Financial Market Response to Climate Litigation Against Corporations

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Abstract

We systematically analyse the financial market response to climate litigation. We construct a global database of over 115 climate change related lawsuits against corporations listed in the US and Europe during the period 2005–2021. We find evidence of small financial market responses in specific cases where they are most expected while in general, stock prices of defending firms are not affected. Specifically, we find negative abnormal returns following the filing of climate litigation cases against Carbon Majors, in the order of -0.44% after controlling for other market-wide impacts on share prices. We also find significant negative abnormal returns following the announcement of unfavourable procedural and final decisions, of -1.50% after controlling for market-wide impacts on share prices and corresponds to an average economic loss of 172 million. Further analysis indicates market reactions against climate litigation filings are strengthening in recent years. These findings suggest that climate litigation risk is becoming part of climate-related financial risk.

1 Introduction

In recent years, communities and individuals adversely affected by climate change are increasingly turning to courts to hold governments and high emitting corporations to account. The has led to the development of a growing grey literature that seeks to raise awareness of climate litigation as a form of transition risk (NGFS; 2021). Such climate litigation risk acts as an amplifier exacerbating well-known physical and transition climate risks. Yet, our understanding of the financial costs associated with this litigation has been under-studied in the extant literature (Solana; 2020; NGFS; 2021). In particular, whether climate litigation affects the market valuation of listed companies is still a largely speculative question (Setzer; 2022).

Non-climate litigation risk and costs have dramatically increased in recent years and defendant corporation's stock prices have experienced statistically significant declines upon the filing of a lawsuit (Arena and Ferris; 2017). Yet, it is unclear, a-priori, if these general results hold for climate litigation for at least three reasons. First, arguably, it is only recently and only in some parts of the world where we have evidence that corporations and investors have begun to regard climate change as a material issue affecting business risk which could impact corporate performance or image (e.g., Krueger et al.; 2020). Indeed, one objective of climate litigation is to raise the profile of climate change and make climate considerations more prominent in all types of decision-making including operational, investment, and consumer decisions. Second, it is only recently that corporate climate litigation cases have begun to find success (Setzer and Higham; 2022). The tide started to turn in 2017 when, in *Lliuya v RWE*, a German appeals court deemed as admissible a Peruvian farmer's claim that higher water levels near his farm were caused by carbon emissions from *RWE*. Further, a groundbreaking judgement came in 2021 when in *Milieudefensie v Royal Dutch Shell*, the District Court of the Hague ruled that *Royal Dutch Shell* has to reduce its carbon emissions in 2030 by 45% because of a violation of the duty of care under Dutch law. Third, the cost-benefit trade-off in climate litigation is often unclear. As will be discussed, corporate climate litigation is often strategic and aims to raise public awareness and induce behavioural change of decision-makers (Setzer and Higham; 2022). In some cases, plaintiffs may be seeking orders or injunctions rather than financial awards. In othrs, requested damages may be limited to small or symbolic sums, in as in the *Lliuya v. RWE* case discussed previously.

This study is the first to conduct a comprehensive analysis on the financial market response to climate litigation against corporations for a large sample of individual listed corporations including Carbon Majors, and we make several contributions to overcome some important challenges. One major barrier to understanding how market participants respond to climate litigation risk is the lack of agreed definition or classifications

of climate litigation cases against corporations. These cases are extremely varied, for example, in terms of legal avenues, types of actors, litigation objectives, and jurisdictions (Peel and Osofsky; 2020; Setzer and Higham; 2022). They can range from cases seeking to penalise illegal activities such as deforestation, disincentivise companies from continuing with high-emitting activities, prevent "green washing" by questioning the credibility of 'net zero' plans , or force the management and disclosure of both physical and transition risks by financial service providers. Examining the financial market response to any one event in isolation may therefore have low external validity.

To overcome this barrier, we construct a new data set that records lawsuits filed against major publicly listed emitters that cite climate science, climate policy, emissions reductions, or efforts to adapt to the consequences of climate change as significant factors. To do so, we collect a comprehensive sample of climate litigation cases against corporations drawing on several databases (see Section 3.2). Our data set includes information on over 115 climate-related lawsuits filed against corporations listed in either the US or Europe over the period 2005-2021, representing a near universe of corporate litigation cases in these jurisdiction during that period. We identify 98 corporations that were targeted, the majority of them being Carbon Majors (e.g. Energy, Utilities, and Materials) but also increasingly other sectors such as Industrials, Consumer Discretionary (including Automobile) and Financials. The data also includes; the filing date, decision date, target corporation, characteristics of the case, characteristics of the target corporations, and stock prices of the target corporations surrounding the relevant dates. Using this comprehensive data set and multi-event study regressions, we are able to estimate an aggregate market-wide effect of climate litigation on stock prices by estimating cumulative abnormal returns. In other words, our results can be interpreted in a more general context. The aim here is to better understand the societal impact of climate litigation from diverse types of cases against diverse sets of corporations. Our estimates thus provide the first comprehensive empirical assessment of the impact of climate litigation on corporations' stock market performance.

