How do investors react to climate news? The influence of public attention

Keywords: Climate risks, public attention, Event Study, market reaction

Abstract:

This paper examines how investors react to news about climate risks of the companies they invest in, and on the influence of public attention on this impact. The market takes into account climate news whose direct financial consequences it can estimate. High public attention intensifies this reaction. We also show that a decrease in exposure to transitional climate risks is valued by the market only when public attention is high. Depending on the type of newspaper publishing the news, the market reaction to the company will be different. Our results are in line with signalling theory. Our main contribution is to highlight the importance of a factor that has been little considered so far in the study of the links between finance and climate risk: public attention.

Acronyms:

CDP = Carbon Disclosure Project
CPRS = Carbon Pollution Reduction Scheme
ESG = Environmental, social, and corporate governance
EPU = Economic Policy Uncertainty
GSVI = Google Search Volume Index
SARA = Superfund Amendments and Reauthorization Act
SASB = Sustainability Accounting Standards Board
SICS = The Sustainable Industry Classification System
TCFD = the Task Force on Climate-related Financial Disclosures

Introduction:

Climate change is universal. Many financial actors (companies from all industries, financial institutions, investors, etc.) around the world are preparing to deal with the direct and indirect impacts of climate change. They all recognise the importance of the costs and risks associated with climate change. However, the risks associated with climate change are observable in the long term and are difficult to assess (Engle et al., 2020; Flammer et al., 2021; Krueger et al., 2020).

They are even more difficult to apprehend because of the asymmetry of information between investors and companies on the latter's exposure to climate risks. Thus, there are initiatives to encourage corporate disclosure (Carbon Disclosure Project, 2022). I move away from the traditional model of market efficiency in which information is complete and instantaneous, and I rely on the model proposed by Merton (1987) in which information is not accessible to all. According to the signalling theory, climate news can be seen as a signal to investors that reduces information asymmetry (Connelly et al., 2011; Sekerci et al., 2022). The news sends a signal about the behaviour of companies regarding the risks and costs of climate change, therefore potentially its exposure to climate risks. As explained above, companies are expected to implement strategies that are consistent with climate change adaptation or mitigation objectives. News published in the press therefore also reveals a company's positions. News can come directly from the company, through press releases, or from a third party, such as journalists. Companies are the direct or indirect senders of the signal, and investors are the receivers. The credibility of the signal sent by news comes from the difficulty of reproducing a signal, i.e. the cost of the signal (Filatotchev & Bishop, 2002; Sekerci et al., 2022). All companies can issue press releases, but they will not necessarily be picked up in several press articles in major newspapers. Companies have no control over whether a news story about them is repeated in several major newspapers. With reduced information asymmetry following the reception of the signal, investors can take them into consideration when making their investment decision (Krüger, 2015; Sekerci et al., 2022; Spence, 2002). For this reason, we study how investors react to news about climate risks faced by the companies in which they invest.

Several works in the financial literature study climate risks individually and show that investors react to news related to climate change (See for example: Aouadi & Marsat, 2018; Baldauf et al., 2020; Diaz-Rainey et al., 2021; Faccini et al., 2021; Monasterolo & de Angelis, 2020; Venturini, 2022). As explained earlier, news could be interpreted by investors as signals that reduce the information asymmetry related to the climate risks faced by companies (Sekerci et al., 2022). However, these articles often study only one dimension of climate risk or focus on a single salient climate news item. However, a company is rarely exposed to only one type of climate risk. Therefore, we propose a more systematic and multivariate approach to studying the impact of climate risks on the financial returns of the companies concerned. In addition, to obtain a more detailed and precise view of the exposure of companies to climate risks, we suggest that these risks be broken down at the company level. To define the categories of climate risks, we use a typology described in the Reporting Guide proposed by the Carbon Disclosure Project (CDP) (2022).

The financial literature agrees that public attention has a significant impact on investor attention. Public attention appears to be a particularly important factor in the context of climate change (Choi et al., 2020). Moreover, in recent years, the media has been publishing more and more articles on the sustainable performance of companies (Capelle-Blancard & Petit, 2019). It is known that media exposure of a topic increases its notoriety and awareness of related issues (Lineman et al., 2015). It seems to us that public attention is a factor largely neglected in the literature, even though it potentially plays a key role. For these reasons, we are interested in understanding the role and influence of public attention on investor reaction to climate news.

We seek to understand how the market reacts to the climate risks exposed in the news to the companies concerned? What influence does public attention have on this reaction?

To examine the reaction of shareholders, which can be read through stock prices, to unexpected news, we first mobilise the methodology of event studies according to the approach defined by MacKinlay (1997). This methodology is frequently used in the financial literature on investor attention (Capelle-Blancard & Petit, 2019; Flammer, 2013; Krüger, 2015). This first step measures market reactions, using calculated abnormal returns. The second step aims to investigate which factors influence the reaction of investors to positive or negative climate news. These factors can be classified into three categories: factors related to the content of the news (climate risks, sources, proximity, and duration of the news), the company concerned (its reputation, size) and external pressures (the economic environment).

The database consists of manually collected articles on climate-related company news from 2017 to 2021. The sample companies covered by articles are multinational corporations. We study 706 news events in total.

First descriptive statistics show us that the companies most concerned by climate news are from the oil and mining industrial sector. It is one of the sectors most exposed to a wide range of climate risks, which suggests that it will face challenges and a lot of effort to put in place adaptation and mitigation strategies. We observe that positive news related to regulatory climate risks attract a lot of public attention, and news (positive and negative) related to acute climate risks attract the most attention.

Following the regression, we find that the market reacts negatively to negative climate news related to legal litigation, here called legal risk, and related to institutional or activist investors, called investors risk. Only positive news related to investor risk makes the market react. Still when attention is high, the market reacts positively only if it is positive news related to a transitional climate risk. An exception to the positive market reaction is news related to a supply or demand change risk, which are news that do not attract public attention based on our data. We also show that the market reacts differently when the news is published by a generalist or an environmental newspaper and the attention towards the company is high.

Market reactions support the possibility of investor myopia, which only considers news whose financial consequences they can immediately assess (Faccini et al., 2021). Acute, legal climate risks related to institutional or activist investors, and changes in supply or demand are indeed associated with direct costs for the companies exposed to these risks when it comes to negative news. As for positive news, only those related to institutional or activist investors' risks have direct financial consequences.

The influence of the level of public attention on the market's reactions to climate news is in line with the signalling theory. Indeed, positive news sends a positive signal to the different stakeholders of the company. High public attention to the company means that more people are likely to perceive the positive signal (Sekerci et al., 2022; Spence, 2002). In the case of negative news, the process is identical, with the difference that such news reinforces investors' loss aversion towards companies exposed to risks whose direct financial consequences they can estimate (Hirshleifer, 2015; Karpoff & Lott Jr, 1993; Krüger, 2015). The signalling theory also applies to explain the difference in market reaction depending on the source of news publication, in case of high public attention (Sekerci et al., 2022; Spence, 2002). Higher public attention to the company means that the number of people likely to read about the company and thus receive the signal is higher than usual. The audience of an environmental newspaper is, by definition, interested in, and potentially sensitive to, environmental issues. Publication in a generalist newspaper can generate more attention around

the company. In the event of negative news, the company may therefore be "punished" by customers, activists, or environmentally sensitive investors. Due to loss aversion, investors turn away from the company (Hirshleifer, 2015; Karpoff & Lott Jr, 1993; Krüger, 2015). On the contrary, in case of positive news, the company may attract environmentally sensitive customers and could therefore lead to a higher profit for the company. It would attract opportunistic, or enthusiastic, investors if they are sensitive to these issues as well (Hirshleifer, 2015; Sekerci et al., 2022; Spence, 2002).

Compared to the existing literature on this subject, our main contribution consists in highlighting the importance of a factor that has been little considered until now in the study of the links between finance and climate risk and which emerges from the public's greater or lesser attention to the company. Our study of market reaction to climate news is more precise and systematic, with a refined categorisation of climate risks. We provide several pieces of evidence that confirm that the market is sensitive to public attention and the variation in this sensitivity to news items referring to different climate risks and depending on the sources (here: the type of newspapers) publishing the news. The implications are (1) for companies, which may need to reflect on their communication and the impact of public attention to events that concern them, (2) for investors who are interested in the profitability of their investments and the factors that affect it, and (3) for the public or activists, to whom our results may point to avenues for communication.

The paper is organised as follows. The second part reviews the different axes that emerge from the literature. The third part describe methodological approach and different econometric models used. The next part presents descriptive statistics and results. Then, we explain the results, and discuss them in following section. Finally, last part concludes.

Literature Review:

Investor's reaction:

According to the efficient financial market hypothesis, the prediction of abnormal returns would be impossible because market prices would reflect all possible information (Fama, 1965, 1970). In the 1990s, behavioural finance opposed this hypothesis and assumed that investors have irrational behaviour that influences the stock market (Audrino et al., 2020; Merton, 1987). Two types of behaviour are distinguished: "*Arbitrageurs trade on the basis of fundamentals, and strive to bring prices in line with the "true" value. Noise traders, on the other hand, trade on pseudo-signals, noise, and other popular trading models*." (Joseph et al., 2011). This is because investors do not have access to all information and, due to limited cognitive abilities, can only process a limited set of information (Kahneman, 1973). Thus, noise traders modify prices that arbitrageurs correct out of sync, causing abnormal returns (Joseph et al., 2011).

In 1987, Merton introduced investor attention into a model to study stock prices and liquidity, with "*the investor recognition hypothesis*" (Merton, 1987). Subsequently, theoretical work in finance continues to study the impact of investor attention on stock market activity (Barber & Odean, 2008). Overall, this work shows that cognitive biases impact investors' attention and, consequently, their consideration of information (Aouadi & Marsat, 2018; Mondria et al., 2010). Empirical work confirms that investors' attention influences the stock market. For example, a study by Grullon et al. (2004) shows that spending on advertising is linked to more individual and institutional investors, and better stock liquidity.

In this paper, we focus on investors' attention to news about companies' climate risk exposure and the influence of this attention on the stock market.

The importance of the costs and risks associated with climate change is recognised and many financial actors (companies across all industries, financial institutions, investors, etc.) around the world are preparing for the direct and indirect impacts of climate change as they are all exposed to it (Flammer et al., 2021; Krueger et al., 2020). In a study of German and US companies, returns for 'green' companies have been higher than returns for 'brown' companies in recent years, reflecting increased environmental concerns (Pástor et al., 2022).

Authors approach the climate risk exposure of companies by the amount of carbon emissions (Görgen et al., 2020) and observe that climate risks are taken into account by investors (Bolton & Kacperczyk, 2021a, 2021b; Hsu et al., 2022; Oestreich & Tsiakas, 2015). However, this result is not a consensus. Monasterolo & De Angelis (2020) show that, following the ratification of the Paris Agreements, on the one hand, stock market indices containing companies with good environmental performance are valued by investors, but on the other hand, companies with poor environmental performance are not penalised by the market.

Investors' reactions to companies affected by climate news:

Several works in the financial literature study climate risks individually and show that investors react to climate change-related news (see below). Based on signalling theory, publication of climate-related news about a company in the press can send a signal to different stakeholders (Sekerci et al., 2022). This signal can be an indication of the company's interest in climate issues if the news is positive. When the news is negative, the company is signalling a lack of adaptation and consideration of climate issues. On the investor side in particular, climate news can reduce the information asymmetry on companies' risk exposure. The signal will influence stakeholders' decision-making. According to the study by Krüger, negative ESG events are perceived more strongly by investors (Krüger, 2015).

As explained earlier, empirical studies in the financial literature focus on salient events and specific risks to study the reaction of investors to climate risks. To facilitate the comparison of results, the results of the literature are divided according to the categories of climate risks defined in this study. The categories are described below in the section "Description of explanatory variables – Climate Risks".

Transition risks:

Current and emerging regulation:

Articles on the signing of the Paris Agreement between 2015 and 2017 show different effects. The Paris Agreement negatively affected the returns of oil and gas companies according to Diaz-Rainey et al. (2021), but according to the study conducted by Monasterolo & De Angelis (2020), "brown" companies are not penalized. The European Union's Emissions Trading Scheme has affected the returns of German companies (Oestreich & Tsiakas, 2015). When Australia's Carbon Pollution Reduction Scheme (CPRS) was announced, the market reacted very badly to energy companies, which had almost 31% loss of returns (Ramiah et al., 2013). The market reacts badly to an increase in exposure to this risk by companies (Faccini et al., 2021).

The participation of firms in regulation is also well received by the market. In an article that examines market reactions to the announcement of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the environmental disclosures of chemical companies, the authors demonstrate that it is important for companies to show leadership when regulations affecting them emerge. The market reacts positively to this anticipation (Blacconiere & Northcut, 1997). The introduction of a carbon trading scheme in China has had a positive impact on the returns of participating companies (Wen et al., 2020).

Technology:

Climate change-related technological innovations might threaten the business models of traditional industries (Bolton & Kacperczyk, 2021a; Venturini, 2022). Announcements of green innovations are welcomed by the market (Ba et al., 2013; Dangelico, 2016).

Legal:

Following the publication of press reports of fraud investigations, i.e., impending legal sanctions, the market value of the company's equity of the companies concerned decreases (Karpoff et al., 2005; Karpoff & Lott Jr, 1993). In Korea, when companies appear on the official monthly list of non-compliance with national environmental laws and regulations, the market reacts negatively towards them (Dasgupta et al., 2006). The increased legal risk exposure of companies is not welcomed by the market.

Shift in supply and demand:

Companies face strong pressure from investors and consumers to adopt more environmentally friendly practices (Ambec & Lanoie, 2008). Changes to more sustainable product offerings allow companies to increase their market share, which is welcomed by the market (Dangelico, 2016).

Institutional or activist investors:

Institutional investors seek both financial and societal benefits (Amel-Zadeh & Serafeim, 2018; Dyck et al., 2019; Gutsche et al., 2016). Institutional investors are shying away from so-called "*sin stocks*", which include polluting companies (Hong & Kacperczyk, 2009). Companies with poor environmental performance may come under pressure from investors (Andersson et al., 2015). Charléty (2021) demonstrates that investors coordinate in the face of climate issues.

Physical risks:

The work of Faccini et al. (2021) shows no evidence that the market takes into account acute or chronic physical risks reported by the media.

Chronic:

The real estate market is exposed to physical risks in coastal areas (Baldauf et al., 2020; Giglio et al., 2021). In periods of prolonged drought, the market reacts negatively towards companies belonging to the food industry (Hong et al., 2019).

Acute and chronic:

Investors react negatively to acute risks, and this reaction is very strong when investors live in a disaster area (Alok et al., 2020).

In summary, research in finance shows that investors' attention to news about corporate climate risks influences the stock market. Negative news has a significantly strong negative impact, and positive news has a weak positive impact.

