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ORIGINAL PAPER

The impact of climate litigation and activism on stock prices: the case of oil and gas majors

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Abstract
The issue of oil and gas companies' contribution to climate change gained particular prominence on May 26, 2021. A Dutch court ordered Royal Dutch Shell to significantly reduce its greenhouse gas emissions, while shareholder votes at Exxon Mobile and Chevron succeeded in pushing for further emissions reductions. Together, these events signify a sudden increase in climate litigation and climate activism risk for global oil and gas companies. This study assesses investors' perception of these events by investigating oil and gas companies' stock price reaction. The results show a significant negative impact on the stock prices for European and North American oil and gas firms, while firms located in other jurisdictions record slight gains. Higher environmental, social, and governance scores appear to mitigate the negative impact on European and North American oil and gas companies, primarily driven through better emissions related measures. The results highlight the adverse effect of increased climate litigation and climate activism risk on firm valuations.

Keywords Climate litigation · Climate activism · ESG ratings · Corporate social responsibility (CSR) · Oil and gas companies · Alternative energy companies

JEL Classification G14 · G38 · L71

1 Introduction

Wednesday, May 26, 2021, was arguably a decisive day for major oil and gas companies as concerns about their contribution to global climate change were brought to the forefront of public discourse. A Dutch court ordered Royal Dutch Shell to implement more stringent emissions reduction targets, while Exxon Mobile and Chevron saw successful actions by shareholders concerned with their lack of progress in their emissions reductions. This push for more drastic emissions reductions at these

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companies is reflective of a broader trend towards low emissions business models, driven in part by institutional investors (Azar et al. 2021). Combined, the events on May 26, 2021, signify that climate litigation and activism are gaining prominence and that the associated risk for companies, and for oil and gas companies in particular, is increasing. The events therefore provide a unique opportunity to test how investors perceive changes in these risks and how this will ultimately impact company valuations.

The aim of this study is to identify how investors in major global oil and gas companies reacted to the events on May 26, 2021. To this end, I leverage firms' stock price reactions to these events to understand how they affected firm valuations. As three of the largest and most prominent oil companies were directly affected, it is likely that investors perceive these events as precedents, resulting in spillover effects to other companies operating within the industry (see e.g., Financial Times 2021). In addition, given that the events took place in Europe and the US, it is reasonable to assume that particularly European and North American (i.e., US and Canadian) firms will be affected, as companies headquartered in these jurisdictions are more exposed to similar climate related litigation and/or activism.

Investors increasingly understand that a firm's climate risk, and the associated potential for climate litigation, is a major risk facing many firms. In a recent survey, Krueger et al. (2020) document that investors are aware of firms' climate risk exposure and its potential impact on firms' financial performance. As a result, firm valuations often benefit when firms obtain a higher level of sustainability. Research shows that companies that are added to a sustainability index (e.g., FTSE Environmental Opportunities 100 index) typically experience stock price increases, while the removal from the index leads to a drop in stock prices (e.g., Adamska and Dąbrowski 2021; Biktimirov and Afego 2022; Hawn et al. 2018). However, while investors may value changes in oil and gas companies' business models towards more environmental sustainability through emissions reductions, forcing these changes abruptly upon these companies may also raise concerns. It is not clear whether oil and gas companies will be able to successfully manage the transition to low emissions business models. These concerns are also echoed by credit rating agencies, with Moody's stating that the events on May 26, 2021, are a sign of change that will likely lead to higher risks for oil companies if they fail to meet investors' expectations for transitioning to a low emissions business model (Reuters 2021c). Moreover, increased climate litigation and activism, particularly in Europe and North America, may lead some companies to consider shifting parts of their production activities to countries with less stringent regulations and/or lower levels of climate litigation and activism risk. Evidence from the US suggests that some firms appear to engage in this kind of regulatory arbitrage behavior (Bartram et al. 2022). Concurrently, in case firms are not able to shift their emissions, it may be investors then who decide to reallocate their capital by moving their investments to companies located in jurisdictions with perceived lower levels of climate litigation risk.

The results of this study highlight the negative impact that the increased risk of climate litigation and activism has on firm valuations, particularly for oil and gas companies located in Europe and North America. The estimated abnormal loss in market capitalization for European and North American oil and gas companies is

substantial from an economic perspective, amounting to approximately US$ 36.12 billion. At the same time, companies located in other regions recorded slight gains, indicative of investors moving capital from jurisdictions with perceived higher levels of climate litigation and activism risk to countries with lower levels of risk. The results also indicate that a higher environmental, social, and governance (ESG) score can mitigate the adverse stock price reaction of European and North American oil and gas companies, which is in line with better corporate citizenship providing an insurance-like effect against negative events (e.g., Godfrey et al. 2009; Shiu and Yang 2017). However, the overall benefits appear to be somewhat limited and primarily driven by firms that have robust emissions related policies in place. Looking beyond oil and gas companies, the analyses also indicate that European and North American firms operating in the alternative energy sector record significant positive returns around the events on May 26, 2021. This suggests that investors may not only move capital to companies located in other jurisdictions, but also reallocate some of their capital to companies that are already operating in an industry that is contributing to the decarbonization of the energy sector.

This study contributes to the growing body of academic literature on the financial effects of climate litigation and activism. The stock market reactions to the events on May 26, 2021, underscore survey evidence regarding investors' concerns that changes to climate related regulation could pose significant financial risks (Krueger et al. 2020; Stroebel and Wurgler 2021). Firms in the oil and gas industry are particularly vulnerable to these changes. In addition, this paper contributes to the discussion around the effects of localized environmental regulation (e.g., Fowlie et al. 2016; Walker 2013). While the court ruling against Royal Dutch Shell prevents it from exploiting its internal emissions markets through which it could shift productions to regions with lower emissions standards, a concern raised by recent research (Bartram et al. 2022; Ben-David et al. 2021), it may then be investors who decide to reallocate their capital towards companies located in countries with lower emissions standards. My results suggest that this might indeed be the case, as oil and gas companies outside of Europe and North America experience positive stock returns. My results also add to the literature showing that a firm's corporate social responsibility activity, which is ultimately reflected in higher ESG scores, can have an insurance-like effect in case of negative events and protect firm value (see e.g., Godfrey et al. 2009; Lu et al. 2021; Shiu and Yang 2017). However, this effect appears to be limited to European and North American oil and gas companies that have strong emissions related policies in place. In addition, the results also document that the valuations of alternative energy companies benefit. This suggests that some investors may allocate a share of their capital towards these firms, which may be a desirable consequence of more stringent emissions standards. Nonetheless, the results highlight the importance of a globally coordinated approach to greenhouse gas emissions policies, as either companies or investors may otherwise try to engage in regulatory arbitrage by reallocating emissions intensive production activity or capital towards companies in countries with lower emissions standards.

The remainder of the paper is structured as follows. Section 2 provides a brief background on the *Milieudefensie et al. v Royal Dutch Shell* court case in the Netherlands as well as on the shareholder votes at Exxon Mobile and Chevron. Section 3

briefly describes the related literature and develops the research hypotheses. Section 4 explains the sample selection procedure, provides the descriptive statistics, and introduces the empirical methodology. Section 5 presents the main results of the empirical analyses. This section also includes an investigation of how the events on May 26, 2021, affected companies operating in the alternative energy sector. Section 6 concludes.

2 Background

2.1 Milieudefensie et al. v Royal Dutch Shell

The *Milieudefensie et al. v Royal Dutch Shell*[1] case garnered substantial media attention as it was the first court ruling to impose specific mitigation obligations on a private company, thereby holding the firm at least partially responsible for its contribution to climate change through its global greenhouse gas emissions (Macchi and van Zeben 2021). The case builds on the Urgenda rulings,[2] which state that the Dutch government's actions on climate change are inadequate and that the government thereby violates its duty of care towards its citizens. Milieudefensie originally filed a class action lawsuit against Royal Dutch Shell on behalf of itself, six other nongovernmental organizations, and over 17,000 Dutch citizens on April 5, 2019. The lawsuit is based on the unwritten standard of care pursuant to Book 6 Section 162 of the Dutch Civil code and alleges that Royal Dutch Shell was violating its duty of care by neglecting to take sufficient action to reduce its greenhouse gas emissions, thereby failing to contribute to the prevention of dangerous climate change (Macchi and van Zeben 2021). Under the court ruling, Royal Dutch Shell has to reduce its carbon emissions by 45% by 2030 compared to its 2019 levels. The decision by the court is provisionally enforceable, meaning that Royal Dutch Shell has to work towards meeting these reduction obligations even while it is appealing the ruling.