While estimating an aggregate effect is a central aim, given the large heterogeneity of climate litigation cases against corporations, we expect the financial market response varies by particular characteristics or subgroups of filings and decisions. Grouping all cases together may mask the financial market response at a more granular level. To test these variations, we conduct a thorough legal analysis to classify cases by five key features: whether it involves a novel form of claim or a claim in a novel jurisdiction; whether the case was filed before a court of law; whether the case shares common features with similar cases filed in a similar time window which may therefore be of greater cumulative interest to investors; whether the case if filed by

a government body; and whether the case involved damages. Decisions, which may include final judgements, significant interim judgements or procedural matters, or settlement decisions, are classified as either positive or negative for the targeted corporation. We also label cases against Carbon Majors, as defined by Heede (2014). We test for effects for each of these subgroups and compare results.

Another major barrier to credibly estimating the financial market response to climate litigation relates to the implementation of event study analysis methods for multiple events. We estimate *value-weighted* cumulative average abnormal returns (CARs) because equal-weighted CARs would place too much weight on small stocks, which detracts from our motivation of understanding the aggregate market-wide impact of climate litigation. As this is not possible with standard event study packages within statistical software, this requires us to write our own code. Another econometric issues relating to muti-event study relates to using t-tests based on equal variances for all stocks. This is problematic because it gives too much importance to very volatile stocks. Instead, we take into account the variance of each stock's own returns to ensure we do not artificially inflate the significance of very volatile stocks in our sample. Again, this is not possible with standard event study packages. In general, event study results can be sensitive to the choice of event window, test statistics, and treatment of extreme values. We consequently make extensive effort to minimise the chances that our results are biased.

Our main result is that, on average, there is a significant negative response at the 95% level to filings against Carbon Majors of -0.44% and to negative decisions after 2019 of -1.23%. Further, we find a negative response, on average, to *all* filings of -0.30%, to filings deemed to include novel legal arguments of -0.49%, and for court judgements with negative outcomes for corporations of -0.98%, all at the 90% significance level. We find no significant financial market response, on average, to court judgements that had positive decisions for targeted corporations and to filings that either: are made in a court of law, involve a government plaintiff, have accumulated legal interest in the case, or include damage claims. This result suggest climate litigation is most material to corporations that are considered Carbon Majors, in cases that include novel legal arguments, and in court judgements that have negative decisions for corporations (i.e., plaintiffs win, or the court allows a case to proceed beyond preliminary procedural hurdles). We also identify interesting temporal dynamics in the financial market response to climate litigation. For both all filings and when only considering cases against Carbon Majors, we see that the financial market response has higher statistical significance after 2019 as opposed to before this date. This phenomenon is also evident for all negative decisions. Overall, this suggests climate litigation is gaining traction as climate-related financial risk.

In addition to estimating aggregate effects, we also estimate the cumulative abnormal return for each specific climate litigation case and for each corporation in each case. While this is also a major contribution to the empirical evidence base on this topic, we urge caution when interpreting individual results as climate litigation filings are very idiosyncratic and thus lack external validity. For example, some filings may coincide with other major confounding effects, which for an aggregate analysis can be assumed to be distributed randomly. Some events are the first that a corporation has ever faced whilst others could be one of many cases the corporation has faced over its history. Furthermore, some filings may contain strong legal arguments whilst others are expected to be easily dismissed in court. This is one motivation for focusing on aggregate results.

The paper proceeds as follows. Section 2.1 discusses the relevant literature around impacts of climate litigation, wider environmental litigation, financial market responses to climate related events, and litigation in general that we build on, and highlights the gaps this paper addresses. In Section 2.2, we briefly describe the trends in corporate climate litigation which are growing rapidly in case numbers, spreading geographically, and are highly heterogeneous in nature. In Section 3.1, we describe the empirical strategy and in Section 3.2 we describe the method used to collect our new data set as well as our use of other data sources. In Section 4.1, we turn to estimating the aggregate impact of climate litigation filings (separately and jointly) and judgements on defendant corporations' stock prices. We report the robustness of these results in Section 4.2. In Section 4.3, we then assess the financial market response to each specific case before discussing the magnitude of the response to climate litigation in Section 4.4. Section 5 summarizes and discusses the evidence in light of the broader climate litigation impacts literature. We conclude by considering some of the potential policy implications of our findings and directions for future research.

2 Climate Litigation Against Corporations

2.1 Related Literature

Solana (2020) identify several potential outcomes of corporate climate litigation including corporate behavioural change; public opinion or reputational damage; further litigation; increased direct financial costs including legal, admin, fines, damages; and increased indirect financial cost included increased leverage and insurance premia. Yet, quantitative assessments of the direct and indirect economic costs and financial impacts of climate litigation are scant (Setzer; 2022), including on the financial market impacts, where we seek to fill the evidence gap. Even if strategic litigation is one tool that enables agents to impact corporate

behaviour by increasing reputational and litigation costs (Hong and Kacperczyk; 2009), understanding the financial impacts of these claims is critical.