However, the work presented above focuses on individual risks, or only on salient news events. One exception is Faccini et al. (2021) who observe in their work the market reactions to news in the press on one of four types of climate risks (physical: natural disasters and rising temperatures, transition: US climate policy and international summits on climate change). Therefore, we propose here to take a more systematic and multivariate approach to studying the impact of climate risks on the financial returns of the companies concerned. To improve the understanding of the market's reaction, we mobilise a refined typology of climate risks defined in the CDP Guide (2022) because a news item can

highlight several climate risks. To have a more detailed and precise view of the exposure of companies to climate risks, we propose to break down these risks at the company level.

We formulate the following hypotheses:

Hypothesis 1 a): The market reacts to climate news

Hypothesis 1 b): The market reacts differently depending on the climate risk(s) to which the climate news refers.

Investors and public attention:

As explained above, there is a body of work in the financial literature that examines the financial impact of climate risks individually and provides evidence that investors respond to climate change-related news. However, the publication of news in the press is an indirect way of approaching the public's attention used by many researchers (Bank et al., 2011; Huberman & Regev, 2001). Huberman and Regev (2001) observe in their article a market reaction when a news item, which has been in the news for several months and published in financial newspapers, is published by the New York Times, a generalist newspaper. Thus, the market, which did not react to the publication of this news in specialised newspapers, reacts to its publication in a generalist newspaper with a large audience. Similarly, the results of the literature presented above show that investors react to the publication of climate news in the press. Other authors show that investors react to the publication of ESG news in the press (Aouadi & Marsat, 2018; Capelle-Blancard & Petit, 2019; Flammer, 2013; Krüger, 2015).

Other authors propose a more direct measure of public attention with the online search volume indicator, the Google Search Volume Index (GSVI) (Bank et al., 2011; Da et al., 2011). This indicator is frequently used in the financial literature to study the link between public attention and the stock market. In these studies, the authors generally conclude that an increase in the volume of searches on a company is significantly positively related to an increase in the volume of transactions, liquidity, and volatility of the shares the following day. The results of the papers are consistent in that an increase in GVSI results in higher future returns over a weekly horizon (Audrino et al., 2020; Bank et al., 2011; Dimpfl & Jank, 2016; Joseph et al., 2011; Vlastakis & Markellos, 2012). Including the GVSI in models improves the volatility predictions of stocks (Audrino et al., 2020; Dimpfl & Jank, 2016). These results have been confirmed in the French stock market (Aouadi et al., 2013), and more nuanced for the Japanese market, where the relationship between GVSI and returns is weaker (Takeda & Wakao, 2014).

Public attention is an even more important influencing factor in the context of climate change (Choi et al., 2020). Indeed, in the context of public policy implementation, public involvement and mobilisation is crucial to ensure success (Choi et al., 2020; Lang, 2014). Over the last years, the media has been publishing more articles on sustainable corporate performance (Capelle-Blancard & Petit, 2019). Media exposure of a topic increases awareness of the topic and the issues involved (Lineman et al., 2015). Increased visibility of climate change translates into increased public attention. In 2021, according to an international study, more than 72% of the world's population expressed concern about climate change (EDF & Ipsos, 2021). Authors observe that an increase in press articles on climate change and pollution, and online search volumes on these two topics in the US are associated with positive returns on sustainable US stock market indices (El Ouadghiri et al., 2021). Choi et al. (2020) show in an empirical paper that during periods of abnormally high temperatures, the volume of research on climate change increases, reflecting an increase in public attention to the

topic. During these periods of abnormally high temperatures, the authors also show that locally, polluting companies experience a decline in financial returns.

Thus, the financial literature agrees that public attention has a significant impact on investor attention. However, in the study of the impact of climate news on the financial returns of climate news, this potentially key factor that would influence shareholder reactions is not studied to my knowledge. Based on the previous literature review, we formulate the following hypotheses:

Hypothesis 2 a): The market reacts more to climate news when public attention is high.
Hypothesis 2 b): When public attention is high, the market reacts differently depending on the climate risk to which the climate news refers.

Hypothesis 3 a): The market reacts negatively to negative news published in a general newspaper.
Hypothesis 3 b): The market reacts positively to positive news published in a generalist newspaper.
Hypothesis 3 c): The market reacts negatively to negative news published in an environmental newspaper.
Hypothesis 3 d): The market reacts positively to positive news published in an environmental newspaper.
Hypothesis 3 e): The market does not react to climate news published in a financial journal.

Methodological approach, Variables and Data:

Sample:

The companies selected are those that appear in the news listed by the Novethic website (Website: *Novethic*), and companies ranked by Reprisk (website: *RepRisk*)

Novethic is an online media specialising in sustainable finance and the socially responsible economy. Founded in 2001, it is a subsidiary of the Caisse des dépôts et consignations (CDC), a French public financial institution. This site produces argued and specialised content on sustainable development issues, among others. The advantage of this site is its neutrality, due to its affiliation with the CDC. Another is the specialisation and rigour of the articles, whose subjects are sorted by category. This last point makes it easy to use, and it is very easy to access all the articles on the climate. I chose to use this site because of these advantages, to be able to list the companies that appear in the climate news.

To enrich the sample of selected companies, we used the rankings produced by RepRisk. Reprisk is a Swiss company specialising in ESG data science, ESG risk research and quantitative solutions for business conduct. It is a frequently used source in financial empirical studies (Asante-Appiah, 2020; Burke, 2022; Dai et al., 2021; Eccles et al., 2011; Taliento et al., 2019). The rankings used are the annual reports on the ten most controversial companies. To compile these reports, Reprisk presents the ESG risks of companies by analysing documented negative incidents, criticisms, and controversies from a wide range of third-party sources, including online and print media, NGOs, government agencies, blogs, etc. These annual reports are available from 2008 to 2019 inclusive. We have used these reports as a supplement, due to the presence of the "*Top ESG Issues*" section, which allows us to select companies associated with climate issues. The accessibility of the reports also influenced this choice of use.

Other rankings could have been used such as the one from Corporate Knights, which is both a trade journal and an independent Canadian investment research and advisory firm. Among the

rankings it produces, the ranking of the 100 most sustainable companies in the world, which manage to reconcile social responsibility and financial performance, could have been used (*Corporate Knights*). They provide an analysis of companies with a market capitalisation of at least US$2 billion, on 25 performance indicators (such as: overall sustainability disclosure rate and sustainability disclosure rate relative to GICS industry peers, a Piotroski score based on financials to ensure financial stability, and fines, penalties or settlements paid by the company for sustainability-related violations). This ranking is recognised for rewarding transparency and industry best practice for sustainability rankings. It was not selected because of the lack of certainty that companies in the ranking are cited in the press in the event of climate news. However, many of the companies in the sample already selected appear. Due to time limit, we did not keep the ranking. But it could be used to enlarge the sample. Among the existing rankings, we could also have mobilised the rankings produced by Vigeo Eiris for example, but their accessibility is a problem.

News:

The articles about climate change and the selected companies are extracted from the Europresse online database. This is a French database that allows its users to monitor and analyse information through numerous filters on millions of documents. It is used in many universities and public institutions. Other press databases such as Factiva could also have been used (Flammer, 2013). The keywords used to search for articles were taken from the textual analysis literature on climate change (Brulle, 2018; Delmas et al., 2016; Engle et al., 2020; Flammer, 2013; Gavriilidis, 2021). The following keywords were searched, associated with each of the companies, in the press articles in the database: "climate", "global warming", "extreme weather event", "cyclone", "hurricane", "flood", "drought", "temperature", "sea level", "glacial melting", "heat wave", "emission", "CO2", "carbon dioxide", "green", "environment", "renewable". They were searched in French and English. We used * and + to also consider declensions, plurals, and feminine forms of words. For details of the keywords searched, please see Appendix 2 Methodology.

Then every article in the database is read, so all false positives are immediately removed. Only salient news items (i.e. with several articles on the same subject, from different sources, around the same dates) in the media were selected. This selection choice is made due to the limited attention of individuals, who would be likely to focus more on these news items knowing that the impact can be amplified by the media (Choi et al., 2020). Articles from 2017 to 2021 were then manually processed to extract the relevant data. The sample companies covered by articles are international. We study 706 news events in total : 355 negative news and 351 positive news (Table 6 and Table 7).

Study of the market reaction in three stages:

Event study:

Event studies are used to examine the reaction of shareholders - which can be read from stock prices - to unexpected news. It is assumed that the market is efficient, and therefore that when new information is released, shareholders know about it (Fama, 1970). The reaction of shareholders is reflected in the observed share price, which then differs from the expected return without the event. This is an 'abnormal return'. If investors react (un)favourably to an event, the observed abnormal returns should be significant and positive (negative). The advantage of using an event study methodology lies in the observation of the overall assessment of the market value of the company by investors who quickly consider the information at their disposal (Capelle-Blancard & Petit, 2019; MacKinlay, 1997).

The event study methodology used hereafter is the approach defined by MacKinlay (1997). To predict returns, the market model (augmented by a sectoral index) is used. The event must first

be defined, and the event window identified, i.e. the period over which the prices of the securities of the companies involved in this event will be examined. Here, the event is the release of ESG news about a company. Generally, the window is wider than the specific period of interest to consider the periods before and after the event. The market may indeed receive information before the actual announcement, and the effects on prices may also occur a few days afterwards (MacKinlay, 1997).

Calculation of abnormal returns:

The abnormal returns, for each event, are obtained as follows:

Calculation of the coefficients using the market model : $R_{it} = \alpha_i + \beta_i \times R_{mt} + e_{it}$,

Estimation of the estimated return : $\hat{R}_{it} = \alpha_i + \beta_i \times R_{mt}$

Calculation of abnormal returns : $AR_{it} = R_{it} - \hat{R}_{it}$

AR_{it} : Abnormal return: measures the reaction of shareholders to event i targeting firm j, which belongs to industry s, at time t ;

R_{it} : Observed return for firm i ;

$\hat{R}_{it}$: Estimated return for firm i ;

R_{mt} : Corresponding market return ;

α and β parameters estimated over a 200-day horizon [-240 , -41] (Flammer, 2013).

The first step is to estimate the parameters α and β of the market model. These parameters are estimated over 200 days before the event to avoid contamination from the event. The market model assumes a linear stable relationship between market return, sector return and asset return (Capelle-Blancard & Petit, 2019; MacKinlay, 1997). Next, abnormal returns can be calculated. The abnormal returns are aggregated over periods of (2n + 1) days around the event: n days before to capture possible inside information, the day of the event and n days after. It leads, for each event, to cumulative abnormal returns (for n = 1;...; 5) :

$$CAAR_t^i[-n, +n] = \sum_{\tau=t-n}^{t+n} AAR_\tau^i$$

We then obtain:

$AAR_{[t=0]}$: Abnormal return on the day of the event;

$CAAR_{[-1;+1]}$, $CAAR_{[-2;+2]}$, $CAAR_{[-5;+5]}$ and $CAAR_{[-+1+5]}$: Cumulative abnormal yields respectively over 3, 5 and 10 days around the climatic event, and 4 days after the event.

Global regression:

$$CARR_{j;s;t}^i[-n; +n] = \alpha + \beta_0\, GVSI_{j;t} + \beta_1 \boldsymbol{Sources}_i + \beta_2 \boldsymbol{Climate\ Risks}_i + \beta_3 Distance_{i,j} + \beta_4 Common\ language_{i,j} + \beta_5 Sustainability\ performance_j + \beta_6 EnvironmentMateriality_s + \beta_7 Duration_i + \beta_8 EPU_t + \beta_9 \boldsymbol{Controls}_{j,t} + \delta_j + \theta_s + \partial_t + \varepsilon_{i;j;s;t} \quad (1)$$

The variables Sources, Climate Risks and Controls are in bold because they are vectors of variables.

First, the global equation (1) is calculated for positive and negative climate news separately.

Description of dependent variables:

Two abnormal cumulative returns are tested in the regression: $CARR^{i}_{j;s;t}[-1;+1]$ and $CARR^{i}_{j;s;t}[-2;+2]$. We have chosen to focus on the window around the event, and to use event windows commonly chosen in the literature (Capelle-Blancard & Petit, 2019; Flammer, 2013; MacKinlay, 1997).

Description of explanatory variables:

The reaction of shareholders to positive or negative climate news can be influenced by factors that can be classified into three categories: (1) factors related to the content of the news (the climate risks, the sources, the proximity, and duration in time of the news), (2) the company concerned (its reputation, its size), and (3) external pressures (the economic environment).

GVSI:

The data available on Google Trends is relative search trend comparison data for the search term. The data ranges from 0 to 100, with 100 being the maximum search volume observed over the selected time horizon and geographically. When the search volume index is 0, this means that the volume is censored as it does not exceed a defined threshold in terms of absolute search volume. The remaining search volume data is set in proportion to this maximum. The keywords searched are the names of companies as a subject (Cavanagh et al., 2014; Choi et al., 2020; Herrnstadt & Muehlegger, 2014; Kahn & Kotchen, 2011; Lineman et al., 2015). The use of the GSVI requires manual data collection. For this reason, the number of companies studied is lower compared to studies that can mobilise databases. We are interested in the variation of public attention to the company around the date of publication of climate news. For this aim, we follow Kahn and Kotchen (2011), and standardise the GVSI data. For each company, over the period 2017 to 2021, the GVSI data is distributed *N*[0,1].

Sources:

It is a vector composed of three variables: generalist, economic-financial and environment. The first variable takes the value 1 if the news was published in generalist newspapers, and 0 otherwise. The second takes the value 1 if the news was published in economic or financial newspapers, and 0 otherwise. The third takes the value 1 if the news was published in specialised environmental newspapers, and 0 otherwise. The categorisation of newspapers is taken as it is done by the Europresse database.

Could the source of a news item influence investor reactions? The article by Huberman and Regev (2001) proves that an article published in the New York Times on Sunday caused significant returns even though it was a news item that had already been published 5 months earlier in other newspapers (Nature, the Times). On the other hand, Capelle-Blancard and Petit (2019) observe a very weak influence of article sources for negative ESG news.

Variables on News proximity (*Distance* et *Common language*):

The proximity of the news item is estimated by a first indicator that represents the number of kilometres (in logarithm) between the country where the news item takes place and the home country of the company involved in the news item. The second indicator is a binary variable that takes the value 1 if the news takes place in a country that has a common official language with the home country of the company, and 0 if they have no common official language. The source of these data is CEPII (Mayer & Zignago, 2011).

There is a consensus in the domestic bias literature on the influence of proximity to current events on investor reaction. Investors and households tend to prefer to invest in companies that are

geographically close and have a common language. Similarly, investors pay more attention to news that takes place in proximity or in countries that are culturally close (Al-Thaqeb & Algharabali, 2019; Capelle-Blancard & Petit, 2019; Choi et al., 2020; Coval & Moskowitz, 2001; Grinblatt & Keloharju, 2001; Huberman & Regev, 2001).

