction terms measuring the effect of public attention to 'corporate social responsibility' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Corporate social	-0.0191***	-0.0171***	-0.0969***	-0.0963***	-0.0932***	-0.0887***
responsibility	(0.0047)	(0.0052)	(0.0086)	(0.0096)	(0.0133)	(0.0147)
ESG_low	0.0006	0.0008	-0.0006	-0.0003	0.0010	0.0008
	(0.0009)	(0.0009)	(0.0012)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Corporate	0.0009	0.0008	0.0011	0.0009	0.0016	0.0019
social responsibility	(0.0008)	(0.0008)	(0.0012)	(0.0012)	(0.0022)	(0.0022)
ESG_high	0.0006	-0.0002	0.0020	0.0004	0.0012	-0.0007
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*Corporate	0.0003	0.0002	-0.0009	-0.0013	-0.0021	-0.0026
social responsibility	(0.0006)	(0.0006)	(0.0013)	(0.0013)	(0.0022)	(0.0023)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0006		-0.0009		-0.0015
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0000		0.0113
		(0.0088)		(0.0129)		(0.0194)
ROA		-0.0038		-0.0145**		-0.0046
		(0.0040)		(0.0066)		(0.0104)
Constant	-0.0249***	-0.0262***	-0.1214***	-0.1313***	-0.1211***	-0.1315***
	(0.0059)	(0.0066)	(0.0106)	(0.0120)	(0.0164)	(0.0187)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0197	0.0235	0.0423	0.0492	0.0375	0.0412
Adjusted R^2	0.0168	0.0198	0.0395	0.0456	0.0347	0.0376
Hausman	0.9938	0.8263	0.9992	0.4352	0.9862	0.6461
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.16: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'ESG'

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged public attention to the search term 'ESG' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*ESG* and *ESG_high*ESG* are interaction terms measuring the effect of public attention to 'ESG' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
ESG	0.0009***	0.0008***	0.0051***	0.0051***	0.0050***	0.0048***
	(0.0003)	(0.0003)	(0.0005)	(0.0005)	(0.0007)	(0.0008)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0011	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*ESG	0.0009	0.0010	0.0009	0.0012	-0.0018	-0.0029
	(0.0008)	(0.0009)	(0.0014)	(0.0014)	(0.0027)	(0.0026)
ESG_high	0.0006	-0.0001	0.0019	0.0002	0.0010	-0.0008
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*ESG	0.0011	0.0011	-0.0026*	-0.0020	-0.0007	0.0000
	(0.0009)	(0.0009)	(0.0015)	(0.0014)	(0.0022)	(0.0022)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0016
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0006		0.0115
		(0.0087)		(0.0129)		(0.0194)
ROA		-0.0036		-0.0142**		-0.0047
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0023**	-0.0062***	-0.0063***	-0.0171***	-0.0105***	-0.0259***
	(0.0009)	(0.0022)	(0.0014)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0198	0.0236	0.0425	0.0493	0.0374	0.0411
Adjusted R^2	0.0169	0.0199	0.0397	0.0457	0.0346	0.0375
Hausman	0.9981	0.9158	1.0000	0.4740	0.9989	0.7128
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.17: Regression models measuring the effect of the standardised two-weeks averaged public attention to the search term 'MSCI ESG'

This table shows the **r**esults of the regression models using panel data measuring the effect of the standardised two-weeks averaged public attention to the search term 'MSCI ESG' on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*MSCI ESG* and *ESG_high*MSCI ESG* are interaction terms measuring the effect of public attention to 'MSCI ESG' for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
MSCI ESG	0.0010***	0.0008***	0.0053***	0.0052***	0.0051***	0.0050***
	(0.0003)	(0.0003)	(0.0005)	(0.0005)	(0.0007)	(0.0008)
ESG_low	0.0008	0.0010	-0.0005	-0.0002	0.0008	0.0004
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0021)	(0.0021)
ESG_low*MSCI ESG	0.0008	0.0009	-0.0001	0.0004	-0.0024	-0.0045
	(0.0009)	(0.0010)	(0.0016)	(0.0018)	(0.0031)	(0.0030)
ESG_high	0.0007	-0.0000	0.0017	0.0001	0.0008	-0.0009
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*MSCI ESG	0.0012	0.0014	-0.0024	-0.0014	-0.0020	-0.0007
	(0.0011)	(0.0011)	(0.0018)	(0.0017)	(0.0022)	(0.0021)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0016
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0129		0.0005		0.0116
		(0.0088)		(0.0130)		(0.0194)
ROA		-0.0036		-0.0142**		-0.0048
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0030***	-0.0067***	-0.0096***	-0.0203***	-0.0136***	-0.0289***
	(0.0010)	(0.0022)	(0.0015)	(0.0040)	(0.0024)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0197	0.0236	0.0424	0.0491	0.0375	0.0413
Adjusted R^2	0.0168	0.0199	0.0395	0.0455	0.0347	0.0376
Hausman	0.9993	0.9244	0.9998	0.4942	0.9989	0.7090
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table G.18: Regression models measuring the effect of the standardised two-weeks averaged aggregate public attention to socially responsible investing