Second, we contribute to a wider literature on environmental lawsuits and their impacts on corporate behaviour and outcomes. Both actual and potential environmental lawsuits were found to lead to falls in share prices, notably during the Volkswagen emissions scandal of 2015 ('Dieselgate'). Nunes and Park (2016) finds the disclosure of the breach by the Environmental Protection Agency lead to a loss in market value of around 30 per cent in several days. They conclude that the impact of strategic environmental litigation forcing disclosure can be severe, as it unveils greenwashing, which in turn is found to lead to additional litigation, losses in reputation, consumer trust, and corresponding market share. Wood et al. (2018) documents that Dieselgate had significant spillover effects, with American automobile companies all experiencing falls in their share price. Furthermore, following Dieselgate, share prices dropped in response to failures to meet environmental standards, reflecting heightened scrutiny of the automotive industry by investors (ibid). Liu et al. (2020) instead examine a large sample of 588 US environmental lawsuits between 2000-2015, and find that the negative stock market response is worse for corporations with superior corporate social responsibility reputations and somewhat improved by lobbying. Liu (2020) find that the financial market response is less favourable to environmental lawsuits with a Democrat appointed judge.

Third, we contribute to the relatively new literature exploring the financial market response to climate policy and other climate related events. For example, studies have explored financial responses to announcements related to the German Climate Levy (Sen and von Schickfus; 2020), the Australia Kyoto Protocol ratification (Nguyen and Phan; 2020), the Trump election (Aklin; 2018), the signing of the Paris Agreement (e.g. Monasterolo and de Angelis; 2020; Kruse et al.; 2020; Pham et al.; 2019), environmental regulation announcements in Australia (Ramiah et al.; 2013) and the collapse of EU Emissions Trading System prices in 2006 (Bushnell et al.; 2013). Several studies estimate responses to climatic events. For example, Choi et al. (2020) examine the impact of abnormal local temperature shocks on stock prices, while Alok et al. (2020) study whether fund managers within a major disaster region overreact to large climatic disasters. In general, this literature finds evidence that climate change transition risk and physical risk is increasingly recognised by investors but climate litigation risk is yet to be quantified.

Lastly, we contribute new evidence on the effect of litigation on corporations in general. Duanmu et al. (2022) find that corporations less exposed *ex-ante* to litigation risk outperform those more exposed to litigation

risk. They argue this is due to investor inattention. Gande and Lewis (2009) show investors react negatively to litigation filings and that corporations in the same industry also suffer due to the anticipation of future litigation that consequently suppresses the event day reaction. In the real economy, corporations facing litigation face higher borrowing costs (Deng et al.; 2014), decrease their investment in innovation (Lin et al.; 2021), hold more cash in anticipation of settlements (Arena and Julio; 2015), and also reduce their capital expenditure (ibid).

2.2 Trends in Corporate Climate Litigation

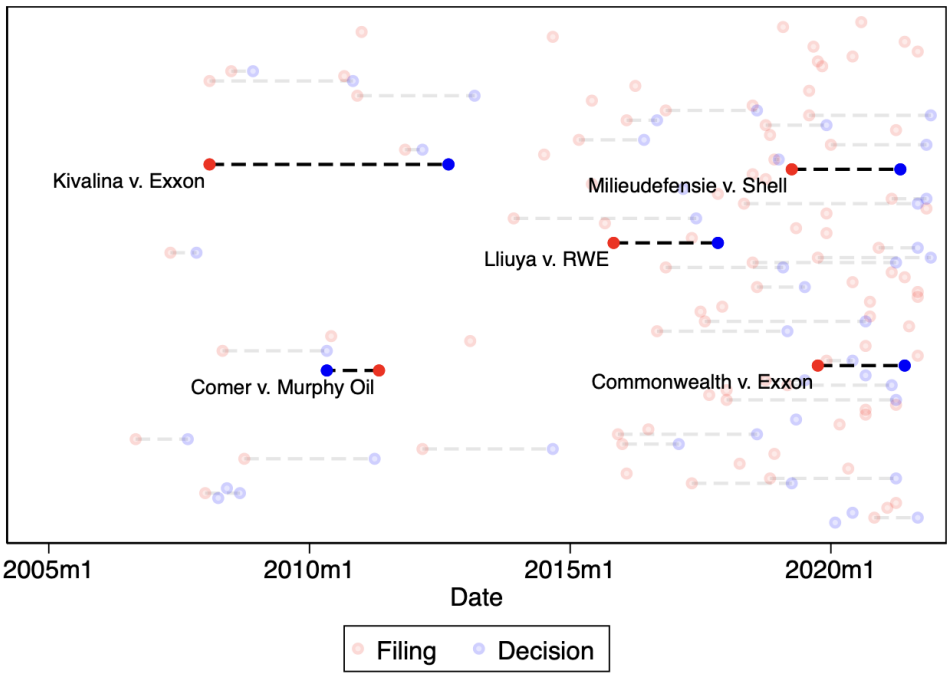
Climate litigation against corporations began in the mid-2000s and has been rapidly rising since 2015. This is part of a growing trend in lawsuits that cite climate science, climate policy, emissions reduction, or efforts to adapt to the consequences of climate change as a significant factor. Over 2000 of such cases have been filed globally between 1986 and 2022 by and against a variety of actors including subnational governments, corporations, financial institutions, shareholders, regulators, NGO,s and individuals. The large majority of these cases are filed against governments (Setzer and Higham; 2022).