Variables on the sustainable reputation of the firm (*Sustainability performance* et *EnvironmentMateriality*):

Two variables were used. The "Sustainability performance" variable provided by RobecoSAM ranges from 0 to 100. It is made up of the sum of a score based on the answers to a company questionnaire. The latter are evaluated on three main fields: Economic, Environmental and Social. These data were extracted from the Bloomberg database.

The index on the importance of environmental issues for companies is constructed based on the article by Flammer (2021). The Sustainability Accounting Standards Board (SASB) is an American non-profit organisation. Its objective is to develop accounting standards for sustainability (website: *SASB*). One of the services provided by SASB is the proposal of a classification of companies' ESG issues, according to whether they are significant for each industry. This classification is widely used in the financial literature (Flammer, 2021; Khan et al., 2016). SASB assesses ESG exposure along five dimensions: (1) Environment, (2) Social Capital, (3) Human Capital, (4) Business Model & Innovation and (5) Leadership & Governance. Here we are interested in the exposure of companies to climate risks. Therefore we only take into account the first axis (Environment) and the fourth axis (Business Model & Innovation), which mainly deal with climate issues, to construct the index. This environment materiality index has been constructed by adding up the number of issues in axes 1 and 4 that are considered financially important for companies in the sector. This data is freely available on the SASB website.

The literature shows that a company's sustainable reputation plays an important mediating role in the sustainable performance - financial performance relationship (Gatzert, 2015; Handayani & Wahyudin, 2020; Orlitzky et al., 2003; Rindova et al., 2005). There are two main findings in the literature. (i) The "*goodwill hypothesis*": the company's good reputation protects it from declines in performance in the event of negative events (Capelle-Blancard & Petit, 2019; Schnietz & Epstein, 2005). This is notably the result that emerges from the empirical article by Capelle-Blancard and Petit (2019). There may also be a 'boomerang' effect; companies with a good reputation are punished more severely by shareholders in the event of negative news (Capelle-Blancard & Petit, 2019; Chrun et al., 2016). Indeed, the empirical study by Luo et al. (2011) proves that companies with the best sustainable performance are more exposed by the media in case of news. This article focuses only on the oil sector and oil spill cases. In her paper, Flammer (2013) observes a lower positive market reaction to environmentally friendly events for companies with a higher CSR score.

Duration:

This is the estimated number of days that news articles were published in the press. This variable ranges from 1 to 7 days. If the news extends beyond 7 days, it is counted twice.

Some authors have focused on extreme negative events (Karpoff & Lott Jr, 1993; Palmrose et al., 2004; Xu et al., 2012), others on more ordinary events (Capelle-Blancard & Petit, 2019; Krüger, 2015). Shareholder attention is time-limited, estimated at approximately one week by scholars (Bank et al., 2011; Choi et al., 2020; Joseph et al., 2011). But to our knowledge, none has yet looked at the time span of the publication of climate news, which could impact shareholders' reactions, as suggested by Capelle-Blancard and Petit (2019).

Macroeconomic context (E*PU*):

This variable shows the relative frequency per month of major newspaper articles, which contain a trio of terms related to economics (E), politics (P) and uncertainty (U) (Davis, 2016). It is available as an open-access online dataset, along with other indicators of uncertainty computed by US finance researchers.

The effects of macroeconomic and political uncertainty have been observed on corporate returns in several countries. The relationship is generally negative. But the magnitude of the effects will vary depending on the country, the strength of the economy and the size of the financial market (Al-Thaqeb & Algharabali, 2019). However, Capelle-Blancard and Petit (2019) do not observe a significant effect of long-term economic trends on investors' reactions to ESG news.

Climate Risks:

It is a vector composed of seven variables: Regulation, Technology, Legal, Shift in supply or demand, Acute, Chronic, and Investors. Each of the variables takes on a value of 1 if the news reflects the relevant climate risk, and 0 otherwise. A news event can reflect several or none of the seven climate risks listed (i.e. a news item may only relate to reputational risk which is not considered here since all news items consider this risk).

Engle et al. (2020) suggest that their work could be improved by refining the climate risks: physical or transitional. They hypothesise that depending on the industry, the coefficient will be higher for one of the two risks. For example, investors in real estate assets would be more concerned with news about physical risks (particularly sea level rise), while investors in the coal industry would be more sensitive to news about regulatory changes and therefore to news related to transition risks (Engle et al., 2020).

An even finer slice of climate risk is offered in the Carbon Disclosure Project (CDP) 2022 report. The CDP is a British non-profit organisation. Each year, this organisation enables large public companies to improve their transparency by completing a report on climate change, water security and forests. According to the CDP, more than a quarter of European companies have completed this report. Part of the questions in the report concern the climate change risks to which companies are exposed. There are two main categories of risks: transition risks and physical risks. Transition risks arise from the future or current (local, national, etc.) implementation of climate change policies (emission limits, energy efficiency standards) or the development of climate neutral technologies. Physical risks arise from extreme weather events or changes in climate models (Carbon Disclosure Project, 2022; Flammer et al., 2021).

Here, the categorisation of news items according to the climate risks referred to is done arbitrarily. The categories are based on the one provided in the CDP's 2022 guide to business. Here is their definition:

<u>Extract from the Guidance CDP 2022: (Question (C2.2a))</u>

« Climate-related risks: The Task Force on Climate-related Financial Disclosures (TCFD) divides climate-related risks into two major categories: risks related to the transition to a lower-carbon economy and risks related to the physical impacts of climate change.

Transition risks :

- ***Current and emerging regulation****: policy developments that attempt to constrain actions that contribute to the adverse effects of climate change or policy developments that seek to promote adaptation to climate change ;*

- ***Technology**: all risks associated with technological improvements or innovations that support the transition to a lower-carbon, energy-efficient economic system ;*
- ***Legal**: all climate-related litigation claims;*
- ***Market**: all shifts in supply and demand for certain commodities, products, and services;*
- ***Reputation**: all risks tied to changing customer or community perceptions of an organization's contribution to or detraction from the transition to a lower-carbon economy.*

Physical risks :

- ***Acute**: risks that are event-driven, including increased severity of extreme weather events, such as cyclones, hurricanes, or floods ;*
- ***Chronic**: longer-term shifts in climate patterns (e.g. sustained higher temperatures) that may cause sea level rise or chronic heat waves.* »

Here, we adopt the name "shift in supply and demand risk" rather than "market risk", to avoid misunderstandings because of different meaning in finance. Reputational risk is not considered in this study because it is considered in all news. Positive (or negative) news about a company influences customer or community perceptions of a company's contribution (or diminution) to the transition to a low carbon economy.

To these risks, due to the different news events, we have chosen to add a category of transition climate risk, an investor risk:

- **Investors**: include all risks related to institutional or activist investors. These are changes in the investment policies or strategies of institutional investors, or pressure from activist investors.

Description of control variables:

Size:

The size of companies is controlled by the natural logarithm of the company's total assets and Price Earning Ratio. Indeed, several articles in the literature prove that the larger a company is and the more visibility it has, the more sensitive shareholders will be to ESG news concerning it (Aouadi & Marsat, 2018; Capelle-Blancard & Petit, 2019; Chrun et al., 2016).

Institutional ownership:

This variable expresses the percentage of the company's shares held by institutions. It makes it possible to characterise the governance of companies (Hubbard et al., 2017). Investors take climate risks into account as much as financial risks, and companies with a larger share of institutional investors voluntarily disclose their carbon emissions according to the work of Ilhan et al (2019). In the same vein, Bolton and Kacperczyk (2021a) show in their paper that institutional investors value less polluting companies more.

Data sources:

All the data on climate-related news are from Europresse. We obtained data on the proximity variables from CEPII. The EnvironmentMateriality index is based on data from SASB. Data on volume of online searches (GVSI) are extracted from Google Trends. All financial and extra-financial data is extracted from the Bloomberg platform. This platform provides access to real-time data, news, and analysis to its users, who are mainly finance professionals.

Limit heterogeneity problems:

To limit heterogeneity problems, fixed effects for years, and firms are introduced and the standard errors are clustered by industry (Aouadi & Marsat, 2018).

The industry classification used is the Sustainable Industry Classification System (SICS) created by SASB, to group companies according to their sustainability profile (risks, opportunities). For precision, in the standard errors of the regressions, we use the smallest categorisation of industries. But for the rest of the document, for the sake of clarity, we use the larger categories, which we call "industrial sectors".

Regression with public attention :

The financial literature agrees that public attention has a significant impact on financial performance; investors react to climate news in the press (Aouadi & Marsat, 2018; Capelle-Blancard & Petit, 2019; Flammer, 2013; Krüger, 2015). But how do we know whether the public has actually paid attention to the company cited in the media? A more direct measure is mobilised in the financial literature on attention; the online search volume indicator, the Google Search Volume Index (GSVI) (Bank et al., 2011; Da et al., 2011). Indeed, using the volume of internet searches allows the identification of changes in public awareness and perception of an issue. For a very low cost, it is possible to efficiently collect this information updated in near real time (Cavanagh et al., 2014; Lineman et al., 2015).

Studies have shown that Google search terms are valuable predictors of changes in economic activity. For a better understanding of public interest, several studies use Google Trends as a proxy for individual attention (Cavanagh et al., 2014; Choi et al., 2020; Kahn & Kotchen, 2011; Lang, 2014; Lineman et al., 2015). Similarly, in this study, search volume data will be used to reveal individuals' behaviours regarding their interest in sampled companies concerned with climate change-related news.

The relevance of using Google search volume as an indicator is based on two points:

First, it is representative. According to the Reuters Institute, by 2021, 25% of news searches worldwide will be done through online searches, and 8% on news aggregators. According to Statista, Google is the market leader in search engines, with a market share of 85.5% in December 2021. Google offers a news aggregator: the Google News application. By 2020, 23% of online news views worldwide will be through the Google News aggregator(Newman, 2021). Thus, the GSVI is indeed a representative indicator of global search behaviour on an international scale (Da et al., 2011; Mondria et al., 2010).

Second, using the GSVI as a measure of revealed interest is appropriate. An Internet user searches for a specific keyword only if he/she is interested in his/her search term (Bank et al., 2011; Da et al., 2011). This indicator identifies the degree of public awareness of a topic rather than its popularity (Cavanagh et al., 2014; Kahn & Kotchen, 2011; Lang, 2014; Lineman et al., 2015).

Google search volume is indeed a direct measure of public attention. Mobilising this indicator in this context would allow us to understand the public attention towards a company concerned with positive and negative climate change news. This would allow us to approach the seriousness of the news as perceived by the public. Indeed, this approach is also used, among others, to study the perception of climate change (Cavanagh et al., 2014; Choi et al., 2020; Herrnstadt & Muehlegger, 2014; Kahn & Kotchen, 2011; Lang, 2014).

Public attention as a factor of influence:

As explained above, the financial literature emphasises the importance of public attention for investors. Therefore, we will test the interaction between the level of public attention and two variables of interest: the different climate risks mentioned in the news on the one hand, and the sources of climate news on the other.

$$CARR^{i}_{j;s;t}[-n;+n] = \alpha + \beta_0\, GVSI_{j;t} + \beta_1 \boldsymbol{Sources}_i + \beta_2 \boldsymbol{Climate\ Risks_i} + \beta_3 Distance_{i,j} + \beta_4 Common\ language_{i,j} + \beta_5 Sustainability\ performance_j + \beta_6 EnvironmentMateriality_s + \beta_7 Duration_i + \beta_8 EPU_t + \beta_9 GVSI_{j;t} \times \boldsymbol{Climate\ Risks_i} + \beta_{10} \boldsymbol{Controls}_{j,t} + \delta_j + \theta_s + \partial_t + \varepsilon_{i;j;s;t} \quad (2)$$

This equation (2) makes it possible to study the effect of an interaction between the level of public attention towards the company concerned by the news and the type of climate risks presented in the news.

$$CARR^{i}_{j;s;t}[-n;+n] = \alpha + \beta_0\, GVSI_{j;t} + \beta_1 \boldsymbol{Sources}_i + \beta_2 \boldsymbol{Climate\ Risks_i} + \beta_3 Distance_{i,j} + \beta_4 Common\ language_{i,j} + \beta_5 Sustainability\ performance_j + \beta_6 EnvironmentMateriality_s + \beta_7 Duration_i + \beta_8 EPU_t + \beta_9 GVSI_{j;t} \times \boldsymbol{Sources_i} + \beta_{10} \boldsymbol{Controls}_{j,t} + \delta_j + \theta_s + \partial_t + \varepsilon_{i;j;s;t} \quad (3)$$

This equation (3) allows us to study the effect of an interaction between the level of public attention towards the company involved in the news and the source, i.e. the category of newspaper that published the news. For each of equations (2) and (3), we ran a positive and negative climate news regression separately. Our coefficient of interest in both equations is β_9.

Robustness checks:

We estimated for robustness checks the post-event market reaction over the window [+1 ;+5], and extended this event window to get a broader view with the window [-5 ;+5]. The [+1 ;+5] window reveals market reactions to certain factors, reflecting the need for the market to take time to consider the news. Over the window [-5 ;+5], market reactions weaken, probably due to limited investor attention (Flammer, 2013; Hirshleifer, 2015) (See Appendix 3 and Appendix 4)

The regression in equation (2) was calculated by removing the climate risk related to institutional or activist investors (See Table 14 in Appendix). Indeed, this risk was added because of reading the news collected. It is not listed in the CDP questionnaire response guide (2022).

Results:

Climate risk exposure according to climate news, by industry sector:

As explained above, we use the SICS industry categories proposed by SASB. To analyse which industries are most exposed to climate risks according to the climate news, for the sake of clarity we use the broad industry categories, here called "industrial sector".