The court ruling of *Milieudefensie et al. v Royal Dutch Shell* is important in the context of climate litigation and reflects the general trend towards increased scrutiny of global greenhouse gas emissions by large multinational corporations, particularly in the oil and gas sector. While the first generation of climate litigation was generally not successful, as these cases frequently failed to clear judicial thresholds, more recent cases started to have some success (see for example The Guardian (2023a) for recent developments in the US). Ganguly et al. (2018) argue that this is driven by a better understanding of the science behind climate change as well as individuals and organizations involved in climate activism increasingly turning to courts in

[1] *District Court of The Hague, Milieudefensie et al. v Royal Dutch Shell PLC* (26 May 2021) C/09/571932/HA ZA 19-379.

[2] *Urgenda Foundation (on behalf of 886 individuals) v The State of the Netherlands (Ministry of Infrastructure and the Environment)* (2015) ILDC 2456 (NL 2015) (Urgenda—District Court); *The State of the Netherlands (Ministry of Economic Affairs and Climate Policy) v Urgenda Foundation* (2018) C/09/456689/ HA ZA 13-1396; *The State of the Netherlands (Ministry of Economic Affairs and Climate Policy) v Stichting Urgenda* (2019) 19/00135.

light of the slow progress by global policy makers in their efforts to combat climate change. In this context, *Milieudefensie et al. v Royal Dutch Shell* is the first ruling to hold a private company at least partially responsible for its global greenhouse gas emissions and forcing it to take a more proactive role in reducing its emissions. The ruling is therefore likely to set a precedent for future climate litigation.

2.2 The Exxon mobile proxy fight and Chevron's shareholder vote

On the same date as the court ruling against Royal Dutch Shell, a small and until then almost unknown activist hedge fund, Engine No. 1, was able to install three of its four nominated board members on Exxon Mobile's 12-member board. Engine No. 1 launched its campaign in December 2020, at a time when it only held about US$ 40 million worth of shares in Exxon Mobile, while Exxon Mobile itself had a market capitalization of almost US$ 175 billion. Engine No. 1's aim was to get several of its suggested directors appointed to Exxon Mobile's board, who would then push the firm to recognize its contribution to global climate change and bring it to significantly reduce its greenhouse gas emissions (Nathan and Coradin 2021). The success of Engine No. 1 against the opposition of Exxon Mobile's incumbent management was seen as a shock to the energy industry, highlighting that it is increasingly important for major oil and gas companies to more proactively address investors' concerns regarding the industry's impact on climate change (Reuters 2021b). The three board members are expected to significantly influence Exxon Mobile's strategy going forward and promised to push Exxon Mobile to further diversify its current business model beyond oil and to do more to combat climate change (Bloomberg 2021).

In the case of Chevron, shareholders voted in favor of a proposal to force Chevron to cut its Scope 3 emissions (i.e., emissions generated using the company's products and services). Chevron's management urged shareholders to reject the proposal, but it was eventually passed with 61% of shareholder voting for the reductions (Reuters 2021a). While the proposal does not contain any specific reduction targets that Chevron has to reach, it was nonetheless seen as an important vote that expressed investors' concerns about Chevron's lack of action to tackle the issues posed by climate change. This again underscores that investors are increasingly taking a more active role in forcing companies to reduce their emissions if they fail to proactively address this issue.

3 Related literature and hypotheses development

The existing literature on how litigation events, such as lawsuit filings and settlements, impact firms' stock prices is predominantly focused on the US. Early studies by Bhagat et al. (1994) and Bhagat et al. (1998) find that defendant firms experience a significant drop in their stock prices following the filing of a lawsuit. A finding that Haslem et al. (2017) subsequently confirm. A similar trend emerges when it comes to the announcement of enforcement actions related to corporate misconduct

by regulatory agencies, such as the US Securities and Exchange Commission or the US Environmental Protection Agency. These announcements are likewise associated with significant negative stock returns (Bosch et al. 1998; Karpoff et al. 2008). When it comes to the conclusion of litigation, the research predominantly focuses on the settlement of litigation or enforcement actions. This is, at least in the US, due to lawsuits against corporations rarely going on trial as the parties typically reach a settlement prior to the start of formal procedures to avoid the additional costs associated with a lengthy trial and the associated negative publicity. Moreover, even if a lawsuit proceeds to the trial stage, verdicts are rare as the parties typically settle prior to the verdict. These settlement announcements are associated with either insignificant stock price reactions (Bhagat et al. 1998) or slightly positive ones (Bhagat et al. 1994; Flore et al. 2017, 2021).

The literature on the capital market effects of climate litigation is still nascent, even though investors recognize that climate regulation, and the associated litigation risk, will impact their investments. In a survey about climate risk perceptions, Krueger et al. (2020) find that institutional investors acknowledge that climate risk does have financial implications for their portfolio firms. These investors stated that in particular regulatory risks have already started to materialize. These concerns are also echoed in the survey results of Stroebel and Wurgler (2021). Looking at the stock market, Bolton and Kacperczyk (2021) document that a carbon premium exists for firms with high carbon emissions, whereby firms with higher carbon emissions need to and do earn higher returns than firms with lower emissions. This positive correlation between stock returns and a firm's level of carbon emissions suggests that these firms face a higher cost of equity because investors view them as risky and consequently demand compensation for this risk in the form of higher stock returns.

Research addressing the impact of environmental issues on stock prices frequently turn to examining firm-specific environmental violations. Karpoff et al. (2005) look at the effects of environmental violations on firms' market values. They find that firms experience significant losses in their market valuation when environmental violations are revealed, but this loss in market value is approximately equivalent to the fine imposed. The literature on the effect of litigation linked to environmental misconduct on firms' stock prices is likewise comparatively limited. Wei et al. (2011) document that the filing of lawsuits against firms due to environmental pollution leads to a significant drop in the firms' stock prices, indicating that environmental litigation has a detrimental effect on firm valuations. This result is later reaffirmed by Haslem et al. (2017), who likewise find significant negative stock returns for a subsample of environmental lawsuit filings.

Another strand of literature examines whether the inclusion of firms in sustainability indices is associated with positive stock price reactions. This line of research centers around the question whether investors value the inclusion in an index as a form of (external) certification of a firm's sustainability efforts. If this is the case, stock prices should rise once a firm is included in an index and should fall if a firm is dropped from the index. Most studies find that index inclusion leads to a positive stock price reaction (e.g., Biktimirov and Afego 2022; Clacher and Hagendorff 2012; Hawn et al. 2018; Lackmann et al. 2012; Ramchander et al. 2012), while the deletion from an index is typically associated with a strong negative stock price

reaction (e.g., Becchetti et al. 2012; Doh et al. 2010; Hawn et al. 2018). In a comprehensive analysis of multiple markets, Adamska and Dąbrowski (2021) find that the capital market reactions to index inclusions and exclusions are more pronounced in markets with riskier institutional environments (i.e., emerging markets). They interpret this result as evidence that a firm's sustainability efforts, as measured by its corporate social responsibility (CSR) activities, is seen by investors as a risk reduction tool rather than a means for value creation. Thereby, CSR activity is more akin to a form of insurance that can protect a firm's market value (see e.g., Godfrey et al. 2009; Lu et al. 2021; Shiu and Yang 2017).

The research on the impact of climate activism on stock prices is still in its early stages. Ramelli et al. (2021) examine the impact of the first Global Climate Strike on March 15, 2019, on European firms' stock prices. They find that the strike resulted in stock price declines for carbon intensive firms in Europe, which they argue is at least partially driven by increased public attention to climate activism. Caiazza et al. (2022) look at the stock market spillover effects of the *Milieudefensie et al. v Royal Dutch Shell* court ruling to firms that are constituents of the S&P 500 and STOXX Europe 600 indexes. They find that all European and US firms are negatively affected by the court ruling, particularly those companies with high carbon emissions, even if they are not operating in the oil and gas industry.

Against this backdrop, it is reasonable to assume that the events of May 26, 2021, will have an overall negative impact on global oil and gas companies' stock prices. As a consequence of these events, investors will reassess their assumption regarding the prevalence and implications of climate litigation and climate activism risk. This reassessment should consequently lead to a reduction in the market value of these companies. I therefore hypothesize:

H1: Global oil and gas companies experienced significant negative stock returns surrounding the events on May 26, 2021.

It should, however, be noted that climate litigation and activism currently appear to be largely concentrated in Europe and North America (see also Setzer and Higham (2023) for an overview of the global climate litigation landscape). The events on May 26, 2021, exemplify this: The court ruling against Royal Dutch Shell took place in the Netherlands, while the shareholder votes at Exxon Mobile and Chevron occurred in the US. It therefore appears as if climate litigation and activism is localized and may lead to an increasingly fragmented regulatory environment. This may raise concerns that the lack of a unified approach towards emissions policies could encourage firms to engage in a form of regulatory arbitrage, whereby they shift emissions intensive productions to regions with less stringent emissions rules. In this context, Bartram et al. (2022) study the impact of California's cap-and-trade program on firms' emissions.[3] They document that financially constrained firms

[3] California's cap-and-trade program was started in 2013 and is one of California's main tools in trying to reduce the state's carbon emissions. Under the program, all electric power plants, industrial plants, and fuel distributors (since 2015) emitting more than 25,000 tons of CO_2 per year are covered. The program allocates yearly capped allowances to the covered firms with specific year vintages and these allowances can later be traded. The covered entities are required to pay off their emissions by using the allocated

push some of their emissions intensive production activities to manufacturing sites in other states with lower levels of regulation. This supports the notion that companies engage in a form of regulatory arbitrage by reallocating polluting activities in an attempt to circumvent the increased cost associated with emissions regulation.