In general, the development of climate litigation can be split into two distinct phases. First, in the 2000s, a small set of lawsuits against oil, gas and electric companies was tested in North American courts. Much like in previous major controversies like tobacco and asbestos that sued corporations for compensation, earlier climate related litigation centred around damages and adaptation costs. For example, *Comer vs Murphy Oil* was brought by residents and property owners from the Mississippi Gulf Coast seeking damages related to Hurricane Katrina. In *Kivalina v Exxon*, a coastal Alaskan resident facing the threat of a rising sea level filed a case seeking financial damages for the potential relocation. Victims claimed that the actions of Carbon Majors exacerbated damages they suffered as a result of extreme weather events. These early cases were ground breaking and drew much attention but were ultimately unsuccessful, partly because they were unable to rely on advancements in climate science and in particular attribution science that came a decade later (Marjanac and Patton; 2018; Stuart-Smith et al.; 2021).

Corporate climate litigation activity died down following the unsuccessful outcomes of the earlier high profile cases (see Figure 1). Momentum picked up again around 2015 due to a number of factors. This included the identification of 90 Carbon Majors responsible for the majority of global carbon emissions by Heede (2014). These so-called Carbon Majors are corporations that emitted large historical carbon emissions and are collectively responsible for 63% of the carbon dioxide and methane emitted between 1751 and 2010.

Furthermore, the Paris Agreement was signed in December 2015 that sent a credible signal that governments will seek to limit global carbon emissions. Advances in attribution science also equipped plaintiffs with powerful evidence that they can bring to the courts (Ganguly et al.; 2018)[1] and a small number of high profile cases began to have success such as *Milieudefensie et al. v. Royal Dutch Shell plc.* in 2021.[2]

Figure 1: Climate litigation filings and decisions against corporations in the US, UK and EU (2005-May 2022)



Notes: Based on data from Climate Change Laws of the World and Sabin Center Climate Case Chart.

Analysis of climate litigation trends also show that climate related litigation is becoming increasingly strategic (Setzer and Higham; 2022). Cases are brought with the explicit aspiration to influence corporate behaviour and strategies in relation to climate change, rather than compensation motives. For example, in *Lliluya v*

[1]Despite this, not all cases used the state-of-the-art scientific evidence already available at the time of the filings (Stuart-Smith et al.; 2021).

[2]The groundbreaking judgement by the District Court of The Hague confirmed that *Royal Dutch Shell* had a corporate duty of care and due diligence obligations under national tort law. The decision was also grounded in human rights duties enshrined in international and EU law. Based on those grounds, the court interpreted the corporations duty of care towards the inhabitants of the Netherlands as requiring it to mitigate climate change by reducing the carbon dioxide emissions resulting from its global operations by at least 45% by 2030, compared with 2019, not just to the emissions for which the company and its suppliers were directly responsible, but also to those produced when consumers burn the corporations oil. *Royal Dutch Shell* has appealed. Pending a new decision, though, it must comply.

RWE, plaintiffs are seeking to cause reputational damage and to change public opinion.[3] The legal avenues used to bring forward cases are also diversifying and evolving rapidly, ranging from misleading investors regarding climate change risks, overstating recoverable reserves, and abuse of human rights, consumer protection, fraud, and fiduciary duties, respectively. An example of the latter is a case in 2018 whereby *Enea* was sued by Client Earth for failing on their fiduciary duty, claiming directors are not acting in the best interest of investors because the coal plant they were planning to build would ultimately be a stranded asset.

Several cases have been brought forward against Carbon Majors for failing to properly inform the public of the risks of climate change at a time when they were aware of them. Such cases include the case of *Commonwealth v. Exxon*, in which the Massachusetts Attorney General started enforcement proceedings against the company for failing to disclose climate change risks, failing to disclose its products' impacts on climate change, and greenwashing.

A major case made on human rights ground is *Milieudefensie v. Royal Dutch Shell* whereby the plaintiff claimed *Royal Dutch Shell* has a duty of care towards Dutch citizens under the country's civil code and the European Convention on Human Rights, which guarantees the right to life. By failing to take adequate steps to avoid dangerous climate change, *Royal Dutch Shell* is unlawfully endangering lives. To summarise these developments, the IPCC 6th Assessment Report recognises that climate litigation is now a powerful force in climate governance in constraining both public and private entities and in shaping structural factors such as the beliefs and institutions around climate governance (IPCC; 2022).

Moreover, environmental, social and governance (ESG) issues are progressively becoming a critical part of mainstream investment decision making. Investors are increasingly concerned about the negative climate fallout of their investments (Krueger et al.; 2020). In addition to climate related physical risk, policy risk, and other transitional risks, some corporations increasingly consider climate litigation to pose a material risk, according to financial-risk disclosure statements filed annually to the US Securities and Exchange Commission (SEC; 2022). Transparency on these is important to enable financial markets to align investments with long-term climate goals and ensure the stability of financial institutions and financial markets. Yet, the impact of climate change litigation is still an under-explored question. Little is known at this stage about the costs

[3]Here, a Peruvian farmer and mountain guide sued *RWE*, the European Union's largest emitter, for potential damage to their city due to the increased risk of flooding caused by increasing glacial meltwater. Heede (2014) provide evidence that 0.47% of all historical carbon emissions arise from *RWE*'s operations. Mr Luciano Lliuya's lawyers are consequently suggesting the company should pay 0.47% of what it would cost their client to protect his property. The case was initially dismissed, but in 2017 a German appeals court deemed it admissible. Evidence is currently being gathered for what legal scholars believe will be a landmark test of how well various forms of attribution science hold up in court.

and impacts of climate litigation against corporations, and the extent to which this type of strategy will lead to transformative legal or social change.