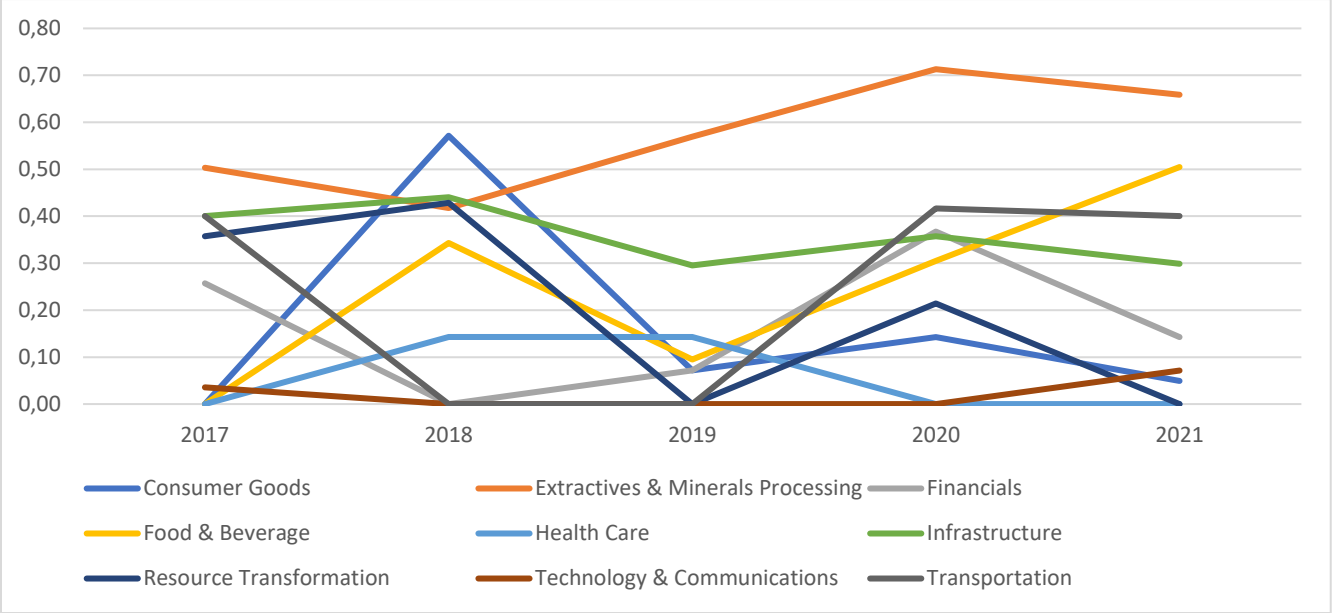
This table shows the number of climate events per year, from 2017 to 2021, the mean and standard deviation of annual climate events between 2017 and 2021, by industrial sector. Data on climate-related news are from Europresse. Industry classification is from SASB.

Table 1 Number of climate news about climate risk, by industry sector

	2017	2018	2019	2020	2021	**Mean**	***St. Dev.***
Number total positive news							
Consumer Goods	4	3	11	5	9	6.4	*3,44*
Extractives & Minerals Processing	21	30	27	25	45	29.6	*9,21*
Financials	7	4	2	6	12	6.2	*3,77*
Food & Beverage	2	6	5	6	8	5.4	*2,19*
Health Care	0	0	1	0	0	0.2	*0,45*
Infrastructure	16	14	15	3	14	12.4	*5,32*

Resource Transformation	2	0	0	1	6	1.8	*2,49*
Technology & Communications	3	2	3	3	8	3.8	*2,39*
Transportation	3	1	5	7	6	4.4	*2,41*
Number total negative news							
Consumer Goods	1	5	5	2	4	3.4	*1,82*
Extractives & Minerals Processing	35	43	46	47	54	45	*6,89*
Financials	6	3	5	6	5	5	*1,22*
Food & Beverage	2	6	5	5	4	4.4	*1,52*
Health Care	1	1	2	1	0	1	*0,71*
Infrastructure	9	11	6	5	3	6.8	*3,19*
Resource Transformation	2	2	0	1	0	1	*1,00*
Technology & Communications	1	1	1	1	3	1.4	*0,89*
Transportation	2	0	4	5	4	3	*2,00*

Figure 1 Exposure to climate risks in the news, by industry sector, 2017-2021



This graph presents the exposure to climate risks in the news, by industry sector between 2017 and 2021. The climate risk exposure of different industrial sectors is approximate by the share of negative climate events among climate events. Data on climate-related news are from Europresse. Industry classification is from SASB. The calculation is done by year for each industrial sector. The data are detailed in Table 8 (Appendix 1).

Extractives & Minerals Processing: This large industry sector is the one with the most climate-related news (see Figure 1). SASB standards indicate that this sector presents many issues related to climate risks. In our study, we observe that on average, climate-related news concerns the extractive and mining industry. Between 2017 and 2022, the companies in the sample belonging to this industry are affected by an annual average of 45 negative climate news items and just under 30 positive climate news items. (see Table 1). According to our data, the sector is exposed to regulatory, legal, physical (acute and chronic) and institutional investor risks, among others. To a lesser extent, market and technology risks are also a threat to this sector (see Table 9).

Infrastructure: This is the second most climate-sensitive industry sector (see Figure 1). Between 2017 and 2022, the companies in the sample in this sector are affected, on average each year, by just under seven negative news items and a dozen positive ones (see Table 1). The exposure to climate risks varies according to news. According to SASB standards, this industry sector is highly exposed to climate risks. The share is very high in 2017, 2018 and 2020. This sector is mainly exposed to physical (acute and chronic), legal and regulatory climate risks (see Table 9).
Healthcare: This is the sector with the least amount of climate-related news in the sample and with very few companies in our sample (see Figure 1). Companies in this sector are affected by an average of 0.2 positive and one negative news item per year between 2017 and 2022 (see Table 1). This is one of the least exposed industrial sectors in the sample according to SASB standards. This sector is mainly exposed to legal and acute climate risks (see Table 9).
Resource Transformation: This is the second sector with the least amount of climate news (see Figure 1). On average, companies in this sector are affected by 1.8 positive and one negative news item per year (see Table 1). It is a very exposed sector according to SASB, but the number of news items is very low, with a peak in 2021. The main climate risks that emerge from the news for companies in this sector are regulatory and legal risks. The risks of change in supply or demand and acute risks also concern this sector to a lesser extent (see Table 9).

Market's reaction to climate-related news and influence from public attention depending on the climate risks cited:

We present here the results of the global equation (1) and of the equation (2) focusing on climate risks.

Table 2 Descriptive statistics

Climate Risks	Transition	Physical	**TOTAL**	GVSI	CARR [-1 ;+1]	CARR [-2 ; +2]
	Quantity	*Quantity*		*Mean*	*Mean*	*Mean*
Regulation	74	0	**74**	0.22 (1.33)	-0.31 (3.8)	-0.13 (5.98)
Technology	191	1	**191**	0.11 (1)	0.08 (4)	-0.09 (5.7)
Legal	89	0	**89**	0.14 (0.94)	-0.57 (4.1)	-1.26 (5.93)
Supply and demand	104	0	**104**	-0.16 (0.88)	-0.14 (4.48)	-0.36 (6.43)
Acute	0	105	**105**	0.49 (1.6)	0.2 (4.4)	0.85 (6.3)
Chronic	1	16	**17**	-0.09 (0.85)	1.18 (6.4)	2.19 (7.8)
Investors	34	0	**34**	-0.08	-1.54 (3.38)	-1.3 (4.7)
TOTAL	**590**	**122**	**706**			
GVSI	0.1 (1.2)	0.4 (1.5)				
CARR [-1 ; +1]	-0.28 (4)	0.3 (4.7)				
CARR [-2 ; +2]	-0.33 (6)	1 (6.48)				
CARR [-5 ; +5]	-0.9 (10.7)	1.8 (9)				
CARR [+1 ; +5]	-0.27 (6.4)	1.1 (5.6)				
Legend: mean (standard deviation)						

This table presents the number of climate-related news, the average volume of online search, and the average change in firm's market value around the publication, for each climate risks.

CARR [-1 ;+1], and CARR [-2 ; +2] are the cumulative average abnormal returns over 3, and 5 days, respectively, around the publication. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse.

GVSI data are from Google Trends. Financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Table 3 Results general regression, equation (1)

	Negative news		Positive News	
Event window	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-1 ;+1]	CARR [-2 ; +2]
Source				
Main	-0.601	-1.332	-0.225	-0.325
	(-0.47)	(-0.82)	(-0.46)	(-0.43)
Finance	-0.231	-0.146	1.067	1.508
	(-0.55)	(-0.26)	(1.51)	(1.98)
Environnement	1.658	0.823	2.368	1.848
	(1.96)	(0.63)	(2.05)	(0.94)
Concern				
Regulation risks	0.675	1.125	-0.899	-1.298
	(0.44)	(0.45)	(-0.79)	(-0.82)
Technology risks	1.635	2.418	0.827	0.791
	(1.36)	(1.14)	(1.23)	(1.06)
Legal risks	-1.308*	-2.452***	-0.409	-0.154
	(-2.51)	(-3.81)	(-1.02)	(-0.24)
Supply and demand risks	-2.182	-3.092	-0.0264	-0.627
	(-1.73)	(-1.81)	(-0.03)	(-0.57)
Investors risks	-2.763**	-4.146**	3.317***	4.544***
	(-3.71)	(-2.95)	(4.40)	(5.65)
Acute risks	-1.209	-1.568	1.134	1.352
	(-1.63)	(-1.81)	(1.07)	(0.75)
Chronic risks	1.651	1.934	0	0
	(1.68)	(1.45)	(.)	(.)
Proximity				
Distance	-0.0839	-0.0376	0.0432	-0.0887
	(-1.23)	(-0.31)	(0.32)	(-0.41)
Common language	-1.448	-1.269	0.465	-0.802
	(-1.50)	(-0.87)	(0.31)	(-0.35)
Environmental perfomances				
Sustainability performance	0.0177	0.0422	0.0374	0.0581
	(0.96)	(1.43)	(0.63)	(0.80)
EnvironmentMateriality	-3.234*	-3.260	0	0
	(-2.15)	(-1.40)	(.)	(.)
Attention				
GVSI	0.190	0.317	0.367	0.738
	(1.16)	(1.07)	(1.76)	(1.84)
Duration	0.212	0.247	-0.0582	-0.0444
	(1.58)	(1.71)	(-0.38)	(-0.24)
Context				
EPU	0.0143*	0.0293*	-0.000888	0.00559
	(2.66)	(2.24)	(-0.11)	(0.49)
Controls				
Assets	-2.297	-4.847**	2.113	2.408
	(-1.76)	(-3.07)	(0.74)	(0.58)

P/E Ratio	0.000108	0.000463	-0.000205	-0.000402
	(0.58)	(1.54)	(-1.10)	(-1.56)
Institutional Ownership	0.00517	0.0469	0.0201	0.0307
	(0.34)	(1.94)	(0.81)	(0.91)
Constant.	38.21*	60.74**	-29.61	-33.91
	(2.53)	(3.02)	(-0.97)	(-0.77)
Specifications				
Nb. Obs.	325	325	323	323
R-square	0.133	0.164	0.0900	0.0884
Adjusted R-square	0.00161	0.00479	0.0000109	0.000288
F statistic	.	.	.	.
P>F	.	.	.	.
Firm fixed effects	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes
Industry clustered standard errors	Yes	Yes	Yes	Yes

This table presents the average change in firm's market value around the publication of climate-related news, from least squares regressions (using industry clustered standard errors).

Robust standard errors are reported in parentheses. * represents t-statistics as follow: * p<0.05, ** p<0.01, *** p<0.001.

CARR [-1 ;+1], and CARR [-2 ; +2] are the cumulative average abnormal returns over 3, and 5 days, respectively, around the publication. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. Proximity data are from CEPII. EnvironmentMateriality index is based on data from SASB. GVSI data are from Google Trends. Sustainability performance from RobecoSAM and financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Table 4 Results regression with the interaction between attention and climate risks, equation (2)

	Negative news		Positive News	
Event window	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-1 ;+1]	CARR [-2 ; +2]
Source				
Main	-0.724	-1.570	-0.414	-0.553
	(-0.65)	(-1.16)	(-0.83)	(-0.67)
Finance	-0.412	-0.401	0.998	1.347
	(-0.80)	(-0.74)	(1.31)	(1.51)
Environnement	1.218	0.129	2.078	1.426
	(1.35)	(0.09)	(1.76)	(0.72)
Concern				
Transition risks	2.550	3.478	-1.755	-0.605
	(0.82)	(1.03)	(-0.76)	(-0.25)
Physical risks	2.670	3.796	-0.521	1.114
	(0.93)	(1.30)	(-0.19)	(0.33)
Proximity				
Distance	-0.103	-0.0626	0.0740	0.00321
	(-1.41)	(-0.46)	(0.66)	(0.02)
Common language	-1.382	-1.068	0.951	0.499
	(-1.61)	(-0.76)	(0.68)	(0.25)
Environmental perfomances				
Sustainability performance	-0.00415	0.0210	0.0382	0.0628
	(-0.30)	(0.81)	(0.59)	(0.77)
EnvironmentMateriality	0.728	2.264	0	0
	(0.31)	(0.73)	(.)	(.)
Attention				
GVSI	0.500*	0.557	-0.417	-0.698
	(2.17)	(1.25)	(-1.15)	(-1.40)
GVSI× Regulation risks	2.088	2.840	0.913	2.395**
	(1.26)	(1.24)	(1.93)	(3.64)
GVSI× Technology risks	0.301	-0.177	1.255*	1.850*
	(0.44)	(-0.12)	(2.14)	(2.17)
GVSI× Legal risks	-2.542	-2.714	1.050*	0.877
	(-1.43)	(-1.14)	(2.42)	(1.19)
GVSI× Supply and demand risks	-0.715	-2.451**	-0.0886	0.341
	(-0.72)	(-3.58)	(-0.15)	(0.38)
GVSI× Investors risks	-1.146	-1.135	-8.268*	-11.37*
	(-0.88)	(-0.77)	(-2.81)	(-2.66)
GVSI× Acute risks	-0.446*	-0.248	-0.921	-1.040
	(-2.40)	(-0.60)	(-0.74)	(-1.03)
GVSI× Chronic risks	-1.564	-2.416	0	0
	(-1.46)	(-1.03)	(.)	(.)
Duration	0.101	0.115	-0.0678	-0.111
	(0.89)	(0.90)	(-0.44)	(-0.55)
Context				
EPU	0.0141**	0.0297**	-0.00204	0.00420

	(3.63)	(2.87)	(-0.25)	(0.36)
Controls				
Assets	-0.910	-3.391*	2.512	3.125
	(-1.10)	(-2.46)	(0.89)	(0.74)
P/E Ratio	0.0000725	0.000346	-0.000235	-0.000425
	(0.43)	(1.28)	(-1.13)	(-1.45)
Institutional Ownership	0.00462	0.0454	0.0200	0.0240
	(0.29)	(1.69)	(0.81)	(0.74)
Constant.	3.571	17.53	-32.27	-42.18
	(0.28)	(0.73)	(-1.03)	(-0.92)
Specifications				
Nb. Obs.	325	325	323	323
R-square	0.135	0.145	0.102	0.115
Adjusted R-square	0.0225	0.00718	0.0000116	0.000286
F statistic	.	.	.	.
P>F	.	.	.	.
Firm fixed effects	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes
Industry clustered standard errors	Yes	Yes	Yes	Yes

This table presents the average change in firm's market value around the publication of climate-related news, with interaction between public attention and various climate risks, from least squares regressions (using industry clustered standard errors).

Robust standard errors are reported in parentheses. * represents t-statistics as follow: * p<0.05, ** p<0.01, *** p<0.001.

CARR [-1 ;+1], and CARR [-2 ; +2] are the cumulative average abnormal returns over 3, and 5 days, respectively, around the publication. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. Proximity data are from CEPII. EnvironmentMateriality index is based on data from SASB. GVSI data are from Google Trends. Sustainability performance from RobecoSAM and financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Summary of results:

The market reacts to climate news about institutional or activist investors (e.g. Norwegian fund removes oil companies from its portfolio). The reaction is positive (negative) to positive (negative) news. The market reacts negatively to negative legal climate news. News about other climate risks does not cause a market reaction (Table 3).