This table shows the results of the regression models using panel data measuring the effect of the standardised two-weeks averaged aggregate public attention to socially responsible investing on three different dependent variables regarding the stock returns. Columns 1 and 2 show the regression models with the abnormal returns as the dependent variable. Columns 3 and 4 show the results of the models using the CAR for the three-day event window as the dependent variable. Columns 5 and 6 show the results of the regressions using the CAR for the seven-day event window as the dependent variable. *ESG_low* and *ESG_high* are dummy variables representing whether a firm is part of the 10% lowest or highest ESG ratings. *ESG_low*Aggregate SGSVI* and *ESG_high*Aggregate SGSVI* are interaction terms measuring the effect of the aggregate public attention to socially responsible investing for firms within the 10% lowest or highest ESG ratings. Even columns present the models with control variables, which include size, leverage, book-to-market ratio, and return on assets. Year and industry fixed effects are included in the models. Robust standard errors are used and reported in parentheses. 1%, 5%, and 10% significance levels are indicated by ***, **, and *, respectively.

	(1) AR	(2) AR	(3) CAR [-1, 1]	(4) CAR [-1, 1]	(5) CAR [-3, 3]	(6) CAR [-3, 3]
Aggregate SGSVI	0.0008***	0.0007***	0.0047***	0.0046***	0.0046***	0.0044***
	(0.0002)	(0.0003)	(0.0004)	(0.0005)	(0.0006)	(0.0007)
ESG_low	0.0007	0.0009	-0.0005	-0.0002	0.0011	0.0009
	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0020)	(0.0021)
ESG_low*Aggregate	0.0013	0.0014	0.0014	0.0017	-0.0013	-0.0024
SGSVI	(0.0009)	(0.0010)	(0.0014)	(0.0014)	(0.0026)	(0.0026)
ESG_high	0.0006	-0.0002	0.0019	0.0002	0.0010	-0.0008
	(0.0008)	(0.0008)	(0.0013)	(0.0014)	(0.0021)	(0.0023)
ESG_high*Aggregate	0.0012	0.0013	-0.0031*	-0.0027*	-0.0018	-0.0012
SGSVI	(0.0009)	(0.0009)	(0.0016)	(0.0016)	(0.0025)	(0.0025)
Size		0.0002*		0.0007***		0.0010***
		(0.0001)		(0.0002)		(0.0003)
Leverage		0.0007		-0.0008		-0.0015
		(0.0012)		(0.0019)		(0.0031)
BM		-0.0128		0.0005		0.0117
		(0.0087)		(0.0129)		(0.0194)
ROA		-0.0036		-0.0143**		-0.0046
		(0.0040)		(0.0067)		(0.0104)
Constant	-0.0020**	-0.0059***	-0.0048***	-0.0155***	-0.0090***	-0.0246***
	(0.0009)	(0.0022)	(0.0013)	(0.0040)	(0.0022)	(0.0060)
Observations	7800	7136	7800	7136	7800	7136
Groups	780	760	780	760	780	760
R^2	0.0200	0.0238	0.0427	0.0496	0.0374	0.0411
Adjusted R^2	0.0171	0.0201	0.0399	0.0459	0.0346	0.0374
Hausman	0.9984	0.9185	1.0000	0.4302	0.9977	0.6834
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$