3 Methodology and Data

We now discuss our methodology to estimate the financial market reaction to climate litigation against listed corporations and the data we obtain to do so.

3.1 Financial Market Response to Climate Litigation

We estimate abnormal stock returns for defendant corporations following an event study methodology, taking the difference between actual and expected stock returns. To calculate the latter, we use the market model specific to each region (North America and Europe) as is standard in event studies (Campbell et al.; 2012). In this approach, an important assumption is that financial markets are efficient and quickly incorporate new material information. Abnormal returns consequently provide evidence of investors incorporating new information into the price of a stock. Specifically, we assume the following:

$$R_{jt} = \alpha + \beta MKT_t + \epsilon_{jt}, \tag{1}$$

where R_{jt} is the realised return for corporation j at time t, α is the intercept, MKT_t is the return of each region's market portfolio, and ϵ_{jt} is the error term with expectation zero. Despite its simplicity, the variance in abnormal returns is not reduced to a significant degree when using less parsimonious models (Campbell et al.; 2012, p.154-156). Indeed, this is also true in our sample. We find the 3-factor model of Fama and French (1993) does not substantially lower the standard deviation of abnormal returns compared to the 1-factor market model. As a robustness check, we also estimate abnormal returns using the 3-factor model with an additional oil price factor.

The expected event day ($t = 0$) return for corporation j is:

$$E(R_{j0}) = \widehat{\alpha} + \widehat{\beta} MKT_0. \tag{2}$$

We define the abnormal return, A_{j0}, as the realised return minus the expected return, that captures the

financial market reaction to unexpected events on the event day:

$$A_{j0} = \epsilon_{j0} = R_{j0} - \widehat{\alpha} + \widehat{\beta} MKT_0. \tag{3}$$

We assess abnormal returns over multiple days - known as the event window. We define the cumulative abnormal return between the beginning (τ_1) and end (τ_2) of the event window as:

$$CAR_j(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2} A_{jt}. \tag{4}$$

When jointly assessing the reaction to multiple events for multiple corporations of different sizes, one question is how to aggregate over cumulative abnormal returns. Putting equal-weights on CARs would place too much weight on small stocks, which detracts from our motivation of understanding the aggregate market-wide impact of climate litigation. Instead, we propose to weight abnormal returns by the log of each stock's most recently available market capitalisation (common shares outstanding multiplied by annual closing price), such that the *value weighted*-average cumulative abnormal return is calculated as:

$$\overline{CAR}(\tau_1, \tau_2) = \sum_{j=1}^{N} w \cdot CAR_j(\tau_1, \tau_2), \tag{5}$$

where $\overline{CAR}(\tau_1, \tau_2)$ is the weighted-average cumulative abnormal return between day τ_1 and τ_2 for stocks with the weight denoted by w. The *value-weighted* cumulative average abnormal returns (CARs) is our baseline specification and we show that results are sensitive to the weighting in the robustness section where non-weighted CARs are shown for comparison. In terms of implementation, estimating *weighted* cumulative average abnormal returns (CARs) is not possible with standard event study packages within statistical software, which thus requires us to write our own code and brings a number of challenges that we explain later.

The parameters $\widehat{\alpha}$ and $\widehat{\beta}$ in Eq. 1 are estimated via time-series OLS regressions of excess returns on the market model using region-specific factors over the 520 day window (-540, -20) relative to the filing or decision date (0). This period is known as the estimation window. Because the estimation window ends 20 days prior to day 0, anticipation effects will likely not bias the loadings on the market model for the event window. The abnormal returns A_{j0} in the event window are then assessed for statistical significance relative to the distribution of abnormal returns A_{jt} in the estimation window.

In our main specification we report the Patell test (Patell; 1976). This test is, in essence, a t-test with unequal variances combined with an out-of-sample forecast error correction. Unequal variances means that the test takes into account the variance of each stock's own returns and therefore gives lower weight to very volatile stocks. For example, the returns to coal stocks such as *Arch Resources* have much larger volatility compared to larger corporations such as *ExxonMobil*. As a robustness check, we also examine a t-test both with equal and unequal variance.

We also report a two-stage regression-based approach, where we regress excess abnormal returns (the first stage) on a dummy variable which is one during all the corporation-event windows (the second stage). The regression uses robust standard errors clustered both at the corporation-event level to take into account serial correlation and at the corporation-period level to take into account that we have duplicated observations for corporations with events with overlapping estimation periods. We report these robustness results in Section 3.

It is not clear, a-priori, whether there is anticipation in climate litigation filings and it is unlikely in the case of judgements (the decision date may be anticipated but not the outcome). Thus, we gauge the market reaction over three event windows; a two-day CAR with window (0,1); a 10-day CAR with window (-5, 5); and a three-day CAR with window (-1,1). This accounts for the possibility that the news was leaked and investor reaction was delayed, whilst still maintaining good statistical power (MacKinlay; 1997). We choose to focus on the (-1,1) event window to capture the immediate market response to the filing or judgement (given the relatively high efficiency of the US and EU stock markets) while minimizing potential confounding effects of other events.