However, when public attention is high, the market reacts negatively to companies affected by negative news about companies' exposure to climate risks, and positively in the case of positive climate news. This reaction differs for risks related to institutional or activist investors, which attract little public attention, and positive news stories about these risks generate a negative market reaction (Table 4).

Transition risks:

Regulation risks:

On average between 2017 and 2021, climate news that addresses regulatory risks attracts public attention, especially when the news is positive (Table 2). The financial market does not react to news related to regulatory risks (Table 3). But positive news stories related to regulatory risks are well received by the market if public attention is high (Table 4). This includes news about companies breaching or adjusting to existing regulations, but also news about plans to implement new laws, charters, etc., often in response to corporate behaviour.

Technological risks:

The market does not react to news related to technological risks (Table 3). These news items expose whether companies are moving towards technologies that support the transition to a low-carbon economy. When positive news is associated with high public attention, the market reacts positively to the news (Table 4).

Legal risks:

The market reacts negatively to negative news stories that refer to climate-related litigation that the company has faced (Table 3). Public attention does not influence this reaction. This is the news about all the lawsuits, fines of the companies. When public attention is high and the news is positive, the market reacts positively for a while (Table 4). It is usually about charges being dropped or trials being won.

Shift in supply or demand risks

News about supply or demand change risks attracts very little public attention, on average, between 2017 and 2021 (Table 2). The market reacts negatively to negative news related to a supply or demand change climate risk only in the [+1; +5] window tested in the robustness tests (Table 11). This negative reaction is reinforced around the news release date when it is associated with high public attention (Table 4).

Institutional or activist investors risks

Climate news about institutional or activist investors and companies attracts very little public attention (Table 2) but provokes significant market reactions (Table 3). In the case of negative news, such as a divestment from the Norwegian Fund's oil industries, the market reacts negatively. In case of positive news – e.g. the Norwegian Fund reintegrates the company into its portfolio – the market reacts positively. In case of high public attention, the market reacts negatively to positive news (Table 4). The coefficients in equation (2) do not change in sign or significance when this risk is removed (see robustness check in Table 14).

Physical risks :

Chronic risks :

News about chronic climate risks attracts very little public attention, on average between 2017 and 2021 (Table 2). The market does not react to news related to chronic climate risks (Table 3). In combination with high public attention, the market reacts negatively to negative news about chronic physical risks (Table 4).

Acute risks :

News about acute climate risks attract, on average, a lot of public attention between 2017 and 2021 (Table 2). In the robustness tests, we observe that the market reacts negatively to negative news only in the [+1; +5] window (Table 11). This negative reaction is reinforced around the news release date when it is associated with high public attention (Table 4).

Table 5 Results regression with the interaction between attention and sources, equation (3)

	Negative news		Positive News	
Event window	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-1 ;+1]	CARR [-2 ; +2]
Source				
Main	-0.559	-1.225	-0.596	-0.685
	(-0.47)	(-0.83)	(-1.34)	(-0.90)
Finance	-0.645	-0.651	0.717	1.095
	(-1.72)	(-1.56)	(0.99)	(1.32)
EnvironmentMateriality	0.981	-0.104	1.231	0.617
	(1.13)	(-0.08)	(1.25)	(0.27)
Concern				
Transition risks	0.251	0.169	-0.746	-0.880
	(0.33)	(0.17)	(-0.72)	(-0.48)
Proximity				
Distance	-0.0908	-0.0490	0.0327	-0.0813
	(-1.16)	(-0.37)	(0.28)	(-0.47)
Common language	-1.384	-1.233	0.182	-0.867
	(-1.47)	(-0.86)	(0.14)	(-0.48)
Environmental perfomances				
Sustainability performance	0.00495	0.0250	0.0409	0.0651
	(0.26)	(0.88)	(0.73)	(0.96)
Materiality Index	-2.264	-1.633	0	0
	(-1.71)	(-0.79)	(.)	(.)
Attention				
GVSI	0.996	1.754	-0.133	-0.226
	(1.19)	(1.06)	(-0.29)	(-0.29)
GVSI× Main	-1.293	-2.156	0.500	1.060
	(-1.70)	(-1.51)	(1.20)	(1.60)
GVSI× Finance	0.444	0.671	-0.256	-0.161
	(1.69)	(1.44)	(-0.47)	(-0.18)
GVSI x Environnement	-0.269	-1.308*	1.680***	1.446
	(-0.45)	(-2.15)	(4.15)	(1.14)
Duration	0.186	0.210	-0.0553	-0.0697
	(1.73)	(1.68)	(-0.39)	(-0.41)
Context				
EPU	0.0145*	0.0298*	0.000274	0.00689
	(2.77)	(2.36)	(0.03)	(0.59)
Controls				
Assets	-1.899	-4.274**	2.016	2.100
	(-1.56)	(-2.82)	(0.75)	(0.53)
P/E Ratio	-0.0000629	0.000160	-0.000224	-0.000402
	(-0.41)	(0.62)	(-1.26)	(-1.72)
Institutional Ownership	-0.00718	0.0279	0.0316	0.0430
	(-0.47)	(1.09)	(1.16)	(1.18)
Constant.	31.14*	49.80*	-27.39	-29.59

	(2.66)	(2.58)	(-0.96)	(-0.70)
Specifications				
Nb. Obs.	325	325	323	323
R-square	0.0987	0.136	0.105	0.0956
Adjusted R-square	0.000635	0.00802	0.000677	0.0000145
F statistic	.	.	213.0	2686.8
P>F	.	.	2.01e-21	4.87e-34
Firm fixed effects	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes
Industry clustered standard errors	Yes	Yes	Yes	Yes

This table presents the average change in firm's market value around the publication of climate-related news, with interaction between public attention and news sources, from least squares regressions (using industry clustered standard errors).
*Robust standard errors are reported in parentheses. * represents t-statistics as follow: * p<0.05, ** p<0.01, *** p<0.001.*
CARR [-1 ;+1], and CARR [-2 ; +2] are the cumulative average abnormal returns over 3, and 5 days, respectively, around the publication. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. Proximity data are from CEPII. EnvironmentMateriality index is based on data from SASB. GVSI data are from Google Trends. Sustainability performance from RobecoSAM and financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Market's reaction to climate-related news and influence from public attention depending on news sources:

We present below the results of the global equation (1) and of equation (3) focusing on sources publishing climate news.

$$CARR^{i}_{j;s;t}[-n;+n] = \alpha + \beta_0\, GVSI_{j;t} + \beta_1 \boldsymbol{Sources}_i + \beta_2 \boldsymbol{Climate\ Risks_i} + \beta_3 Distance_{i,j} + \beta_4 Common\ language_{i,j} + \beta_5 Sustainability\ performance_j + \beta_6 EnvironmentMateriality_s + \beta_7 Duration_i + \beta_8 EPU_t + \beta_9 GVSI_{j;t} \times \boldsymbol{Sources_i} + \beta_{10} \boldsymbol{Controls}_{j,t} + \delta_j + \theta_s + \partial_t + \varepsilon_{i;j;s;t} \quad (3)$$

(*see eq. (1)*) In the case of high attention, the market reacts temporarily positively to the publication of a positive news item in an environmental newspaper, or a generalist newspaper, as a strong positive significant coefficient is obtained in the event window [+1; +5] in the case of robustness checks(see Table 13). Still in the case of high attention, the market reacts negatively for a while to a negative news item published in an environmental newspaper (Table 5).

Discussion of results: Why and to what do investors react?

Climate risk exposure according to climate news, by industry sector (Figure 1, Table 1 et Table 9).

Extractives & Minerals Processing: This industry sector is highly exposed to climate risks according to the news extracted. It is exposed to all types of climate risks (transitional and physical), which makes it difficult to put in place targeted adaptation and mitigation policies. Indeed, companies in this sector are highly exposed to the risk of stranded assets (Hong et al., 2020).
Infrastructure: This industry sector is also highly exposed to climate risks, but they are more limited. It may therefore be easier for this sector to target adaptation and mitigation policies.

Healthcare: This sector has very little exposure to climate risks and should have the capacity to cope with them. It seems to be concerned by very specific climate risks that it will be easier to identify and counter.
Resource Transformation: The low-risk exposure of companies in this sector in the press may be due to sample bias. The companies in this sector may not be representative. The other possibility is that these companies are highly exposed to climate risks, but do not appear much in major climate news. However, this industry sector faces a wide range of climate risks in the climate news. The implementation of targeted climate risk mitigation and adaptation policies will therefore be challenging for companies in the sector.

Consideration of the cited climate risks and influence of the level of public attention:

We interpret here the results of the global equation (1) and of the equation (2) focusing on climate risks. Different market reactions are observed depending on the climate risks mentioned in the news, and on the level of public attention. The results do not indicate a lack of investor interest in climate news, contrary to the findings of Faccini et al (2021).

Transition risks:

The negative reaction of the market to climate news related to legal climate risks (and to changes in supply or demand, only in the window [+1; +5] of robustness checks), and the lack of reaction to regulatory and technological risks can be explained by the hypothesis of a myopia of investors who focus on risks that have direct financial consequences (Faccini et al., 2021). It is indeed quick to estimate the financial costs of a legal dispute, including the amount of financial penalties. A change in supply or demand results in a direct change in a company's profitability. Whereas a change in regulation may have a time lag or adjustment possibilities that make cost estimates difficult. The assumption of investor myopia with respect to financial consequences may apply, also, for technological risks (Faccini et al., 2021).

Physical risks:

The difference in market reaction between acute and chronic climate risks can also be explained by the assumption that investors' myopia regarding the financial consequences can be applied (Faccini et al., 2021). An acute climate risk, such as a hurricane or cyclone, causes damage whose financial costs can be assessed. For chronic risks, such as an exacerbation of extreme temperatures, however, it is much more difficult to gauge the immediate financial consequences for a company.

Public attention influence:

Positive news:

The market reacts positively only to news related to transitional climate risks and provided that public attention is high. Such news could reflect an improvement in the public image of the company. Investors could be excited by the news and reward the company. Another point is that because of the positive news that is perceived as a signal, the company could attract a climate-sensitive clientele, and generate more profit (Sekerci et al., 2022; Spence, 2002). Investors could then be opportunistic (Hirshleifer, 2015; Karpoff & Lott Jr, 1993).

How to explain the differences in reactions to positive news?

For news related to transitional climate risks, a decrease in risk exposure can be linked to an increase in corporate profitability by attracting environmentally sensitive consumers, or to avoided costs by complying with regulations for example. This effect does not appear for supply or demand change risk because it does not attract public attention. Climate news about positive physical risks refers more to the company getting back up and running after dealing with a hurricane or cyclone.

Negative news:

We find that public attention does not influence the market reaction to climate news related to legal risk, which supports the hypothesis that news should be considered according to its direct financial consequences.

The high public attention in the case of negative news related to a supply or demand change climate risk, or an acute climate risk, concentrates and precipitates the negative market reaction around the date of the news release. Concern about climate change is growing among the global population (EDF & Ipsos, 2021). Thus, the high public attention could bring a sense of loss aversion in case of negative news. Such news sends a negative signal and tarnishes the reputation of the targeted companies among customers or communities. The news could result in financial losses for companies, if the customer population 'punishes' the offending company (Hirshleifer, 2015; Karpoff, et al., 1993; Krüger, 2015; Sekerci et al., 2022; Spence, 2002). This would explain the negative market reaction to high public attention when the published news is negative and linked to an acute or chronic supply or demand change climate risk.

How to explain the differences in reactions to negative news?

High public attention reinforces investors' loss aversion, which they have experienced by estimating the direct financial consequences. The risks for which the market does not react are those for which it is difficult to estimate the costs immediately, as explained above. Investors have difficulty estimating the costs associated with these risks, possibly because of information asymmetry about the level of exposure of companies to the risks.

Investors risks:

The market reaction to climate-related news linked to institutional or activist investors may come from the event itself. Disinvestment by investors, or reinvestment, will drive the stock's performance down or up respectively. A second explanation may be a mimicry behaviour of investors in front of the announcement of institutional investors' decisions. Due to investors' short-sightedness, they react quickly to this announcement which has immediate financial consequences (Faccini et al., 2021). The public pays very little attention to this news. For this risk, the level of public attention decreases each time it is positive news. Thus, the negative coefficient could be interpreted as the market penalising the company for the decrease in public attention.

Some authors (Da et al., 2011) make a direct link between attention measured by the volume of online searches and the attention of individual investors. This could be another explanation for the influence of public attention on market reactions. But this explanation does not seem to hold here. Abnormal returns approximate individual investor attention, which is measured in the overall equation, and in interaction with online search volume, the results are different.

Influence of newspaper readership:

We interpretate the results of the global equation (1) and of equation (3) focusing on the sources publishing the climate news:

The market reaction would consider the potential attention of the readership. When general newspapers read by the general population, and environmental newspapers read by interested and potentially activist individuals, publish climate news, the market reacts when the public attention to the company concerned by the news is high.

The fact that the negative news is brought to the public's attention in an environmental newspaper could provide a sense of loss aversion for investors. This news sends a signal that can damage the reputation of the company among the climate-sensitive customers who receive it.

However, as explained above, environmental concerns are of concern to most of the population. A decline in reputation could translate into a potential decline in profitability for the company (Krüger, 2015; Sekerci et al., 2022; Spence, 2002).

When positive news is associated with high attention, investors could expect a valuation of the company by the public because the image of the company would be better because of the signal sent back with the news (Sekerci et al., 2022; Spence, 2002). It can then be assumed that investors are opportunistic (Hirshleifer, 2015).

Discussion of the results in relation to the literature and the hypotheses:

Hypothesis 1 a) : The market is reacting to climate news.

The results show that the market is aware of climate risks. However, the market only reacts to news related to legal risks and to institutional or activist investors. This result is contrary to the results of Faccini et al. (2021) who show that the market only considers regulatory risk. However, their paper focuses on general news, while here we only consider news that concerns companies specifically.

Hypothesis 1 b): The market reacts differently depending on the climate risk(s) to which the climate news refers.

The market reaction differs depending on the risk.

Only news related to legal climate risks with direct financial consequences are considered by the market. Public attention does not influence the market reaction. This is in line with the results of the literature that focuses on regulatory violations with a systematic approach. Indeed, Karpoff et al (2005) find that a decrease in regulatory risk exposure is associated with a decrease in the market value of the firm's equity of the firms involved. Similarly, in Korea, non-compliant firms experience a decline in returns (Dasgupta et al., 2006). Variations in firm returns in the case of risk-related news from institutional or activist investors are in line with the results in the literature about the coordination between investors (Charléty, 2021).