More general research on the impact of changes in emissions policies on stock prices typically documents that a tightening of emissions standards is associated with negative stock returns, particularly for firms with high emissions or operating in polluting industries. Birindelli and Chiappini (2021) document the impact of multiple European Union policy announcements linked to climate change policies on stock prices of EU firms and find that negative stock price reactions are more prevalent than positive ones. Ramiah et al. (2013) likewise find significant negative stock price reaction for Australian oil and gas firms to the announcement of the Carbon Pollution Reduction Scheme on July, 16, 2008.[4] These results are corroborated by Chapple et al. (2013), who show that especially firms with high carbon emissions experienced negative stock returns. For China, a similar picture emerges, with Guo et al. (2020) reporting that the announcement of stricter environmental polices had a negative impact on the stock prices of heavily polluting firms.

While emissions regulations seem to tighten in most countries, it is still primarily European and North American companies that appear to have a relatively high exposure to climate litigation and climate activism risk, whereas firms from other jurisdictions are less exposed.[5] Therefore, while firms may not be able to easily exploit regulatory differences themselves, investors may respond to the perceived increase in climate litigation and activism risk by reallocating their investments towards jurisdiction with perceived lower levels of risk. This leads to the following two linked hypotheses:

H2a: European and North American oil and gas companies experienced significant negative stock returns surrounding the events on May 26, 2021.

H2b: Oil and gas companies located outside of Europe and North America experienced significant positive stock returns surrounding the events on May 26, 2021.

Footnote 3 (continued)
allowances and, in case the allowances do not suffice, by buying additional allowances (if not all allowances are needed to pay for the emissions, they can also be sold). See California Air Resources Board (2022) for more detailed information on California's cap-and-trade program.

[4] It should be noted that Australia later backtracked on this commitment when it submitted its carbon reduction range to the Copenhagen Accord in 2010 and did not commit to a reduction of more than 5% on the 2000 levels unless there is a strong commitment from other countries to do the same, particularly China and India (Reuters 2010).

[5] Setzer and Higham (2023) document in their report on climate litigation that the number of climate litigation cases filed in Europe and North America is much higher than in the rest of the world, with cases in the US making up half to two thirds of all global cases in certain years. Moreover, they also document that most climate related cased are filed against companies engaged in fossil fuel exploration, production, and transportation.

While a firm's geographical location is likely to impact its returns surrounding the events of May 26, 2021, its ESG score could potentially help to mitigate the anticipated negative impact. This is based on the assumption that a higher ESG score, coupled with a firm's corresponding CSR activities,[6] might serve to alleviate potential adverse effects on the firm's stock price. In this context, Godfrey et al. (2009) and Shiu and Yang (2017) find evidence suggesting that higher CSR activity is linked to insurance-like effects in case of negative events, while Lu et al. (2021) document that CSR is positively related to firm value in situations involving high financial or environmental risk. Moreover, the study conducted by Du and Vieira (2012) underscores the active use of CSR by oil and gas companies for enhancing their corporate legitimacy. Given that I hypothesize return differences to the event on May 26, 2021, based on a firm's country of origin, it appears reasonable to assume that the value of a better sustainability performance is also likely to differ by country. If European and North American oil and gas companies stand to be more adversely impacted by a rise in climate litigation and climate activism risks, companies located in these jurisdictions might also derive a higher value from superior sustainability practices, as indicated by a higher ESG score. I therefore hypothesize:

H3: Higher ESG scores moderated the negative stock returns for oil and gas companies to the events on May 26, 2021, particularly for European and North American oil and gas companies.

4 Sample construction and empirical approach

4.1 Sample selection and description

In order to investigate whether investors perceived the court ruling against Royal Dutch Shell and the shareholder votes at Exxon Mobile and Chevron as significantly increasing the risk of climate litigation and activism for major oil and gas companies, I test the stock price response of firms operating in this sector to these events. The sample consists of the 75 largest stock listed global oil and gas companies by market capitalization as of December 31, 2020 (Table OA - 1 in the Online Appendix provides an overview of the selected companies).[7] I selected the largest 75 firms to capture all major global oil and gas companies, while achieving an adequate

[6] ESG and CSR are intricately linked concepts, representing a firm's commitment to responsible practices. CSR activities encompass a company's efforts to positively impact society, including through environmental actions, stakeholder programs, or similar initiatives. In turn, CSR activities significantly influence a firm's ESG score, which reflects a firm's overall sustainability performance. ESG scores can thereby be viewed as a metric to quantify the depth of a firm's CSR engagement, which investors can use as a screening tool prior to making investment decisions to evaluate a company's sustainability and ethical practices as well as long-term viability.

[7] Four companies (Gazprom Promgaz (Russia), Texhoma Energy (USA), Sky Petroleum (USA) and INA (Croatia)) are dropped from the 75 largest oil and gas companies due to poor stock data quality. The sample was subsequently extended to include the next four largest firms (i.e., rank 76–79).

sample size for the further analyses.[8] Stock price data is collected from Refinitiv's Datastream, ESG scores and related data from Refinitiv, and accounting data from S&P Capital IQ.

Table 1 provides an overview of the sample statistics. Looking at the firm-specific variables (Table 1 Panel A), firm size, as measured by a firm's total assets, is on average US$ 73 billion, but the median is considerably lower at US$ 19 billion. The large heterogeneity in firm size is further exemplified by the high standard deviation in total assets, indicating that there are several very large firms in the sample. Firms' leverage, defined as total debt divided by total assets, is on average 26%, with the median slightly higher, suggesting that the majority of firms have an adequate capital structure and are not over indebted. The return on assets shows that the sample firms are generally profitable, with the average (median) return on assets being 1.51% (0.95%). However, looking at the 25 percentile, there is also a small number of loss making firms. The cash holdings of the sample firms appear to be significant, with the average (median) company holding US$ 4.7 billion (US$ 1.23 billion) in cash. Examining the companies' ESG scores, there also appears to be a large variation among the sample firms. The 75 percentile has an ESG score greater than 70, with several firms having scores above 75, whereby they are considered industry leaders. In contrast, the 25 percentile includes firms with ESG scores below 50, indicating a mediocre ESG rating, with several companies having scores below 25 and therefore considered laggards in terms of their ESG performance. Looking at the components of the ESG score, i.e., the environmental, social, and governance pillar scores, a similar picture emerges as with the overall ESG score. It is noteworthy though, that the governance scores of the oil and gas companies are generally rather high with an average of 64 and a median of 70, documenting that the majority of firms appear to have comparatively good corporate governance structures in place.

The distribution of firms by country (Table 1 Panel B) shows that the sample contains firms from 25 different nations. The majority of the sample firms are located in Europe or North America (i.e., Canada and the US) (46 companies; 61.33%). Most firms are from the United States (23), followed by Canada and Russia (8 each), and Australia and the United Kingdom (4 each). Finally, Table 1 Panel C shows the correlations between the different variables.

4.2 Methodology

The market reaction to the events on May 26, 2021, is estimated using the market model event study methodology (see e.g., MacKinlay 1997).[9] Event studies are a common tool for analyzing the information content of specific events. The

[8] Selecting more than 75 firms provides limited additional value, as the market capitalization then drops below US$ 1.5 billion, which is comparatively small in the context of major oil and gas companies (less than 1% of the market capitalization of each of the three largest companies).

[9] The three event firms, Royal Dutch Shell, Exxon Mobile and Chevron are included in the sample in order to also account for their returns. Removing these three companies from the sample does not alter the results in a significant manner.