3.2 Data

We now outline the climate litigation data and financial data used in this paper.

Climate Lawsuit Sample Selection and Data Collection

As climate litigation is a relatively new phenomenon, our objective is to maximise the sample size in order to improve the external validity and statistical power of our analysis. Our main source of data from outside the US is the Global Litigation database maintained by the Sabin Center for Climate Change Law, in partnership with the Grantham Research Institute on Climate Change and the Environment and other institutional partners. Our main source of data for cases filed in the US is the US Litigation database maintained by the Sabin Center on Climate Change Law in partnership with Arnold and Porter. Given we assess the impacts

on stock prices, we restrict our sample to cases involving publicly listed corporations as defendants. In the Climate Case Charts, cases are identified by relying on a) the classification of the parties in non-US cases in the Climate Change Laws of the World database, maintained by the Grantham Research Institute on Climate Change and the Environment in partnership with the Sabin Center, b) previous classification of the parties in US cases filed until 2016 by McCormick et al. (2018) and c) original classification of previously unclassified US cases. All sources take the narrow approach to defining climate litigation, that is, they includes only cases before judicial and quasi-judicial bodies that involve material issues of climate change science, policy, or law. Cases where climate change is only incidental to main issues are excluded.

From these sources, we start with 85 climate litigation cases involving publicly listed corporations with headquarters outside of the United States and 67 cases involving publicly listed corporations with headquarters in the United States filed since 2016. We complement these cases with an additional 44 cases made against listed companies identified by McCormick et al. (2018). A number of exclusions are made. We systematically drop cases brought by corporations against third parties and focus on cases where corporations are defendants. Cases where corporations are involved as intervening forces are also excluded, as are cases where corporations are claimants (i.e. those brought in retaliation against city and state officials). We drop 2 cases involving defamation and 2 cases involving the misuse of commercial information in the context of acquisitions, since they are quite different to all other climate litigation cases in our data set. We exclude 23 cases where we lack key information. Of the 126 cases where companies are listed in the US and Europe, we identify 115 cases where we can precisely define a filing date and 75 cases where we can precisely define a significant decision being handed down. We define a significant decision as cases where there has been a merits decision or where there has been a significant decision on admissibility.

Our final sample includes, for filing dates, 309 corporation-event observations between 20/09/2006 to 09/11/2021 in the US (223), UK (49), and wider Europe (38). In terms of industries, the majority of corporations belong to Energy, Utilities, Consumer Staples, Materials, with some in Industrials, Consumer Discretionary, Financials. In terms of judgements, our data set records 75 cases with decisions that translates to 107 corporation-event observations between 14/11/2005 to 16/12/2021, with 58 being a positive judgement for the corporation and 49 being negative.

Climate Lawsuit Characteristics and Variable Construction

From the sample of cases described above, we review the details of each company named in the complaint. Where one or more of the companies are listed by Heede (2014) and the Climate Accountability Institute, we classify the case as a Carbon Major case. Overall, 52 of the cases identified are classified as Carbon Major cases.

For case filings, we then use expert legal judgement to determine the following information for each case:

1. Did the case involve a novel form of claim and/or a claim in a novel jurisdiction?
2. Was the case filed before a court of law or filed before an administrative tribunal or quasi-judicial body?
3. Might the case be of cumulative interest when considered alongside other similar cases?
4. Did a sub-national government or NGO/Individuals file the case?
5. Did the case involve damages or civil penalties?

In particular, for assessing the novelty of claims, we investigate three factors. First, whether a novel legal argument is made: we classify the legal arguments as novel in cases such as *Milieudefensie v. Shell*, in which claimants relied on business and human-rights standards to argue that a corporation has an obligation to reduce carbon emissions from its global operations, and also in cases such as *County of San Matteo v. Chevron*, one of the earliest cases in which the Carbon Majors research by Heede (2014) was used by US subnational governments to sue one or more of the Carbon Majors. Second, we consider whether a novel argument (i.e., applied in only one or two cases globally) was applied in a new jurisdiction for the first time. Third, we consider whether a novel argument (i.e., applied in only or two cases globally) was applied against a new industry, as in the case of *Deutsche Umwelthilfe (DUH) v. BMW* and *Deutsche Umwelthilfe (DUH) v. Mercedes-Benz AG*.

For case decisions, we classify decisions simply based on whether they had a positive or negative outcome for the targeted corporation(s).

Financial Data

We obtain the daily closing price P_{jt}, stock-split adjustment factor AF_{jt}, and daily total return factor (including cash equivalent distributions, reinvestment of dividends, and the compounding effect of dividends

paid on reinvested dividends) TRF_{jt} for each common stock in North America and Europe that has had a climate litigation case filed against them over our sample period between 1st January 2005 and 31st December 2021 from Compustat North America and Compustat Global. Following Chaieb et al. (2021) and Ramelli et al. (2021), for stocks with multiple listings, we identify the primary listing and the exchange where most volume is traded for the common stock, and further cross-reference the returns with The Center for Research in Security Prices (CRSP) for North American stocks and Yahoo! Finance for all stocks in the sample. We collect daily exchange rates from IBES and convert all prices to US dollars. We then calculate the adjusted daily closing price as:

$$AP_{jt} = (\frac{P_{jt}}{AF_{jt}}) \times TRF_{jt}. \tag{6}$$

Daily stock returns are then $R_{jt} = (AP_{jt} - AP_{jt_{-1}})/AP_{jt_{-1}}$. Due to volatile small-cap stocks in our sample, we winsorize returns at the 0.5% level.