Hypothesis 2 a): The market reacts more to climate news when public attention is high.
Hypothesis 2 a) is valid for news about all climate risks, except legal and investor risks. The market reacts strongly to news related to these risks, and public attention does not influence this reaction (see discussion for Investors risks:). The market reacts negatively to negative news related to legal risk. One explanation could be that such news is usually associated with financial losses due to fines and legal costs. High public attention would not result in more, or negligible, losses.
Our results are in line with the financial literature, which agrees on a significant impact of public attention on investor attention (Aouadi & Marsat, 2018; Capelle-Blancard & Petit, 2019; Choi et al., 2020; Flammer, 2013; Huberman & Regev, 2001; Krüger, 2015). In line with signalling theory, climate news sends a signal of exposure or decrease in attention to environmental issues. When attention is high, the number of people likely to receive the signal increases. This increases investors' loss aversion in the case of negative news and investors' opportunism or enthusiasm in the case of positive news (Hirshleifer, 2015; Sekerci et al., 2022; Spence, 2002).

Hypothesis 2 b) : In the case of high public attention, the market reacts differently depending on the climate risk(s) to which the climate news refers.

The results of the significance of public attention are in line with the results in the literature. But the empirical studies generally focus on a single climate risk and one or more major events. And these

events have generated a lot of attention. Therefore, public attention is an omitted variable in these studies.

Regulation risks:
For this risk, we observe no effect in case of negative news, contrary to the results of the literature which shows that the market reacts poorly to an increase in exposure to this risk by firms (Diaz-Rainey et al., 2021; Faccini et al., 2021; Oestreich & Tsiakas, 2015; Ramiah et al., 2013). Our results are in line with those of Monasterolo & De Angelis (2020), who provide evidence that "brown" firms are not penalized following the signing of the Paris Agreement.
The positive market reaction to positive news is in line with the results of the literature (Blacconiere & Northcut, 1997; Wen et al., 2020).

Technological risks:
The market reacts positively to news related to this risk when attention is high. This result is in line with the literature (Ba et al., 2013; Dangelico, 2016).

Shift in supply or demand risks:
There is a market reaction only to negative news, but Dangelico's (2016) article focuses on a decrease in exposure to this risk which makes comparison difficult with our results.

Physical risks:
The market only reacts in case of high public attention to chronic risks, yet in the literature, a market reaction is generally observed in case of exposure to chronic risks (Baldauf et al., 2020; Giglio et al., 2021; Hong et al., 2019). However, these articles usually focus on a specific industry (food industry, real estate), or geographical area (coastal).
Investors react negatively to acute risks. This result is in line with the literature (Alok et al., 2020). The results are contradictory to the work of Faccini et al. (2021) who find no evidence that the market takes into account acute or chronic physical risks reported by the media. But as explained above, they consider global news and not specifically on companies.

Hypothesis 3 a): The market reacts negatively to negative news published in a generalist newspaper.
Hypothesis 3 b): The market reacts positively to positive news published in a generalist newspaper.
Hypothesis 3 c): The market reacts negatively to negative news published in an environmental newspaper.
Hypothesis 3 d): The market reacts positively to positive news published in an environmental newspaper.
Hypothesis 3 e): The market does not react to climate news published in a financial journal.

In line with the results of the literature, we observe that investors react to news published in the press (Aouadi & Marsat, 2018; Capelle-Blancard & Petit, 2019; Flammer, 2013; Karpoff et al., 2005; Krüger, 2015). However, here the reaction only occurs when the audience's attention is high, in contrast to the literature that does not observe the need for this factor. But we focus on climate news, while these articles count ESG news, or focus on news with a very focused theme such as fraud investigation reports.

The difference in reaction by newspaper readership is consistent with the results of Huberman and Regev (2001). Again, publication of news in a financial newspaper does not cause abnormal market reactions, and publication in a generalist newspaper does.

Conclusion:

This paper examines the financial impact of investors' attention to news about the climate risks of the companies in which they invest, and the influence of public attention on this impact.

We first studied market reactions to climate news. We observe that the market reacts positively (negatively) to positive (negative) climate news about institutional or activist investors. The market reacts negatively to negative legal climate news, and news related to other climate risks does not trigger a market reaction.

To improve the understanding of investor reactions, we checked the influence of public attention. To this end, we introduce into the overall equation an interaction term between the level of public attention and the climate risks cited in the news. We show that the higher the public attention, the more the market reacts negatively to companies involved in negative news stories presenting the climate risk exposure of companies, and positively in the case of positive climate news. This reaction differs for risks related to institutional or activist investors, which attract little public attention, and positive news stories presenting these risks generate a negative market reaction.

There is no relationship between the market reaction and the source of a news item. Following this result, and the work of Huberman and Regev (2001), we again asked the question of the influence of public attention. Therefore, we took up the overall equation and introduced an interaction term again. This time the interaction term is between the level of public attention and the type of newspaper that published the news. In case of high attention, the market reacts negatively (positively) to negative (positive) news published by an environmental newspaper. The publication of negative news in a generalist newspaper is negatively perceived by the market in case of high attention. It is shown that investors consider the potential attention of the newspaper's readership (interested/environmentally oriented citizens) when the public's attention to the company increases.

Overall, the results support the hypothesis that investors are short-sighted in considering news whose direct financial consequences they can assess (Faccini et al., 2021). The observed effects of weighting by the level of public attention consistent with with signalling theory. Positive news sends a positive signal to the different stakeholders of the company. If the public's attention to the company is high, the number of people likely to receive the positive signal increases (Sekerci et al., 2022; Spence, 2002). The argument is similar in the case of negative news. The difference is that such news reinforces investors' loss aversion towards companies exposed to risks whose direct financial consequences they can estimate (Hirshleifer, 2015; Karpoff & Lott Jr, 1993; Krüger, 2015). The different market reaction depending on the source of publication of climate news, in case of high public attention, is also an application of signalling theory. More people are likely to receive the (negative or positive) signal (Sekerci et al., 2022; Spence, 2002). The readership of an environmental newspaper, interested in and sensitive to environmental issues, could 'punish' the company for negative news. Environmentally sensitive or loss averse investors would then turn away from the company (Hirshleifer, 2015; Karpoff & Lott Jr, 1993; Krüger, 2015). In the case of publication in a generalist newspaper, the attention around the company may increase as a result. If the news is positive, environmentally sensitive consumers may have received the signal and become customers of the company. The company could then have higher returns and would attract opportunistic or enthusiastic investors if they are sensitive to the issues as well (Hirshleifer, 2015; Sekerci et al., 2022; Spence, 2002).

However, this study is limited by the method of data collection which reduces the sample size. It would be interesting to check whether the results are consistent with a larger study, perhaps starting with companies in a stock market index, for example.

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Appendix 1 Descriptive statistics

Table 6 List of companies constituting the sample

	Firm	Numbers of climate news	Industry sectors
	Adidas	6	Consumer Goods
	Air-France	10	Transportation
	Amazon	13	Consumer Goods
	Anglo-American	3	Extractives & Minerals Processing
	ArcelorMittal	26	Extractives & Minerals Processing
	BASF	7	Resource Transformation
	BHP	23	Extractives & Minerals Processing
	BNP Paribas SA	13	Financials
	BP	12	Extractives & Minerals Processing
	Bank of America Corp	7	Financials
	Barclays Plc.	3	Financials
	Barrick	6	Extractives & Minerals Processing
	Bayer	6	Health Care
	Carrefour	12	Food & Beverage
	Casino	3	Food & Beverage
	Chevron	49	Extractives & Minerals Processing
	Citigroup Inc.	2	Financials
	Cnova	4	Consumer Goods
	Coca-Cola	8	Food & Beverage
	ConocoPhillips	17	Extractives & Minerals Processing
	Deutsche Bank.	4	Financials
	Duke Energy Corp.	9	Infrastructure
	E.ON AG.	5	Infrastructure
	EOG Resources	1	Extractives & Minerals Processing
	Electricité de Franc	36	Infrastructure
	Engie	19	Infrastructure
	Eni	14	Extractives & Minerals Processing
	Equinor	36	Extractives & Minerals Processing
	ExxonMobil	47	Extractives & Minerals Processing
	General Motors	8	Transportation
	Glencore	11	Extractives & Minerals Processing
	Google	14	Technology & Communications
	Greenyard	1	Food & Beverage
	H&M	5	Consumer Goods
	HSBC	10	Financials
	Heineken	1	Food & Beverage
	Honeywell	1	Resource Transformation
	JBS Tolleson Inc	7	Food & Beverage
	L'Oréal	14	Consumer Goods
	LVMH	4	Consumer Goods
	Lufthansa	6	Transportation
	Mcdonalds	3	Food & Beverage

	Meta	8	Technology & Communications
	Michelin	8	Transportation
	Natwest Group PLC	2	Financials
	Nestlé	12	Food & Beverage
	Nike Inc.	1	Consumer Goods
	Occidental	12	Extractives & Minerals Processing
	Pandora	2	Consumer Goods
	Pernod Ricard	2	Food & Beverage
	PetroChina	3	Extractives & Minerals Processing
	Petroleo Brasileiro	5	Extractives & Minerals Processing
	Pioneer Natural Reso	2	Extractives & Minerals Processing
	RWE AG	21	Infrastructure
	Repsol	3	Extractives & Minerals Processing
	Rio Tinto plc	19	Extractives & Minerals Processing
	Ryanair	5	Transportation
	Samsung	4	Technology & Communications
	Shell	42	Extractives & Minerals Processing
	Société Générale.	10	Financials
	Suncor	11	Extractives & Minerals Processing
	Syngenta	6	Resource Transformation
	Total	26	Extractives & Minerals Processing
	Transocean	1	Extractives & Minerals Processing
	UBS	2	Financials
	Vale	7	Extractives & Minerals Processing
	Veolia	6	Infrastructure
TOTAL	**67 firms**	**706 events**	**9 Industry sectors**

This table presents the 67 firms constituting the sample, and for each, the number of climate-related news associated and its industry sectors.

Table 7 Distribution of companies and news by industrial sectors

	Industry sectors	**Number of Firm**	**Number of climate news**
	Consumer Goods	8	49
	Extractives & Minerals Processing	23	376
	Financials	9	53
	Food & Beverage	9	49
	Health Care	1	6
	Infrastructure	6	96
	Resource Transformation	3	14
	Technology & Communications	3	26
	Transportation	5	37
TOTAL	**9 Industry sectors**	**67 firms**	**706 events**

This table presents the 9 industry sectors constituting the sample, and for each, the number of firms and of climate-related news associated.

Table 8 Exposure to climate risks in the news, by industry sector

Industry sectors	2017	2018	2019	2020	2021	**Mean**	***St. Dev.***
Consumer Goods	0,00	0,57	0,07	0,14	0,05	0,17	*0,23*
Extractives & Minerals Processing	0,50	0,42	0,57	0,71	0,66	0,57	*0,12*
Financials	0,26	0,00	0,07	0,37	0,14	0,17	*0,15*
Food & Beverage	0,00	0,34	0,10	0,30	0,50	0,25	*0,20*
Health Care	0,00	0,14	0,14	0,00	0,00	0,06	*0,08*
Infrastructure	0,40	0,44	0,30	0,36	0,30	0,36	*0,06*
Resource Transformation	0,36	0,43	0,00	0,21	0,00	0,20	*0,20*
Technology & Communications	0,04	0,00	0,00	0,00	0,07	0,02	*0,03*
Transportation	0,40	0,00	0,00	0,42	0,40	0,24	*0,22*

This table shows the exposure to climate risks in the news, per year, from 2017 to 2021, the mean and standard deviation between 2017 and 2021, by industrial sector. Data on climate-related news are from Europresse. Industry classification is from SASB. The climate risk exposure of different industrial sectors is approximated by the share of negative climate events among climate events.

Table 9 Exposure of each industrial sector to the various climatic risks according to the news published in the press

	2017	2018	2019	2020	2021
Consumer Goods					
Regulation risk	0%	100%	50%	0%	0%
Technology risk	0%	0%	0%	0%	20%
Legal risk	0%	100%	0%	100%	0%
Shift in supply and demand risk	0%	100%	0%	0%	14%
Investors risk	0%	0%	0%	0%	0%
Acute risk	0%	100%	0%	0%	0%
Chronic risk	0%	0%	0%	0%	0%
Extractives & Minerals Processing					
Regulation risk	40%	93%	70%	100%	89%
Technology risk	0%	9%	0%	17%	0%
Legal risk	80%	78%	79%	63%	100%
Shift in supply and demand risk	0%	13%	0%	20%	0%
Investors risk	50%	0%	50%	100%	92%
Acute risk	82%	100%	100%	100%	80%
Chronic risk	100%	0%	100%	100%	100%
Financials					
Regulation risk	0%	0%	0%	100%	0%
Technology risk	60%	0%	0%	0%	0%
Legal risk	0%	0%	0%	0%	0%
Shift in supply and demand risk	20%	0%	50%	57%	0%
Investors risk	0%	0%	0%	100%	100%
Acute risk	100%	0%	0%	0%	0%
Chronic risk	0%	0%	0%	0%	0%
Food & Beverage					
Regulation risk	0%	0%	0%	80%	100%
Technology risk	0%	40%	67%	33%	20%

Legal risk	0%	0%	0%	100%	100%
Shift in supply and demand risk	0%	0%	0%	0%	33%
Investors risk	0%	0%	0%	0%	0%
Acute risk	0%	100%	0%	0%	100%
Chronic risk	0%	100%	0%	0%	0%
Health Care					
Regulation risk	0%	0%	0%	0%	0%
Technology risk	0%	0%	0%	0%	0%
Legal risk	0%	100%	0%	0%	0%
Shift in supply and demand risk	0%	0%	0%	0%	0%
Investors risk	0%	0%	0%	0%	0%
Acute risk	0%	0%	100%	0%	0%
Chronic risk	0%	0%	0%	0%	0%
Infrastructure					
Regulation risk	0%	0%	100%	100%	0%
Technology risk	0%	8%	7%	0%	9%
Legal risk	100%	100%	0%	100%	0%
Shift in supply and demand risk	0%	0%	0%	0%	0%
Investors risk	0%	0%	0%	0%	0%
Acute risk	80%	100%	0%	50%	100%
Chronic risk	100%	100%	100%	0%	100%
Resource Transformation					
Regulation risk	100%	100%	0%	50%	0%
Technology risk	0%	0%	0%	0%	0%
Legal risk	0%	100%	0%	100%	0%
Shift in supply and demand risk	50%	100%	0%	0%	0%
Investors risk	0%	0%	0%	0%	0%
Acute risk	100%	0%	0%	0%	0%
Chronic risk	0%	0%	0%	0%	0%
Technology & Communications					
Regulation risk	0%	0%	0%	0%	50%
Technology risk	25%	0%	0%	0%	0%
Legal risk	0%	0%	0%	0%	0%
Shift in supply and demand risk	0%	0%	0%	0%	0%
Investors risk	0%	0%	0%	0%	0%
Acute risk	0%	0%	0%	0%	0%
Chronic risk	0%	0%	0%	0%	0%
Transportation					
Regulation risk	100%	0%	0%	100%	0%
Technology risk	0%	0%	0%	0%	0%
Legal risk	100%	0%	0%	100%	0%
Shift in supply and demand risk	0%	0%	0%	0%	0%
Investors risk	0%	0%	0%	100%	0%
Acute risk	33%	0%	0%	0%	100%
Chronic risk	0%	0%	0%	0%	0%

This table shows the exposure to climate risks in the news, per year, from 2017 to 2021, the mean and standard deviation between 2017 and 2021, for each industrial sector, by climate risks. Data on

climate-related news are from Europresse. Industry classification is from SASB. The climate risk exposure of different industrial sectors is approximated by the share of negative climate events among climate events. Reputational risk does not appear in the table since it is considered in all news and would be a repetition of Table 8. The calculation is done by year.