Table 1 Summary statistics for the sample of oil and gas companies

Variable	n	Average	Median	25 percentile	75 percentile	Std. dev
Panel A: Firm-specific variables						
Total Assets (million US$)	75	73,208.12	19,229.00	8,165.76	79,759.43	110,576.46
Leverage (%)	75	26.38	28.31	18.23	33.62	15.34
Return on Assets (%)	75	1.51	0.95	−0.88	3.27	5.03
Cash (million US$)	75	4,706.97	1,229.04	238.09	3,691.52	9,416.69
ESG Score	72	59.38	63.03	49.21	70.27	17.82
Environmental Score	72	54.82	54.57	41.80	71.44	19.97
Social Score	72	60.24	65.13	44.74	78.20	22.59
Governance Score	72	64.68	70.72	48.32	85.63	22.62

Country	n	Percentage	Cumulative percentage
Panel B: Firm distribution by country			
Europe or North America			
Austria	1	1.33	1.33
Canada	8	10.67	12.00
France	1	1.33	13.33
Hungary	1	1.33	14.67
Italy	1	1.33	16.00
Norway	2	2.67	18.67
Poland	1	1.33	20.00
Portugal	1	1.33	21.33
Romania	2	2.67	24.00
Spain	1	1.33	25.33
United Kingdom	4	5.33	30.67
United States	23	30.67	61.33
Rest of world			
Argentina	1	1.33	62.67
Australia	4	5.33	68.00
Brazil	2	2.67	70.67
China	3	4.00	74.67
Colombia	1	1.33	76.00
Hong Kong	2	2.67	78.67
India	1	1.33	80.00
Japan	2	2.67	82.67
Pakistan	1	1.33	84.00
Russia	8	10.67	94.67
Saudi Arabia	1	1.33	96.00
Thailand	2	2.67	98.67

Table 1 (continued)

Country	n			Percentage				Cumulative percentage	
Turkey	1			1.33				100.00	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel C: Correlation matrix									
(1) Europe or North America	1.00								
(2) ESG Score	0.09	1.00							
(3) Environmental Score	0.00	0.86	1.00						
(4) Social Score	0.10	0.92	0.72	1.00					
(5) Governance Score	0.12	0.61	0.30	0.36	1.00				
(6) ln(Total Assets)	−0.22	0.50	0.64	0.35	0.22	1.00			
(7) Leverage	0.18	0.04	−0.03	0.01	0.14	−0.02	1.00		
(8) Return on Assets	−0.27	−0.36	−0.32	−0.32	−0.23	−0.26	−0.46	1.00	
(9) ln(Cash)	−0.27	0.30	0.36	0.22	0.16	0.64	−0.01	−0.04	1.00

This table shows the summary statistics for the sample of oil and gas companies. Panel A shows the sample statistics for the firms' total assets, leverage, return on assets, cash, ESG score, environmental score, social score, and governance score. Panel B reports the sample distribution by country, while Panel C shows the pairwise Pearson correlation score for the variables. Detailed variable descriptions are provided in the Appendix

underlying assumption is that that capital markets are informationally efficient and that new information about a given firm is quickly reflected in its stock price (Fama 1970). Event studies are based on the semi-strong form of market efficiency and allow to measure the immediate impact of new information on stock prices (e.g., without the need to wait, for the next quarterly or annual report). Additionally, the stock price also reflects investors' future expectations, allowing for conclusions regarding a firm's potential future financial performance. Event studies are therefore an appropriate method for measuring how investors value events that may ultimately result in an increase in firms' climate litigation and activism risk.

I use a 126-trading day estimation period (half a trading year), from $t = -128$ to $t = -3$ where $t = 0$ is May 26, 2021, using:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

where R_{it} is the return of stock i on day t during the estimation period, R_{mt} is the return of the respective value-weighted Datastream country index on day t, while α_i and β_i are the regression coefficients of stock i. Abnormal returns during an up to 5-day event window from $t = -2$ to $t = +2$ are calculated by:

$$AR_{it} = R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{mt}\right) \tag{2}$$

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the regression coefficients of stock i from the market model. The cumulative average abnormal return over an event window from $t=\tau_1$ to $t=\tau_2$ $\left(CAR_{i,[\tau_1;\tau_2]}\right)$, where τ_1, τ_2 $\epsilon[-2,\ldots,+2]$, is calculated using:[10]

$$CAR_{i,[\tau_1;\tau_2]} = \sum_{t=\tau_1}^{\tau_2} AR_{it} \tag{3}$$

For a sample of N event firms, the average cumulative abnormal returns (ACARs) over a given event window are then calculated by:

$$ACAR_{[\tau_1;\tau_2]} = \frac{1}{N}\sum_{i=1}^{N} CAR_{i,[\tau_1;\tau_2]} \tag{4}$$

Several tests are used to establish statistical significance. Specifically, I use the standard t-test, the variance-change corrected standardized cross-section test suggested by Boehmer et al. (1991), and the nonparametric Wilcoxon rank-sum test. Statistical differences between subsamples are tested using the two-sample t-test and the nonparametric Mann–Whitney-U-test.[11]

5 Empirical results

5.1 Oil and gas companies' market reaction

The results of the event study are reported in Table 2. For the entire sample of oil and gas companies, significant negative abnormal returns are observed during the $[-2;+2]$ as well as the $[-1;+1]$ and $[-2;\ 0]$ event window (Table 2 Panel A), thereby confirming Hypothesis **H1**. These negative returns appear to be primarily driven by the two days leading up to the events on May 26, 2021, which suggests that investors appear to have anticipated the outcome of the events. Following the event day, positive returns are observed, but these lack significance. This overall result is in line with the prior research documenting a negative impact of litigation on stock prices (e.g., Bhagat et al. 1994, 1998; Haslem et al. 2017; Wei et al.

[10] Using short event windows is common practice when investigating firms' stock price reactions to specific events (see e.g., Adamska and Dąbrowski 2021; Ramelli et al. 2021). Longer event windows are more susceptible to confounding events that could distort the results. Therefore, limiting the length of the event window can help to minimize the likelihood of such distortions.

[11] In the spirit of Doidge and Dyck (2015) and Schäfer et al. (2016), I also run a market model event study using a seemingly unrelated regression framework. This approach may be preferable to the two stage market model event study approach when all firms are affected at the same time, as the regressions are estimated simultaneously so that cross-correlations are taken into account (Binder 1985). I employ the same parameters in terms of estimation period, event period, etc. The results are qualitatively very similar and omitted for reasons of brevity.

Table 2 Event study results for oil and gas companies

Event Window	ACAR (%)	Median CAR (%)	*t*-test (*t*-value)	BMP-test (Z-score)	Wilcoxon test (Z-score)
Panel A: All oil and gas companies (n = 75)					
[−2; +2]	−1.109	−0.456	−3.138***	−3.138***	−2.429**
[−1, +1]	−0.803	−0.903	−3.448***	−3.448***	−3.501***
[−2;0]	−0.788	−0.403	−3.010***	−3.010***	−2.455**
[0; +2]	0.252	0.016	1.200	1.200	1.098
Panel B: European and North American oil and gas companies (n = 46)					
[−2; +2]	−2.143	−2.053	−4.412***	−4.408***	−3.698***
[−1, +1]	−1.207	−1.075	−4.424***	−4.319***	−3.665***
[−2; 0]	−1.587	−1.409	−4.417***	−4.324***	−3.884***
[0; +2]	0.355	0.236	1.256	0.743	1.251
Panel C: Other country oil and gas companies (n = 29)					
[−2; +2]	0.531	0.326	1.716*	1.561	1.654
[−1, +1]	−0.161	−0.864	−0.406	−0.533	−0.984
[−2; 0]	0.480	0.292	2.251*	1.920*	1.784*
[0; +2]	0.090	−0.038	0.288	0.284	0.119
Event Window	ΔACAR (%)	ΔMedian CAR (%)	two-sample *t*-test (*t*-value)	Mann–Whitney-U-Test (Z-score)	
Panel D: Difference between European and North American and other country oil and gas companies					
[−2; +2]	−2.675	−2.37	−4.050***	−3.748***	
[−1, +1]	−1.047	−0.211	−2.249**	−1.648*	
[−2; 0]	−2.066	−1.701	−4.270***	−4.161***	
[0; +2]	0.265	0.274	0.611	0.397	

This table reports the event study results for the 75 largest oil and gas companies by market capitalization as of December 31, 2020, to the Dutch court verdict against Royal Dutch Shell, Exxon Mobil's loss in a proxy fight, and Chevron's investors backing further emissions cuts on May 26, 2021. Cumulative abnormal returns are estimated over multiple event windows and daily abnormal returns are obtained using a market model event study with a 126-trading day estimation period. The respective Datastream country index of the relevant company's country of origin is used as the market portfolio. Average cumulative abnormal returns (ACARs) are tested for statistical significance using the standard *t*-test, the parametric Boehmer et al. (1991) test procedure (the BMP-test), and the nonparametric Wilcoxon rank-sum test (Wilcoxon test). Differences between European and North American oil and gas companies and oil and gas companies from other countries are tested for significance using the parametric two-sample *t*-test and the nonparametric Mann–Whitney-U-test

*, **, *** denote statistical significance at the 10, 5, and 1% level, respectively

2011) and also reflective of the survey findings of Krueger et al. (2020) and Stroebel and Wurgler (2021) regarding investor concerns regarding climate regulation. The results confirm that increased climate litigation and activism risk leads to significantly lower firm valuations.