We obtain daily regional returns for the risk-free rate, market, size, and value risk factors from Ken. French's Data Library for North America and Europe. We also obtain the daily closing price for a barrel of crude oil (specifically, WTI spot Cushing in US dollars) from Refinitiv Datastream and calculate simple returns similar to our measure of daily stock returns.

4 Results

We now explain our results. In Section 4.1, we report the average financial market response to climate litigation and the robustness of these results in Section 4.2. We then turn our attention to specific climate litigation cases in Section 4.3 where we report the financial market response to each corporation-case observation in our sample. In Section 4.4, we provide back-of-the-envelope calculations of the economic magnitude of our estimates.

4.1 Aggregate Response to Climate Litigation Cases

Heterogeneity in the Financial Market Response

We expect the effect of litigation, if any, to depend on various characteristics that our comprehensive data and legal analysis can provide insight on. We first focus on this heterogeneity and, in particular, on Carbon Majors.

Panel A in Table 1 shows the cross-sectional heterogeneity in the financial market response to climate litigation filings. We identify a negative response, on average, to cases against Carbon Majors of -0.44%. This response is statistically significant at the 95% level for cases made after the 1^{st} January 2019. We also identify a negative response, on average, to cases against all corporations of -0.24% but this is only statistically significant for cases made after the 1^{st} January 2019 and at the 90% level. Interestingly, we also identify a negative response, on average, to cases deemed to include novel legal arguments against corporations of -0.49% for all cases and -0.63% for cases only involving Carbon Majors, both statistically significant at the 90% level.

We identify no significant financial market response, on average, when assessing only cases that are filed in a court of law, that involve a government plaintiff, have cumulative interest in the case, or include damage claims, respectively. This null result holds true regardless of whether we assess all corporations or only Carbon Majors. Overall, Panel A supports claims that climate litigation cases are more salient to Carbon Majors.

Panel B in Table 1 then shows the cross-sectional heterogeneity of the financial market response to positive and negative climate litigation decisions. We identify a considerable negative response, on average, to negative decisions against all corporations that are made after the 1^{st} January 2019 of -1.50%. This is significant at the 95% level. We identify no significant response, on average, to negative decisions against all corporations prior to this date. Looking at Carbon Majors specifically, we identify a negative response, on average, to negative decisions against Carbon Majors of -1.49% which is statistically significant at the 95% level. We also identify some weak evidence that negative decisions against Carbon Majors made prior to the 1^{st} January 2019 had a larger response from financial markets, perhaps because they were significant events for setting a precedence for future climate litigation decisions. Overall, Panel B provides evidence of a large financial market response to negative decisions against corporations, although our sample for these decisions is small.

Table 1: The heterogeneous response to climate litigation.

	Cumulative return	CAAR (%)	Obs
Panel A: Filings			
All: before 2019	-0.62	-0.33	167
All: after 2019	-0.68	-0.24*	112
All: novel	-0.84	-0.49*	120
All: court of law	-0.14	0.03	235
All: government plaintiff	-0.03	0.17	170
All: interest	-0.70	-0.21	135
All: damages	-0.17	-0.07	210
Non-Carbon Majors	-0.58	0.03	85
Carbon Majors	-0.67	-0.44**	194
Carbon Majors: before 2019	-0.60	-0.44	118
Carbon Majors: after 2019	-0.78	-0.44**	76
Carbon Majors: novel	-1.27	-0.63*	34
Carbon Majors: court of law	-0.34	0.32	70
Carbon Majors: government plaintiff	-0.01	0.66	37
Carbon Majors: interest	0.49	0.37	33
Carbon Majors: damages	-0.05	0.33	51
Panel B: Decisions			
All: negative before 2019	-0.03	-0.02	10
All: negative after 2019	-1.23	-1.50**	17
Carbon Majors: positive	0.56	0.14	24
Carbon Majors: negative	-0.83	-1.49**	12
Carbon Majors: negative before 2019	-2.75	-2.15	2
Carbon Majors: negative after 2019	-0.45	-1.35	10

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

Notes: We report cross-sectional heterogeneity under our preferred specification. Our preferred specification uses an event window of (-1, 1), cumulative abnormal returns weighted by the log of each corporation's market capitalisation, excess returns winsorized at the 0.5% level, an estimation window of (-520, -20), and uses a market model to estimate expected returns. Our choice of test statistic follows Patell (1976, p.254-258). Obs is the number of corporation-event observations.