Appendix 2 Methodology

Keywords searched in the Europresse database:

« *Nom de l'entreprise* » &(global warming| (emission+)| CO2| dioxyde| carbon dioxide| (vert+)| (green*)| (renouvelable+)| (environnement*)| renewable | "climat*"| "extreme weather event*" | cyclone* | hurrican* | flood* | drought* | temperatur* | "sea level" | "glacial melting" | "heat wave*"| "risque* climatique*" | "événement* météorologiqu* extrême*" | cyclon* | ouragan* | inondation* | sécheresse* | température* | "niveau de la mer" | "fonte des glac*" | chaleur)

As explained above, these keywords have already been tested and mobilised in the textual analysis literature on climate change (Brulle, 2018; Delmas et al., 2016; Engle et al., 2020; Flammer, 2013; Gavriilidis, 2021).

Appendix 3 Robustness checks with different window event

Table 10 Descriptive statistics with robustness checks

Climate Risks	Transition	Physical	GVSI	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]
	Quantity	*Quantity*	*Mean (st.dev.)*	*Mean (st.dev.)*	*Mean (st.dev.)*	*Mean (st.dev.)*	*Mean (st.dev.)*
Regulation	74	0	0.22 (1.33)	-0.31 (3.8)	-0.13 (5.98)	-0.69 (12.44)	-0.36 (6.28)
Technology	191	1	0.11 (1)	0.08 (4)	-0.09 (5.7)	-1.13 (9.6)	-0.73 (5.8)
Legal	89	0	0.14 (0.94)	-0.57 (4.1)	-1.26 (5.93)	-2.48 (11.7)	-0.83 (6.6)
Supply and demand	104	0	-0.16 (0.88)	-0.14 (4.48)	-0.36 (6.43)	-1.35 (10.21)	-0.79 (5.75)
Acute	0	105	0.49 (1.6)	0.2 (4.4)	0.85 (6.3)	1.35 (8.29)	0.89 (6.65)
Chronic	1	16	-0.09 (0.85)	1.18 (6.4)	2.19 (7.8)	5.73 (12)	2.3 (5.8)
Investors	34	0	-0.08	-1.54 (3.38)	-1.3 (4.7)	2.43 (15.74)	3.25 (9.18)
GVSI	0.1 (1.2)	0.4 (1.5)					
CARR [-1 ; +1]	-0.28 (4)	0.3 (4.7)					
CARR [-2 ; +2]	-0.33 (6)	1 (6.48)					
CARR [-5 ; +5]	-0.9 (10.7)	1.8 (9)					
CARR [+1 ; +5]	-0.27 (6.4)	1.1 (5.6)					

This table presents the number of climate-related news, the average volume of online search around the publication of climate-related news on the firms involved, and the average change in firm's market value around and after the publication, for each climate risks.

CARR [-1 ;+1], CARR [-2 ; +2], and CARR [-5 ;+5], and CARR [+1 ; +5] are the cumulative average abnormal returns over 3, 5, and10 days, respectively, around the publication. CARR [+1 ; +5] are the cumulative average abnormal returns 1 day after the publication, over 5 days. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. GVSI data are from Google Trends. Financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Table 11 Results general regression, equation (1) with robustness checks

	Negative news				Positive News			
Event window	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]
Source								
Main	-0.601	-1.332	1.051	0.242	-0.225	-0.325	0.525	-0.363
	(-0.47)	(-0.82)	(0.35)	(0.12)	(-0.46)	(-0.43)	(0.41)	(-0.54)
Finance	-0.231	-0.146	-0.167	-0.466	1.067	1.508	3.313	1.128
	(-0.55)	(-0.26)	(-0.22)	(-0.57)	(1.51)	(1.98)	(1.88)	(1.10)
Environnement	1.658	0.823	1.117	-0.691	2.368	1.848	4.117	2.135
	(1.96)	(0.63)	(0.41)	(-0.35)	(2.05)	(0.94)	(1.77)	(1.75)
Concern								
Regulation risks	0.675	1.125	3.830	1.457	-0.899	-1.298	-1.793	-1.117
	(0.44)	(0.45)	(0.79)	(0.78)	(-0.79)	(-0.82)	(-0.53)	(-0.69)
Technology risks	1.635	2.418	3.810	1.726	0.827	0.791	1.303	1.104
	(1.36)	(1.14)	(1.73)	(0.80)	(1.23)	(1.06)	(1.16)	(1.28)
Legal risks	-1.308*	-2.452***	-3.439*	-2.655*	-0.409	-0.154	1.458	1.877
	(-2.51)	(-3.81)	(-2.29)	(-2.19)	(-1.02)	(-0.24)	(0.67)	(1.86)
Supply and demand risks	-2.182	-3.092	-1.659	-3.325*	-0.0264	-0.627	-0.0951	-0.101
	(-1.73)	(-1.81)	(-0.64)	(-2.29)	(-0.03)	(-0.57)	(-0.05)	(-0.09)
Investors risks	-2.763**	-4.146**	-3.762	-0.851	3.317***	4.544***	6.462*	4.225***
	(-3.71)	(-2.95)	(-1.17)	(-0.54)	(4.40)	(5.65)	(2.38)	(4.96)
Acute risks	-1.209	-1.568	-2.043	-1.897*	1.134	1.352	4.149	3.026
	(-1.63)	(-1.81)	(-1.68)	(-2.58)	(1.07)	(0.75)	(1.97)	(1.85)
Chronic risks	1.651	1.934	4.431	1.708	0	0	0	0
	(1.68)	(1.45)	(1.33)	(1.13)	(.)	(.)	(.)	(.)
Proximity								
Distance	-0.0839	-0.0376	-0.0316	0.116	0.0432	-0.0887	-0.431	-0.356
	(-1.23)	(-0.31)	(-0.10)	(0.65)	(0.32)	(-0.41)	(-1.02)	(-1.07)
Common language	-1.448	-1.269	-2.071	-0.439	0.465	-0.802	-4.318	-3.240

	(-1.50)	(-0.87)	(-1.02)	(-0.42)	(0.31)	(-0.35)	(-0.99)	(-1.05)
Environmental perfomances								
Sustainability performance	0.0177	0.0422	0.0208	0.0409	0.0374	0.0581	0.0436	0.0482
	(0.96)	(1.43)	(0.31)	(0.74)	(0.63)	(0.80)	(0.72)	(1.12)
EnvironmentMateriality	-3.234*	-3.260	-7.573	-4.143	0	0	0	0
	(-2.15)	(-1.40)	(-2.07)	(-1.64)	(.)	(.)	(.)	(.)
Attention								
GVSI	0.190	0.317	-0.0426	0.0810	0.367	0.738	0.702	0.0562
	(1.16)	(1.07)	(-0.13)	(0.20)	(1.76)	(1.84)	(0.86)	(0.19)
Duration	0.212	0.247	0.438**	0.234*	-0.0582	-0.0444	-0.507	-0.0715
	(1.58)	(1.71)	(3.19)	(2.67)	(-0.38)	(-0.24)	(-1.78)	(-0.38)
Context								
EPU	0.0143*	0.0293*	0.0791**	0.0504**	-0.000888	0.00559	0.0112	0.00842
	(2.66)	(2.24)	(3.05)	(3.49)	(-0.11)	(0.49)	(0.55)	(0.66)
Controls								
Assets	-2.297	-4.847**	-8.355*	-2.306	2.113	2.408	6.612	-2.665
	(-1.76)	(-3.07)	(-2.38)	(-0.58)	(0.74)	(0.58)	(0.80)	(-0.53)
P/E Ratio	0.000108	0.000463	0.000758	0.000456	-0.000205	-0.000402	-0.00119*	-0.000230
	(0.58)	(1.54)	(1.61)	(1.45)	(-1.10)	(-1.56)	(-2.12)	(-0.75)
Institutional Ownership	0.00517	0.0469	0.120*	0.0528**	0.0201	0.0307	0.0999	0.0298
	(0.34)	(1.94)	(2.11)	(3.07)	(0.81)	(0.91)	(1.36)	(0.79)
Constant.	38.21*	60.74**	106.6	29.10	-29.61	-33.91	-82.95	28.79
	(2.53)	(3.02)	(2.05)	(0.53)	(-0.97)	(-0.77)	(-0.89)	(0.49)
Specifications								
Nb. Obs.	325	325	325	325	323	323	323	323
R-square	0.133	0.164	0.188	0.191	0.0900	0.0884	0.105	0.0734
Adjusted R-square	0.00161	0.00479	0.000793	0.00383	0.0000109	0.000288	0.00452	0.00709
F statistic	.	.	.	.	.	.	.	.

P>F	.	.	.	.	.	.	.	.
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the average change in firm's market value around and after the publication of climate-related news, from least squares regressions (using industry clustered standard errors).

Robust standard errors are reported in parentheses. * represents t-statistics as follow: * p<0.05, ** p<0.01, *** p<0.001.

CARR [-1 ;+1], CARR [-2 ; +2], and CARR [-5 ;+5], and CARR [+1 ; +5] are the cumulative average abnormal returns over 3, 5, and 10 days, respectively, around the publication. CARR [+1 ; +5] are the cumulative average abnormal returns 1 day after the publication, over 5 days. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. Proximity data are from CEPII. EnvironmentMateriality index is based on data from SASB. GVSI data are from Google Trends. Sustainability performance from RobecoSAM and financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Table 12 Results regression with the interaction between attention and climate risks, equation (2) with robustness checks

	Negative news				Positive News			
Event window	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]
Source								
Main	-0.724	-1.570	0.669	0.207	-0.414	-0.553	0.113	-0.658
	(-0.65)	(-1.16)	(0.23)	(0.11)	(-0.83)	(-0.67)	(0.08)	(-0.88)
Finance	-0.412	-0.401	-0.248	-0.424	0.998	1.347	2.965	0.907
	(-0.80)	(-0.74)	(-0.29)	(-0.49)	(1.31)	(1.51)	(1.52)	(0.73)
Environnement	1.218	0.129	-0.782	-1.911	2.078	1.426	3.750	1.805
	(1.35)	(0.09)	(-0.22)	(-0.73)	(1.76)	(0.72)	(1.48)	(1.53)
Concern								
Transition risks	2.550	3.478	13.27*	6.135**	-1.755	-0.605	-8.488**	-0.848
	(0.82)	(1.03)	(2.74)	(2.99)	(-0.76)	(-0.25)	(-3.16)	(-0.38)
Physical risks	2.670	3.796	12.46**	5.263*	-0.521	1.114	-5.821	0.986
	(0.93)	(1.30)	(3.01)	(2.42)	(-0.19)	(0.33)	(-1.88)	(0.49)
Proximity								
Distance	-0.103	-0.0626	-0.0466	0.0842	0.0740	0.00321	-0.315	-0.334
	(-1.41)	(-0.46)	(-0.14)	(0.44)	(0.66)	(0.02)	(-0.97)	(-1.14)
Common language	-1.382	-1.068	-1.971	-0.613	0.951	0.499	-2.840	-2.977
	(-1.61)	(-0.76)	(-0.87)	(-0.52)	(0.68)	(0.25)	(-0.82)	(-1.05)
Environmental perfomances								
Sustainability performance	-0.00415	0.0210	0.0224	0.0143	0.0382	0.0628	0.0352	0.0539
	(-0.30)	(0.81)	(0.35)	(0.27)	(0.59)	(0.77)	(0.55)	(1.33)
EnvironmentMateriality	0.728	2.264	0.838	0.558	0	0	0	0
	(0.31)	(0.73)	(0.17)	(0.22)	(.)	(.)	(.)	(.)
Attention								
GVSI	0.500*	0.557	-0.206	0.203	-0.417	-0.698	-0.305	-0.652
	(2.17)	(1.25)	(-0.52)	(0.36)	(-1.15)	(-1.40)	(-0.43)	(-1.23)
GVSI× Regulation risks	2.088	2.840	5.299	2.808	0.913	2.395**	2.928**	1.086
	(1.26)	(1.24)	(1.27)	(1.20)	(1.93)	(3.64)	(3.23)	(1.72)

GVSI× Technology risks	0.301	-0.177	0.00290	0.977	1.255*	1.850*	1.134	1.162*
	(0.44)	(-0.12)	(0.00)	(0.57)	(2.14)	(2.17)	(1.32)	(2.70)
GVSI× Legal risks	-2.542	-2.714	-3.778	-3.290	1.050*	0.877	0.739	-0.244
	(-1.43)	(-1.14)	(-1.00)	(-1.44)	(2.42)	(1.19)	(0.31)	(-0.16)
GVSI× Supply and demand risks	-0.715	-2.451**	-1.935	0.0833	-0.0886	0.341	-1.319	-0.824
	(-0.72)	(-3.58)	(-1.01)	(0.05)	(-0.15)	(0.38)	(-0.97)	(-0.92)
GVSI× Investors risks	-1.146	-1.135	2.388	0.674	-8.268*	-11.37*	-21.73***	-8.619**
	(-0.88)	(-0.77)	(0.93)	(0.40)	(-2.81)	(-2.66)	(-4.89)	(-3.01)
GVSI× Acute risks	-0.446*	-0.248	0.161	-0.0978	-0.921	-1.040	2.490	2.848
	(-2.40)	(-0.60)	(0.33)	(-0.15)	(-0.74)	(-1.03)	(1.18)	(1.72)
GVSI× Chronic risks	-1.564	-2.416	-6.212	-2.108*	0	0	0	0
	(-1.46)	(-1.03)	(-1.37)	(-2.16)	(.)	(.)	(.)	(.)
Duration	0.101	0.115	0.366	0.178	-0.0678	-0.111	-0.514	-0.0792
	(0.89)	(0.90)	(2.07)	(1.74)	(-0.44)	(-0.55)	(-1.73)	(-0.42)
Context								
EPU	0.0141**	0.0297**	0.0772**	0.0519***	-0.00204	0.00420	0.00928	0.00697
	(3.63)	(2.87)	(3.58)	(3.86)	(-0.25)	(0.36)	(0.45)	(0.51)
Controls								
Assets	-0.910	-3.391*	-7.195**	-1.515	2.512	3.125	6.706	-1.541
	(-1.10)	(-2.46)	(-2.86)	(-0.37)	(0.89)	(0.74)	(0.78)	(-0.29)
P/E Ratio	0.0000725	0.000346	0.000356	0.000211	-0.000235	-0.000425	-0.00116*	-0.000189
	(0.43)	(1.28)	(0.92)	(0.73)	(-1.13)	(-1.45)	(-2.29)	(-0.58)
Institutional Ownership	0.00462	0.0454	0.124*	0.0491**	0.0200	0.0240	0.0890	0.0208
	(0.29)	(1.69)	(2.22)	(3.28)	(0.81)	(0.74)	(1.14)	(0.47)
Constant.	3.571	17.53	45.21	-4.100	-32.27	-42.18	-74.51	16.90
	(0.28)	(0.73)	(1.07)	(-0.08)	(-1.03)	(-0.92)	(-0.75)	(0.27)
Specifications								
Nb. Obs.	325	325	325	325	323	323	323	323

R-square	0.135	0.145	0.200	0.202	0.102	0.115	0.120	0.0769
Adjusted R-square	0.0225	0.00718	0.0317	0.0632	0.0000116	0.000286	0.00311	0.0140
F statistic	.	.	.	.	.	.	.	.
P>F	.	.	.	.	.	.	.	.
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the average change in firm's market value around and after the publication of climate-related news, with interaction between public attention and various climate risks, from least squares regressions (using industry clustered standard errors).