To understand whether there are differential effects between companies located in different geographic regions and to test Hypotheses **H2a** and **H2b**, I split the sample into firms headquartered in Europe and North America and those headquartered in

other countries. Dividing the sample into these two regions reveals that the significant negative returns are entirely driven by firms headquartered in Europe and North America (Table 2 Panel B), which experience negative ACARs (median CARs) of −2.14% (−2.05%) during the [−2;+2] event window. This confirms Hypothesis **H2a** and is also in line with Caiazza et al. (2022), who show that European and US firms more broadly experience negative stock returns, between −0.22% and −2.48% during the [0;+1] event window, depending on the industry.[12] Looking at the market capitalization of these firms three days prior to the event, this is equivalent to a total abnormal loss in market value of US$ 36.12 billion.

In contrast, oil and gas companies from other regions record positive returns during the [−2;+2] event window, which are weakly significant during the [−2; 0] event window (Table 2 Panel C). The differences between the regions are likewise significant for all but the [0;+2] event window (Table 2 Panel D). These results provide some, albeit weak, support for Hypothesis **H2b**, as the overall gains for oil and gas firms outside of Europe and the North America appear limited, even if their returns are significantly better than those of their European and North American peers. That firms located in Europe and North America lose value, while firms outside these regions record gains could be interpreted as investors perceiving that the risk of increased climate litigation and activism is highest for European and North America oil and gas companies. Firms headquartered in other regions, in contrast, may be seen as having comparatively lower levels of risk.

In a next step, I divide the sample into high ESG score companies (i.e., firms with ESG scores above the sample median) and low ESG score companies (i.e., firms with ESG scores below the sample median). Splitting the sample by ESG scores is based on the assumption that a higher ESG scores and the firm's associated CSR activity may, at least to a certain extent, mitigate any negative impact on a firm's stock price by providing an insurance-like effect. The results of the sample splits are shown in Table 3. Generally, large return differentials can be observed between high and low ESG score firms, whereby firms with a higher score experience less negative returns, but the differences in returns largely lack significance (Table 3 Panel A). This result mirrors to a certain degree earlier studies that find that CSR activity may moderate the impact of negative events on a firms' stock prices, albeit not compensate it completely (Godfrey et al. 2009; Shiu and Yang 2017).

Next, I double sort firms by region and their ESG score. The results indicate that a high ESG score is particularly valuable for European and North American oil and gas companies, as the returns are less negative than those for low ESG score firms (Table 3 Panel B), with the results being significant at least for the [−2; 0] event window. For firms located outside of Europe and North America, ESG scores do not appear to influence returns. These results provide some support for Hypothesis **H3**, but only for European and North American oil and gas firms.

The stock return patterns suggest that investors perceive an increase in climate litigation and activism risk as overall negative for European and North American oil

[12] It should be noted that the results of Caiazza et al. (2022) vary by industry and that they document no or only very weak reactions for industries associated with low emissions, such as healthcare, technology, real estate, and telecommunications.

Table 3 Event study results for oil and gas companies by ESG score classification

Event window	[−2; +2]	[−1, +1]	[−2; 0]	[0; +2]	[−2; +2]	[−1, +1]	[−2; 0]	[0; +2]	[−2; +2]	[−1, +1]	[−2; 0]	[0; +2]
	High ESG score firms (n = 36)				Low ESG score firms (n = 36)				Δ high ESG score − low ESG score			
Panel A: All oil and gas companies												
ACAR (%)	−0.98	−0.80	−0.44	−0.09	−1.40	−0.88	−1.28	0.59	0.42	0.08	0.84	−0.68
Median CAR (%)	−0.66	−0.93	−0.13	−0.38	−0.42	−0.98	−0.59	0.76	−0.24	0.06	0.45	−1.13
t-test (*t*-value)	−2.40**	−2.32**	−1.34	−0.60	−2.29**	−2.57**	−2.87***	1.78*	0.57	0.16	1.58	−1.56
BMP-test (Z-score)	−2.28**	−2.16**	−1.01	−0.62	−2.23**	−2.47**	−2.91***	1.57				
Wilcoxon test (Z-score)	−2.01**	−2.15**	−1.34	−0.60	−1.67*	−2.86***	−2.50**	2.01**	0.07	0.15	1.11	−1.94*
	High ESG score (n = 23)				Low ESG score (n = 22)				Δ high ESG score − low ESG score			
Panel B: European and North American oil and gas companies												
ACAR (%)	−1.66	−1.13	−0.97	−0.08	−2.83	−1.37	−2.36	0.80	1.16	0.24	1.40	−0.88
Median CAR (%)	−1.80	−0.87	−1.09	−0.52	−2.39	−1.32	−1.83	0.77	0.59	0.45	0.74	−1.29
t-test (*t*-value)	−2.98***	−2.75**	−2.59**	−0.23	−3.51***	−3.62***	−3.94***	1.78*	1.20	0.43	1.99*	−1.54
BMP-test (Z-score)	−3.01***	−2.82***	−2.51**	−0.59	−3.61***	−3.59***	−4.07***	1.59				
Wilcoxon test (Z-score)	−2.52**	−2.34**	−2.31**	−0.40	−2.74***	−2.97***	−3.33***	2.03**	0.81	0.42	1.67*	−1.99**
	High ESG score (n = 13)				Low ESG score (n = 14)				Δ high ESG score − low ESG score			
Panel C: Other country oil and gas companies												
ACAR (%)	0.23	−0.22	0.50	−0.09	0.85	−0.11	0.43	0.27	−0.62	−0.11	0.43	0.27
Median CAR (%)	0.25	−0.98	0.29	−0.32	0.56	−0.73	0.31	0.36	−0.31	−0.25	−0.02	−0.68
t-test (*t*-value)	0.63	−0.37	1.48	−0.20	1.57	−0.18	1.42	0.55	−0.93	−0.13	0.17	−0.53
BMP-test (Z-score)	0.71	−0.27	1.53	−0.24	1.35	−0.41	1.00	0.57				
Wilcoxon test (Z-score)	0.94	−0.45	1.29	−0.66	1.35	−0.85	0.97	0.60	−0.66	−0.12	0.27	−0.66

This table reports the event study results for the 75 largest oil and gas companies by market capitalization as of December 31, 2020, to the Dutch court verdict against Royal Dutch Shell, Exxon Mobil's loss in a proxy fight, and Chevron's investors backing further emissions cuts on May 26, 2021. The companies are divided into high ESG score firms (i.e., firms with an ESG score above the sample median ESG score) and low ESG score firms (i.e., firms with ESG scores below the sample median ESG score) (Panel A). The high and low ESG score firms are then further subdivided into European and North American firms (Panel B) and firms from other countries (Panel C). Cumulative abnormal returns are estimated over multiple event windows and daily abnormal returns are obtained using a market model event study with a 126-trading day estimation period. The respective Datastream country index of the relevant company's country of origin is used as the market portfolio. Average cumulative abnormal returns (ACARs) are tested for statistical significance using the standard *t*-test, the parametric Boehmer et al. (1991) test procedure (the BMP-test), and the nonparametric Wilcoxon rank-sum test (Wilcoxon test). Differences between European and North American oil and gas companies and oil and gas companies from other countries are tested for significance using the parametric two-sample *t*-test (shown in the row of the *t*-test) and the nonparametric Mann-Whitney-U-test (shown in the row of the Wilcoxon test)

*, **, *** denote statistical significance at the 10, 5, and 1% level, respectively

and gas companies. Especially the court ruling against Royal Dutch Shell is likely a signal that the probability of successful climate related litigation may increase, exacerbating oil and gas companies' climate litigation risk. However, the results also provide some evidence that higher ESG scores appear to moderate the negative impact of the events on May 26, 2021, on firms' stock prices, at least for European and North American companies. This could be interpreted as firms with higher ESG scores being perceived as less vulnerable to climate related litigation or activism. This outcome resonates with the findings of Godfrey et al. (2009) and Shiu and Yang (2017), indicating that higher ESG scores may indeed act as a form of insurance against the potential negative effects on firm value stemming from a perceived rise in climate litigation or activism risk among investors. Yet, at the same time, investors seem to reward companies outside of Europe and North America, potentially due to the perceived lower risk of climate related litigation affecting these firms.

5.2 Drivers of the observed stock return patterns

The univariate results so far are suggestive of large regional differences in the stock returns for major oil and gas companies to the events on May 26, 2021. To understand whether the results also hold when controlling for other, firm-specific variables, I estimate an ordinary least squares (OLS) regression, which, in its full specification, takes the form:

$$\begin{aligned} CAR_{i,[-2;+2]} = \gamma_0 &+ \gamma_1 Europe\ or\ North\ America_i \\ &+ \gamma_2 ESG\ Score_i + \gamma_3 Europe\ or\ North\ America_i \times ESG\ Score_i \\ &+ \gamma_4 \ln(Total\ Assets)_i + \gamma_5 Leverage_i + \gamma_6 Return\ on\ Assets_i \\ &+ \gamma_7 \ln(Cash)_i + \epsilon_i \end{aligned} \tag{5}$$

where $CAR_{i,[-2;+2]}$ is company i's $[-2;+2]$ event window CAR, *Europe or North America* is a dummy variable equal to one if the firm is headquartered in Europe or North America, zero otherwise, and *ESG Score* is a firm's Refinitiv ESG score. In addition, a set of firm-specific control variables are added to account for firm size (*Total Assets*), its capital structure (*Leverage*), its profitability (*Return on Assets*), and its cash holdings (*Cash*). Detailed variable definitions are given in the Appendix.

The results of the regression analyses are reported in Table 4 Panel A and confirm the univariate results that oil and gas companies located in Europe and North America experience significantly lower stock returns than firms located in other jurisdictions, as indicated by the significant and negative coefficient for *Europe or North America*. This result is consistent across almost all regression specifications and even holds when controlling for firm-specific variables (see Table 4 Panel A column (2)). This provides further support for Hypothesis **H2a**.

Examining the possible mitigating effect of higher ESG scores, the regression results indicate that a higher ESG score does indeed offset the negative returns to a

Table 4 Regression results

	Dependent variable $CAR_{i,[-2;+2]}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Main regressions						
Europe or North America	−0.027***	−0.029***	−0.097***	−0.086***	−0.083***	−0.044
	(−4.584)	(−3.187)	(−2.775)	(−3.128)	(−3.049)	(−1.564)
ESG Score			−0.000			
			(−1.416)			
Europe or North America × ESG Score			0.001**			
			(2.221)			
Environmental Score				−0.000		
				(−1.482)		
Europe or North America × Environmental Score				0.001**		
				(2.493)		
Social Score					−0.000	
					(−1.394)	
Europe or North America × Social Score					0.001**	
					(2.382)	
Governance Score						−0.000
						(−0.288)
Europe or North America × Governance Score						0.000
						(0.534)
Firm-specific controls						
ln(*Total Assets*)		−0.003	−0.005	−0.005	−0.004	−0.003
		(−1.050)	(−1.137)	(−1.149)	(−1.071)	(−0.981)
Leverage		−0.032	−0.011	−0.015	−0.012	−0.027
		(−1.070)	(−0.352)	(−0.500)	(−0.374)	(−0.799)
Return on Assets		−0.001	−0.001	−0.001	−0.001	−0.002
		(−0.933)	(−0.879)	(−1.096)	(−0.810)	(−1.014)

Table 4 (continued)

	Dependent variable $CAR_{i,[-2;+2]}$					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(*Cash*)		0.001	0.001	0.001	0.001	0.001
		(0.965)	(0.828)	(0.955)	(0.723)	(0.746)
Constant	0.005*	0.071	0.127*	0.136	0.108	0.080
	(1.686)	(1.231)	(1.767)	(1.588)	(1.635)	(1.186)
N	75	75	72	72	72	72
Adjusted R^2	0.172	0.172	0.263	0.270	0.259	0.165
F-value	21.01***	4.982***	3.870***	4.712***	3.547***	3.177***
Panel B: Regressions using component scores and selected underlying data points						
Europe or North America	−0.103***	−0.042***	−0.082***	−0.089**	−0.064***	−0.024**
	(−3.399)	(−3.103)	(−2.718)	(−2.329)	(−3.501)	(−2.086)
Emissions Score	−0.000***					
	(−2.707)					
Europe or North America × Emissions Score	0.001***					
	(2.828)					
Environmental Innovation Score		−0.000				
		(−0.854)				
Europe or North America × Environmental Innovation Score		0.000				
		(1.637)				
Resource Use Score			−0.000			
			(−1.294)			
Europe or North America × Resource Use Score			0.001**			
			(2.064)			
CSR Committee				−0.014		
				(−0.777)		

Table 4 (continued)

	Dependent variable $CAR_{i,[-2;+2]}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Europe or North America × CSR Committee				0.064*		
				(1.698)		
Climate Action					−0.021*	
					(−1.745)	
Europe or North America × Climate Action					0.047***	
					(2.814)	
CO_2-to-Revenues						0.000
						(0.017)
Europe or North America × CO_2-to-Revenues						−0.000
						(−0.022)
Firm-specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
N	72	72	72	72	72	65
Adjusted R^2	0.292	0.194	0.241	0.257	0.310	0.109
F-value	5.104***	3.688***	3.903***	3.389***	4.256***	2.223**

This table reports the ordinary least squares regression results for the sample of oil and gas companies using $CAR_{i,[-2;+2]}$ as the dependent variable. *Europe or North America* is a binary variable defined as one if the firm is headquartered in Europe or North America (i.e., the US or Canada), zero otherwise, *ESG Score* is a company's ESG score, *Environmental Score* is a company's environmental score, *Social Score* is a company's social score, *Governance Score* is a company's governance score, *Emissions Score* is a company's emissions score, *Environmental Innovation Score* is a company's environmental innovation score, *Resource Use Score* is a company's resource use score, *CSR Committee* is a binary variable, defined as one if the company has a CSR sustainability committee, zero otherwise, *Climate Action* is a binary variable, defined as one if the company supports the UN Sustainable Development Goal 13 (SDG 13) Climate Action, zero otherwise, and *CO_2-to-Revenues* is a firm's total CO_2 equivalent emissions divided by its revenues in million US$. The firm-specific control variables include *Total Assets*, a firm's total assets in US$, *Leverage*, is a firm's ratio of total debt to total assets, *Return on Assets,* a firm's return on assets, and *Cash*, a firm's total cash and cash equivalents. All variables are as of 31 December 2020 and detailed variable descriptions are provided in the Appendix. All regressions are controlled for heteroskedasticity and robust *t*-values are given in parentheses

*, **, *** denote statistical significance at the 10, 5, and 1% level, respectively

certain degree, but only for companies located in Europe or North America. This is evidenced by the positive and significant coefficient for the interaction term *Europe or North America*×*ESG Score* in column (3).[13] However, the coefficient is small, and the economic impact therefore appears to be somewhat limited. The firm-specific controls generally lack significance, suggesting that the location of a company coupled with its ESG score are the main drivers of the observed stock market reaction surrounding the events on May 26, 2021. Therefore, Hypothesis **H3** can be supported for European and North American oil and gas companies.

To obtain a better understanding of which components of a firm's ESG score drive the overall mitigating effect, I decompose the ESG score into its three components and test them separately in the same multivariate regression setting. The results are reported in Table 4 Panel A columns (4) through (6). The regression results show that particularly the environmental and social scores are of importance to European and North American oil and gas companies. Interpreting the results in the context of more stringent emissions regulations and climate activism, this appears to be sensible. A higher environmental score is typically associated with lower firm emissions, which likely means that the company may be able to comply with tougher emissions standards more easily and therefore also be less likely to face climate litigation. A higher social score, in turn, is indicative of a better stakeholder engagement and management, which could lead to a lower likelihood of being targeted by climate activism. In contrast, the governance score does not appear to have a large impact. This may be due to the governance scores among major oil and gas companies generally being comparatively high, as noted in the descriptive statistics. Moreover, good corporate governance is not necessarily a prerequisite for being able to effectively deal with the increased risk from climate litigation and activism.

Table 4 Panel B delves deeper into the ESG components that may drive the returns. As the oil and gas industry is very emissions intensive the focus is on a further decomposition of the environmental score into its components and certain fundamental variables.[14] Refinitiv's environmental pillar score consists of three components: the emissions score, the environmental innovation score, and the resource use score. Columns (1) through (3) of Table 4 Panel B analyze these components

[13] Given the recent concerns raised around ESG ratings (Berg et al. 2022), and the ESG scores from Refinitiv in particular (Berg et al. 2021; Sahin et al. 2023), I also hand-collected the MSCI ESG ratings for the sample of oil and gas companies. Of the 75 companies in the sample, I was able to obtain the MSCI ESG rating for 48 companies. In unreported results, I replicate the regression model in column (3) of Table 4. The results largely confirm the findings of in column (3) even though the level of significance of the interaction terms is lower at the 10% level.

[14] The social score also has significant effect on European and North American oil and gas companies, as indicated by the significant coefficient for the interaction term *Europe or North America*×*Social Score*. Table OA - 2 in the Online Appendix shows the results for the decomposition of the social score into its four main components. All components appear to have a positive influence on the stock returns of European and North American oil and gas companies, albeit the level of significance varies by component. Still, it appears as if any form of social engagement can help firms to mitigate the negative impact of climate litigation and activism. However, given that environmental concerns, and emissions related climate change concerns in particular, are the focus of the events described here, I forgo a deeper analysis for reasons of brevity.

and their interaction with a firm's country of origin. Of these three components, the emissions score appears to be the most relevant, particularly for European and North American oil and gas companies. The coefficient for the interaction term *Europe or North America*×*Emissions Score* is positive and highly significant, albeit again small. While the coefficient for *Europe or North America*×*Resource Use Score* is likewise significant, the level of significance is lower than for the interaction term with the emissions score.[15] The environmental innovation score does not appear to be relevant given the coefficient's lack of significance.