Robust standard errors are reported in parentheses. * represents t-statistics as follow: * p<0.05, ** p<0.01, *** p<0.001.

CARR [-1 ;+1], CARR [-2 ; +2], and CARR [-5 ;+5], and CARR [+1 ; +5] are the cumulative average abnormal returns over 3, 5, and 10 days, respectively, around the publication. CARR [+1 ; +5] are the cumulative average abnormal returns 1 day after the publication, over 5 days. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. Proximity data are from CEPII. EnvironmentMateriality index is based on data from SASB. GVSI data are from Google Trends. Sustainability performance from RobecoSAM and financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Table 13 Results regression with the interaction between attention and sources, equation (3) with robustness checks

	Negative news				Positive News			
Event window	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]
Source								
Main	-0.559	-1.225	1.179	0.464	-0.596	-0.685	-0.0692	-0.738
	(-0.47)	(-0.83)	(0.39)	(0.24)	(-1.34)	(-0.90)	(-0.06)	(-1.13)
Finance	-0.645	-0.651	-0.498	-0.564	0.717	1.095	2.531	0.603
	(-1.72)	(-1.56)	(-0.71)	(-0.80)	(0.99)	(1.32)	(1.50)	(0.67)
EnvironmentMateriality	0.981	-0.104	-0.926	-1.438	1.231	0.617	1.735	0.519
	(1.13)	(-0.08)	(-0.26)	(-0.65)	(1.25)	(0.27)	(0.65)	(0.40)
Concern								
Transition risks	0.251	0.169	1.448	1.303**	-0.746	-0.880	-3.028	-1.991
	(0.33)	(0.17)	(1.09)	(3.12)	(-0.72)	(-0.48)	(-1.55)	(-1.26)
Proximity								
Distance	-0.0908	-0.0490	-0.0608	0.104	0.0327	-0.0813	-0.430	-0.351
	(-1.16)	(-0.37)	(-0.18)	(0.57)	(0.28)	(-0.47)	(-1.19)	(-1.20)
Common language	-1.384	-1.233	-2.560	-0.554	0.182	-0.867	-4.411	-3.313
	(-1.47)	(-0.86)	(-1.20)	(-0.51)	(0.14)	(-0.48)	(-1.23)	(-1.21)
Environmental perfomances								
Sustainability performance	0.00495	0.0250	0.0150	0.0207	0.0409	0.0651	0.0541	0.0572
	(0.26)	(0.88)	(0.23)	(0.42)	(0.73)	(0.96)	(1.01)	(1.54)
Materiality Index	-2.264	-1.633	-4.709	-2.389	0	0	0	0
	(-1.71)	(-0.79)	(-1.75)	(-1.66)	(.)	(.)	(.)	(.)
Attention								
GVSI	0.996	1.754	2.602	1.515	-0.133	-0.226	-1.562	-1.607
	(1.19)	(1.06)	(0.99)	(1.04)	(-0.29)	(-0.29)	(-1.07)	(-1.58)
GVSI× Main	-1.293	-2.156	-3.330	-1.724	0.500	1.060	2.174	1.775*
	(-1.70)	(-1.51)	(-1.66)	(-1.26)	(1.20)	(1.60)	(1.69)	(2.53)
GVSI× Finance	0.444	0.671	0.408	0.212	-0.256	-0.161	0.170	-0.0374

	(1.69)	(1.44)	(0.51)	(0.44)	(-0.47)	(-0.18)	(0.13)	(-0.05)
GVSI x Environnement	-0.269	-1.308*	-0.783	-2.321	1.680***	1.446	2.531	1.679*
	(-0.45)	(-2.15)	(-0.38)	(-1.38)	(4.15)	(1.14)	(1.48)	(2.17)
Duration	0.186	0.210	0.458**	0.262*	-0.0553	-0.0697	-0.546*	-0.113
	(1.73)	(1.68)	(2.95)	(2.43)	(-0.39)	(-0.41)	(-2.11)	(-0.75)
Context								
EPU	0.0145*	0.0298*	0.0802**	0.0546***	0.000274	0.00689	0.0117	0.00861
	(2.77)	(2.36)	(3.25)	(4.13)	(0.03)	(0.59)	(0.55)	(0.63)
Controls								
Assets	-1.899	-4.274**	-8.008**	-2.381	2.016	2.100	6.791	-2.588
	(-1.56)	(-2.82)	(-2.83)	(-0.63)	(0.75)	(0.53)	(0.79)	(-0.49)
P/E Ratio	-0.0000629	0.000160	0.000270	0.000164	-0.000224	-0.000402	-0.00116*	-0.000184
	(-0.41)	(0.62)	(0.79)	(0.70)	(-1.26)	(-1.72)	(-2.53)	(-0.63)
Institutional Ownership	-0.00718	0.0279	0.0980	0.0349*	0.0316	0.0430	0.119	0.0425
	(-0.47)	(1.09)	(1.75)	(2.53)	(1.16)	(1.18)	(1.33)	(0.86)
Constant.	31.14*	49.80*	92.73*	23.66	-27.39	-29.59	-81.71	30.18
	(2.66)	(2.58)	(2.40)	(0.48)	(-0.96)	(-0.70)	(-0.85)	(0.49)
Specifications								
Nb. Obs.	325	325	325	325	323	323	323	323
R-square	0.0987	0.136	0.167	0.177	0.105	0.0956	0.119	0.0936
Adjusted R-square	0.000635	0.00802	0.00347	0.0198	0.000677	0.0000145	0.00332	0.0169
F statistic	.	.	.	.	213.0	2686.8	7205.7	1504.7
P>F	.	.	.	.	2.01e-21	4.87e-34	5.79e-39	3.80e-31
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the average change in firm's market value around and after the publication of climate-related news, with interaction between public attention and news sources, from least squares regressions (using industry clustered standard errors).

Robust standard errors are reported in parentheses. * represents t-statistics as follow: * p<0.05, ** p<0.01, *** p<0.001.

CARR [-1 ;+1], CARR [-2 ; +2], and CARR [-5 ;+5], and CARR [+1 ; +5] are the cumulative average abnormal returns over 3, 5, and 10 days, respectively, around the publication. CARR [+1 ; +5] are the cumulative average abnormal returns 1 day after the publication, over 5 days. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. Proximity data are from CEPII. EnvironmentMateriality index is based on data from SASB. GVSI data are from Google Trends. Sustainability performance from RobecoSAM and financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.

Appendix 4 Robustness checks global regression from eq. (1) without Investors risks.

Table 14 Results regression with the interaction between attention and climate risks, equation (2) with robustness checks (without investors risks)

	Negative news				Positive News			
Event window	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]	CARR [-1 ;+1]	CARR [-2 ; +2]	CARR [-5 ;+5]	CARR [+1 ; +5]
Source								
Main	-0.757	-1.603	0.739	0.227	-0.407	-0.543	0.131	-0.650
	(-0.66)	(-1.15)	(0.26)	(0.13)	(-0.80)	(-0.65)	(0.09)	(-0.87)
Finance	-0.466	-0.454	-0.136	-0.393	0.953	1.285	2.846	0.860
	(-0.95)	(-0.85)	(-0.16)	(-0.48)	(1.24)	(1.41)	(1.43)	(0.69)
Environnement	1.057	-0.0314	-0.445	-1.816	2.075	1.422	3.742	1.802
	(1.31)	(-0.02)	(-0.13)	(-0.70)	(1.77)	(0.72)	(1.47)	(1.53)
Concern								
Transition risks	2.587	3.514	13.19*	6.114**	-1.785	-0.647	-8.567**	-0.880
	(0.83)	(1.04)	(2.78)	(3.03)	(-0.79)	(-0.27)	(-3.15)	(-0.39)
Physical risks	2.653	3.779	12.49**	5.273*	-0.616	0.983	-6.072	0.886
	(0.91)	(1.29)	(3.06)	(2.43)	(-0.23)	(0.30)	(-1.99)	(0.44)
Proximity								
Distance	-0.110	-0.0699	-0.0313	0.0886	0.0622	-0.0131	-0.346	-0.346
	(-1.52)	(-0.52)	(-0.09)	(0.48)	(0.57)	(-0.09)	(-1.11)	(-1.22)
Common language	-1.476	-1.161	-1.775	-0.558	0.778	0.261	-3.295	-3.157
	(-1.70)	(-0.80)	(-0.77)	(-0.48)	(0.58)	(0.14)	(-0.99)	(-1.14)
Environmental perfomances								
Sustainability performance	-0.00198	0.0232	0.0178	0.0130	0.0379	0.0625	0.0346	0.0537
	(-0.13)	(0.84)	(0.27)	(0.26)	(0.58)	(0.77)	(0.54)	(1.32)
EnvironmentMateriality	0.417	1.956	1.486	0.741	0	0	0	0
	(0.18)	(0.60)	(0.29)	(0.30)	(.)	(.)	(.)	(.)
Attention								
GVSI	0.444*	0.502	-0.0892	0.236	-0.451	-0.744	-0.394	-0.687
	(2.23)	(1.19)	(-0.24)	(0.45)	(-1.21)	(-1.46)	(-0.51)	(-1.26)

GVSI× Regulation risks	2.064	2.816	5.350	2.822	0.919	2.402**	2.943**	1.092
	(1.25)	(1.23)	(1.29)	(1.21)	(1.92)	(3.58)	(3.02)	(1.65)
GVSI× Technology risks	0.351	-0.127	-0.102	0.948	1.271*	1.872*	1.175	1.178*
	(0.52)	(-0.08)	(-0.06)	(0.58)	(2.19)	(2.21)	(1.38)	(2.76)
GVSI× Legal risks	-2.489	-2.662	-3.889	-3.321	1.090*	0.933	0.845	-0.202
	(-1.40)	(-1.11)	(-1.03)	(-1.46)	(2.44)	(1.24)	(0.35)	(-0.13)
GVSI× Supply and demand risks	-0.753	-2.488**	-1.857	0.105	-0.0680	0.369	-1.265	-0.803
	(-0.76)	(-3.72)	(-0.93)	(0.06)	(-0.12)	(0.41)	(-0.92)	(-0.89)
GVSI× Acute risks	-0.389*	-0.191	0.0422	-0.131	-0.844	-0.933	2.694	2.929
	(-2.36)	(-0.46)	(0.09)	(-0.21)	(-0.68)	(-0.92)	(1.28)	(1.77)
GVSI× Chronic risks	-1.516	-2.369	-6.311	-2.136*	0	0	0	0
	(-1.41)	(-1.01)	(-1.42)	(-2.28)	(.)	(.)	(.)	(.)
Duration	0.112	0.126	0.342	0.171	-0.0647	-0.107	-0.506	-0.0760
	(0.97)	(0.94)	(1.84)	(1.69)	(-0.41)	(-0.52)	(-1.71)	(-0.40)
Context								
EPU	0.0132**	0.0288*	0.0790**	0.0524***	-0.00193	0.00436	0.00958	0.00709
	(3.34)	(2.63)	(3.76)	(4.13)	(-0.24)	(0.37)	(0.46)	(0.52)
Controls								
Assets	-0.992	-3.472*	-7.024*	-1.467	2.540	3.164	6.779	-1.512
	(-1.17)	(-2.45)	(-2.70)	(-0.36)	(0.89)	(0.74)	(0.78)	(-0.28)
P/E Ratio	0.0000180	0.000293	0.000469	0.000243	-0.000244	-0.000438	-0.00118*	-0.000199
	(0.11)	(1.07)	(1.17)	(0.94)	(-1.18)	(-1.51)	(-2.33)	(-0.61)
Institutional Ownership	0.00458	0.0453	0.124*	0.0491**	0.0212	0.0257	0.0923	0.0221
	(0.30)	(1.76)	(2.13)	(3.29)	(0.86)	(0.79)	(1.18)	(0.50)
Constant.	6.316	20.25	39.48	-5.716	-32.36	-42.31	-74.75	16.80
	(0.47)	(0.79)	(0.88)	(-0.11)	(-1.02)	(-0.91)	(-0.75)	(0.26)
Specifications								
Nb. Obs.	325	325	325	325	323	323	323	323

R-square	0.131	0.143	0.198	0.202	0.0982	0.111	0.116	0.0752
Adjusted R-square	0.0327	0.00862	0.0274	0.0531	0.0000345	0.000385	0.00349	0.0120
F statistic	.	.	.	.	.	.	.	.
P>F	.	.	.	.	.	.	.	.
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the average change in firm's market value around and after the publication of climate-related news with interaction between public attention and various climate risks, without investors risks, from least squares regressions (using industry clustered standard errors).

Robust standard errors are reported in parentheses. * represents t-statistics as follow: * p<0.05, ** p<0.01, *** p<0.001.

CARR [-1 ;+1], CARR [-2 ; +2], and CARR [-5 ;+5], and CARR [+1 ; +5] are the cumulative average abnormal returns over 3, 5, and 10 days, respectively, around the publication. CARR [+1 ; +5] are the cumulative average abnormal returns 1 day after the publication, over 5 days. They were estimated over a 200-day horizon, the estimation window is [-240 , -41]. Figures are in percent. Data on climate-related news are from Europresse. Proximity data are from CEPII. EnvironmentMateriality index is based on data from SASB. GVSI data are from Google Trends. Sustainability performance from RobecoSAM and financial data are from Bloomberg. The sample is composed of 67 international firms considered between 2017 and 2021.