Columns (4) through (6) of Table 4 Panel B examine the impact of three selected fundamental components that relate to a firm's emissions and related policies. These variables identify whether a company has a CSR sustainability committee, supports the UN Sustainable Development Goal 13 (SDG 13) Climate Action, and the ratio of its CO_2 equivalent emissions to revenues. While a CSR sustainability committee appears to provide some slight benefits for European and North American oil and gas firms, given the weakly significant coefficient for the interaction term *Europe or North America*×*CSR Committee*, the most important factor seems to be support for UN SDG 13 Climate Action. The coefficient for the interaction term *Europe or North America*×*Climate Action* is positive and highly significant, and the regression model has the highest explanatory power among all regression models as measured by the adjusted R^2. Therefore, European and North American oil and gas firms that signaled a credible committed to combat climate change by supporting UN SDG 13 prior to the events on May 26, 2021, were significantly less impacted than those who did not make this commitment. Interestingly, a firm's ratio of total CO_2 equivalent emissions to revenues does not appear to be a significant driver. Overall, for European and North American oil and gas companies it appears as if having credible policies to combat climate change at the firm level can moderate the otherwise negative stock price impact of climate litigation. While current emissions seem to play a subordinated role, commitments to combat climate change through future actions appear to be an important factor to mitigate risks due to climate litigation and activism. This may be expected, but the results nonetheless highlight the importance of these commitments for oil and gas companies.

5.3 Stock price reactions of alternative energy firms

The previous section has shown that European and North American oil and gas companies experience negative stock returns surrounding the events on May 26, 2021, while firms operating in the same industry in other countries appear to record slight gains. While litigation events can have negative spillover effects for companies operating in the same industry (see also Gande and Lewis 2009 for security class action lawsuits), firms in other industries may obtain positive stock market spillover effects if they stand to gain from increased litigation risk in another industry. One industry that may especially benefit from the increase in climate litigation and activism risk

[15] The regression model using the emissions score is also better specified than the one using the resource use score with an adjusted R^2 of 0.292 versus 0.241 and a higher F-score.

Table 5 Event study results for alternative energy companies

Event window	ACAR (%)	Median CAR (%)	*t*-test (*t*-value)	BMP-test (Z-score)	Wilcoxon test (Z-score)
Panel A: All alternative energy companies (n = 75)					
[−2; +2]	0.532	0.426	0.962	0.805	0.898
[−1, +1]	1.380	0.917	2.513**	2.276**	2.466**
[−2; 0]	−0.060	−0.481	−0.110	−0.362	−0.396
[0; +2]	2.067	1.598	4.314***	4.432***	3.802***
Panel B: European and North American alternative energy companies (n = 40)					
[−2; +2]	1.658	0.576	2.395**	2.231**	1.922*
[−1, +1]	3.251	2.499	4.515***	4.503***	4.180***
[−2; 0]	1.496	0.366	2.197**	2.136**	1.734*
[0; +2]	3.043	2.169	4.256***	4.598***	3.831***
Panel C: Other country alternative energy companies (n = 35)					
[−2; +2]	−0.755	−0.639	−0.899	−0.817	−0.737
[−1, +1]	−0.759	−0.435	−1.102	−0.993	−1.130
[−2; 0]	−1.838	−2.098	−2.387**	−2.319**	−2.178**
[0; +2]	0.951	0.655	1.651	1.634	1.147

Event Window	ΔACAR (%)	ΔMedian CAR (%)	two-sample *t*-test (*t*-value)	Mann–Whitney-U-test (Z-score)
Panel D: Difference between European and North American and other country alternative energy companies				
[−2; +2]	2.413	1.215	2.236**	1.811*
[−1, +1]	4.010	2.934	3.995***	3.903***
[−2; 0]	3.333	2.464	3.255***	2.958***
[0; +2]	2.092	1.514	2.237**	2.427**

This table reports the event study results for the 75 largest alternative energy companies by market capitalization as of December 31, 2020, to the Dutch court verdict against Royal Dutch Shell, Exxon Mobil's loss in a proxy fight, and Chevron's investors backing further emissions cuts on May 26, 2021. Cumulative abnormal returns are estimated over multiple event windows and daily abnormal returns are obtained using a market model event study with a 126-trading day estimation period. The respective Datastream country index of the relevant company's country of origin is used as the market portfolio. Average cumulative abnormal returns (ACARs) are tested for statistical significance using the standard *t*-test, the parametric Boehmer et al. (1991) test procedure (the BMP-test), and the nonparametric Wilcoxon rank-sum test (Wilcoxon test). Differences between European and North American alternative energy companies and alternative energy companies from other countries are tested for significance using the parametric two-sample *t*-test and the nonparametric Mann–Whitney-U-test

*, **, *** denote statistical significance at the 10, 5, and 1% level, respectively

is the alternative energy industry. It is possible that firms which are already operating in the sector associated with the transition to low-emissions energy production stand to gain, particularly against the backdrop of increased climate litigation and activism risk for oil and gas companies. Investors may reallocate their capital from oil and gas firms towards these companies, leading to subsequent valuation gains for these firms.

Table 6 Regression results for the alternative energy companies

	Dependent variable			
	$CAR_{i,[-1;+1]}$			$CAR_{i,[-2;+2]}$
	(1)	(2)	(3)	(4)
Europe or North America	0.040***	0.031***	0.040	0.019
	(3.971)	(2.895)	(0.619)	(1.491)
ESG Score			−0.001	
			(−0.979)	
Europe or North America × ESG Score			0.000	
			(0.249)	
Firm-specific controls				
ln(*Total Assets*)		−0.007*	0.000	−0.013***
		(−1.737)	(0.038)	(−2.689)
Leverage		−0.021	−0.041	0.018
		(−0.906)	(−1.136)	(0.616)
Return on Assets		−0.001	−0.001	0.001
		(−1.480)	(−0.595)	(0.554)
Constant	−0.008	0.154*	0.041	0.269**
	(−1.086)	(1.738)	(0.222)	(2.611)
N	75	70	36	70
Adjusted R^2	0.168	0.292	0.337	0.159
F-value	15.77***	5.432***	2.296*	3.633***

This table reports the ordinary least squares regression results for the sample of alternative energy companies using $CAR_{i,[-1;+1]}$ and $CAR_{i,[-2;+2]}$ as the dependent variables. *Europe or North America* is a binary variable defined as one if the firm is headquartered in Europe or North America (i.e., the US or Canada), zero otherwise, *ESG Score* is a company's ESG score, *Total Assets* is a firm's total assets in US$, *Leverage* is a firm's ratio of total debt to total assets, and *Return on Assets* is a firm's return on assets, all as of 31 December 2020. Detailed variable descriptions are provided in the Appendix. All regressions are controlled for heteroskedasticity and robust *t*-values are given in parentheses

*, **, *** denote statistical significance at the 10, 5, and 1% level, respectively

In order to test this assumption, I examine the stock returns of firms classified as alternative energy companies by Refinitiv, using the same sample approach as for oil and gas companies, i.e., the 75 largest stock listed global companies by market capitalization as of December 31, 2020 (see Table OA - 3 in the Online Appendix).[16] The event study uses the same parameters as before and, mirroring the previous analyses, I divide the sample into European and North American firms and those located in other jurisdictions.

[16] Four companies (Wintime Energy (China), GCL-Poly Energy Holdings (Hong Kong), Super Energy Corporation (Thailand) and Century Wind Power (Taiwan)) were dropped from the 75 largest alternative energy companies due to poor stock data quality. The sample was subsequently extended to include the next four largest firms (i.e., rank 76–79).

The results of the event study are presented in Table 5. For the entire sample of alternative energy firms, positive abnormal returns are observed, which are significant during the $[-1,+1]$ and the $[0;+2]$ event windows (Table 5 Panel A), indicating that the returns are partially driven by the post-event period. Dividing the sample into European and North American alternative energy companies and those located outside these regions reveals that the overall results are exclusively driven by European and North American firms, with all event windows having significant positive abnormal returns. The ACAR reaches 3.25% during the $[-1;+1]$ event window (Table 5 Panel B), which is equivalent to a total abnormal gain of approximately US$ 6.36 billion in market value.

Examining the stock market reaction for companies outside of Europe and North America reveals a strikingly different picture. These firms generally experience negative returns, which are concentrated in the $[-2; 0]$ event window, where they reach a significant ACAR of -1.83% (Table 5 Panel C). In addition, the return differentials between alternative energy companies headquartered in Europe and North America and those headquartered in other regions are significant for all event windows (Table 5 Panel D).

In a similar manner as for the oil and gas companies, a multivariate OLS regression is used to identify the factors that influence the observed stock returns for alternative energy companies around May 26, 2021. The following regression model is used:[17]

$$\begin{aligned} CAR_{i,[-1;+1]} = {} & \gamma_0 + \gamma_1 Europe\ or\ North\ America_i \\ & + \gamma_2 ESG\ Score_i + \gamma_3 Europe\ or\ North\ America_i \times ESG\ Score_i \\ & + \gamma_4 \ln(Total\ Assets)_i + \gamma_5 Leverage_i + \gamma_6 Returnon\ Assets_i + \epsilon_i \end{aligned} \tag{6}$$

where $CAR_{i,[-1;+1]}$ is alternative energy company i's $[-1;+1]$ event window CAR and the other variables are in line with those for the oil and gas companies in Eq. 5 and are defined in the Appendix, while Table OA - 4 in the Online Appendix reports the summary statistics. The dependent variable differs from Eq. (5) as the event study results indicate that the CARs are significant during the $[-1;+1]$ event window rather than for the $[-2;+2]$ event window.

Table 6 reports the results of the regression analyses. Columns (1) through (3) follow the first three models in Table 4. The results of the first two regression models mirror the event study results, indicating that European and North American alternative energy companies benefited from the events on May 26, 2021, as indicated by the significant and positive coefficient for *Europe or North America*. The firm-specific variables largely lack significance, with only the coefficient for *ln*(*Total Assets*) being weakly significant and negative. In column (3) a company's ESG score and the interaction term between the ESG score and North American or European companies are added to the regression model. Including the ESG scores dramatically

[17] The variable ln(*Cash*) needed to be dropped from the equation due to a very high correlation (0.83) with ln(*Total Assets*), which resulted in multicollinearity issues (see also Table OA - 4 Panel C).

reduces the sample size to only 36 observations given limited data availability, allowing for limited inference from these results. Nonetheless, in this case, neither the coefficient for *Europe or North America* nor the coefficient for the interaction term *Europe or North America*×*ESG Score* are significant, potentially indicating no relationship between the ESG score and a firm's country of origin. Finally, the model in column (4) replicates the regression specification (without a firm's ESG score) using $CAR_{i,[-2;+2]}$ as the dependent variable in line with the analyses for oil and gas companies. In line with expectations and reflecting the event study results, the coefficient for *Europe or North America* remains insignificant. However, given the negative and significant coefficient for *ln*(*Total Assets*), it appears that larger alternative energy companies benefited less than smaller ones.

Overall, the analyses of the stock return patterns for alternative energy companies and firms operating in the oil and gas industry, suggest that investors may have reallocated some of their capital towards European and North American alternative energy firms. One reason investors may have done this is to hedge their exposure to European and North American oil and gas companies' increased climate litigation risk. However, it should also be noted that the stock price reaction to the events on May 26, 2021, differ significantly for oil and gas companies as well as alternative energy companies headquartered outside of Europe and North America. In these regions, oil and gas companies experienced positive returns, while alternative energy companies experienced negative ones. This indicates that climate litigation and activism have a differential effect on firms depending on their country of origin. While climate litigation and activism may have desirable effects in terms of emissions reductions for European and North American oil and gas firms and valuation gains for alternative energy companies, the lack in global coordination may lead to opposite effects for firms located in other regions.[18] It therefore seems as if investors potentially reallocate at least some of their capital to jurisdictions with a lower perceived risk of climate litigation and activism. This could be seen as an extension of the concerns raised by Bartram et al. (2022) of firms shifting their emissions intensive production activity to regions with lower emissions regulation.

6 Conclusion

Climate litigation and activism is gaining prominence, with many companies in emissions intensive industries facing increasingly stringent emissions regulation, while investors demand a more proactive approach to emissions reductions. These trends are exemplified by the events on May 26, 2021, when a Dutch court ordered

[18] It should be noted that governments backtracking on their climate commitments can have the opposite effect for alternative energy companies. Ramiah et al. (2013) provide an example of this when the Australian government submitted its carbon reduction range to the Copenhagen Accord on January 27, 2010. As there was no strong commitment for a reduction of more than 5% of its year 2000 emissions, this led to significant decline in the stock prices of Australian alternative energy companies.

Royal Dutch Shell to drastically cut its emissions, while shareholders at Exxon Mobile and Chevron voted against the incumbent managements' interests and set these companies down a path towards more significant emissions reductions. These events do not only have large implications for these companies but will also affect other firms operating in the oil and gas industries.

In this study, I examine the impact of these events on the stock prices of the largest global oil and gas companies. The results suggest that the effect on companies' stock price differs depending on the firm's country of incorporation. While European and North American oil and gas companies experience significant negative average abnormal returns of up to − 2.14%, firms located in other jurisdictions record small and weakly significant gains. These return patterns suggest that investors may move at least some of their capital towards jurisdictions with lower perceived risk of climate litigation and activism. However, it should be noted that higher ESG scores seem to mitigate the negative impact on stock prices for European and North American firms, especially in cases where firms have robust emissions policies in place. This indicates that adhering to a higher ESG standard through CSR activities, particularly those that focus on emissions, can protect the valuation of oil and gas companies to a certain degree.

Yet, while the results show stock prices of European and North American oil and gas companies declined, those of alternative energy companies increased. This, in turn, suggests that climate litigation and activism can also have a positive impact, particularly for companies that are operating in a sector associated with the decarbonization of the energy sector. However, the results show the opposite effect for companies headquartered outside of Europe and North America. In these regions, oil and gas companies recorded positive returns, while alternative energy companies experienced a decline in their stock prices. This suggests that climate litigation and activism can have varying impacts on firms depending on a firm's country of origin.

The results have potential implications for firms and their management as well as for regulators and policy makers. For managers, it becomes increasingly important to understand the potential risks associated with the increase in climate litigation and activism, particularly if the firm is operating in an emissions intensive industry. Proactively engaging in CSR activities, and thereby improving a firm's ESG score, with a focus on environmental aspects and greenhouse gas emissions in particular, may mitigate the potentially adverse effects of climate litigation and activism on firm value. In addition, transparency and clear communication about emissions reduction goals appear to be beneficial, even though it seems as if some oil and gas majors are now backtracking on this to a certain degree (The Guardian 2023b). While this silent backtracking may offer some short-term benefits in the form of cost savings, it is likely to lead to an increase in climate litigation risk in the future.

From a regulatory and policy maker perspective, the results highlight the importance of a globally coordinated approach towards climate change regulation. In case the fragmentation of the local regulatory and legal environment intensifies due to the way climate litigation and activism is impacting different jurisdictions, this may lead to the unintended consequence that firms and investors may reallocate resources and

capital towards jurisdictions with less stringent emissions regulations, thereby ultimately undermining attempts to curb global greenhouse gas emissions.

Appendix

Variable definitions

Variable	Definition	Source
Main variables		
Europe or North America	Binary variable equal to one if a firm is headquartered in Europe or North America, zero otherwise. A firm is considered to be from Europe or North America if it is headquartered in Austria, Canada, Denmark, France, Germany, Hungary, Italy, Norway, Poland, Portugal, Romania, Spain, Sweden, the United Kingdom, or the United States	Refinitiv
ESG Score	A firm's ESG score (TRESGS) as of December 31, 2020	Refinitiv
Environmental Score	A firm's environmental pillar score (ENSCORE) as of December 31, 2020	Refinitiv
Social Score	A firm's social pillar score (SOSCORE) as of December 31, 2020	Refinitiv
Governance Score	A firm's governance pillar score (CGSCORE) as of December 31, 2020	Refinitiv
Component variables and selected underlying data points		
Emissions Score	A firm's emissions score (TRESGENERS) as of December 31, 2020. One of the three components of the Refinitiv's environmental pillar score	Refinitiv
Environmental Innovation Score	A firm's environmental innovation score (TRESGENPIS) as of December 31, 2020. One of the three components of the Refinitiv's environmental pillar score	Refinitiv
Resource Use Score	A firm's resource use score (TRESGENRRS) as of December 31, 2020. One of the three components of the Refinitiv's environmental pillar score	Refinitiv
CSR Committee	Binary variable, defined as one if the firm has a CSR sustainability committee (CGVSDP005) as of December 31, 2020, zero otherwise	Refinitiv
Climate Action	Binary variable, defined as one if the firm supports the UN Sustainable Development Goal 13 (SDG 13) Climate Action (CGVSDP054) as of December 31, 2020, zero otherwise	Refinitiv
CO_2-to-Revenues	A firm's total CO_2 equivalent emissions divided by revenues in million US$ (ENERO03V) as of December 31, 2020	Refinitiv

Variable	Definition	Source
Firm-specific controls		
Total Assets	A firm's total assets in US$ as of December 31, 2020	S&P Capital IQ
Leverage	A firm's total debt in US$ divided by its total assets in US$ as of December 31, 2020	S&P Capital IQ
Return on Assets	A firm's return on assets as of as of December 31, 2020	S&P Capital IQ
Cash	A firm's total cash and cash equivalent items in US$ as of December 31, 2020	S&P Capital IQ

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Declarations

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