We then assess the average market-wide financial market response to climate litigation by including all cases (Carbon Major and non-Carbon Majors). Table 2 shows the cumulative average abnormal return for all filings and for positive and negative decisions against corporations. In Panel A, we identify a negative response, on average, to the filing of a climate litigation case against corporations of -0.30%. This identified effect is significant at the 90% level. In Panel B, which shows decisions that had a positive outcome for the targeted corporation, we find a positive response, on average, of 0.34% but this is not statistically significant. In Panel C, we identify a negative response to decisions that had a negative outcome for the targeted corporation of -0.98% that is significant at the 90% level. Overall, these results provide minor evidence that financial markets are incorporating climate litigation cases into their valuations of corporations.

Table 2: Aggregate financial market response to climate litigation filings and decisions.

Event time	Cumulative return	CAAR (%)
Panel A: All Filings		
(-1, 1)	-0.65	-0.30*
(-5, 5)	-1.28	0.08
(0, 1)	-0.39	-0.12
Panel B: Positive Decisions		
(-1, 1)	0.76	0.34
(-5, 5)	0.73	0.64
(0, 1)	0.22	0.20
Panel C: Negative Decisions		
(-1, 1)	-0.79	-0.98*
(-5, 5)	-1.76	-1.37
(0, 1)	-0.10	-0.60

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

Notes: We report the cumulative average abnormal return (CAAR) around the date of a climate litigation filing made against corporations and the date of a court decision between January 2005 to December 2021 under our preferred specification (with 279 corporation-filing observations). We split court decisions between those that have positive outcomes for corporations (positive decisions) and those that have negative outcomes for corporations (negative decisions). Our preferred specification uses an event window of (-1, 1), cumulative abnormal returns weighted by the log of each corporation's market capitalisation, excess returns winsorized at the 0.5% level, an estimation window of (-520, -20), and uses a market model to estimate expected returns. Our choice of test statistic follows Patell (1976, p.254-258).

4.2 Robustness

Before settling on an interpretation of these estimates, however, we must ask whether they are really best explained by climate litigation having had a very small impact. Perhaps these small numbers should instead caution us that we may have underestimated the impact. We therefore investigate challenges to the internal validity of our results.

First, assessing the *average* effect of climate litigation involves giving equal weighting to all corporations in our sample, which may provide a misleading estimate of the societal impact of climate litigation. Whilst average abnormal returns may be useful in more general settings (e.g., in Gande and Lewis, 2009), it will place larger weights to small corporations that have less of a societal impact. An approach to counter this issue is to estimate value-weighted abnormal returns, which is the approach we take.

Second, and related, combining various events together is itself a dangerous task if these events are highly heterogeneous. This is especially true for climate litigation and for environmental regulations in general. Indeed, Sen and von Schickfus (2020) assess three German utility corporations individually rather than assessing an aggregate effect because the environmental policy specifically targets lignite-producing corporations. In much the same vein, climate litigation targets very specific aspects of a corporations operations, such as their output of emissions, their claims about climate change, and their emissions targets. To combat this, the researcher has to be careful about which cases to put together and must rely on topic expertise. We thus make a concerted effort to separate cases accordingly.

Third, equal-weighting stocks in the sample risks over-estimating the effect of litigation since outliers and small stocks are likely to be more volatile, and can also impact inference. Since small stocks are more sensitive to distress risk from various factors (Fama and French; 1993) such as litigation, they are naturally more prone to being impacted by climate litigation that attempts to limit their ability to generate revenue from their main operations. Again, to combat this one can utilise value-weighted average abnormal returns.

Fourth, the event window length chosen in the empirical approach can be significant for results. A wider window risks capturing other confounding events whilst a smaller window risks missing any anticipation from market participants. We thus have to be careful in striking a balance in our choice of event window. We focus on a relatively short window of (-1, 1) that allows for some anticipation and consumption of the news on the day after the event. Overall, however, we do not expect much anticipation from climate litigation

filings.

Given this, we report the sensitivity of our aggregate results to our preferred specification in Table 3. For filings, Panel A shows that when we do not weight returns by corporations' market capitalisation, we identify a larger average negative response of -0.34% compared to our main specification result of -0.30%. The un-weighted response is also significant at the 95% level compared to the 90% significance we identified in our main specification. This confirms our intuition that smaller corporations suffer more from climate litigation than larger corporations. Further, we find our estimated response to all filings becomes statistically insignificant when using a 4-factor model containing the Fama and French (1993) 3-factors and an oil return factor rather than the 1-factor market model in our main specification. However, the 4-factor model may suffer from over-fitting since we find the variance in abnormal returns in the 4-factor model is the same as in the 1-factor model. Reassuringly, the estimated financial market response to all filings is of the same sign and of similar magnitude in both models. We also report t-statistics following a regression-based approach and assuming equal variance in the residuals, respectively, and find the former is statistically insignificant whilst the latter is the same as in our main specification using the test statistic of Patell (1976, p.254-258).

Panel B in Table 3 shows our results for positive decisions are robust to using un-weighted returns, a 4-factor model, and to the choice of test statistic. That is, there is no statistically significant response to positive decisions.

Panel C in Table 3 shows our results for negative decisions are robust to using un-weighted returns and the effect size is very similar; the financial market response is -0.98% in our main specification and -0.97% when using un-weighted returns. When we use a 4-factor model containing the Fama and French (1993) 3-factors and an oil return factor rather than the 1-factor market model, the identified financial market response becomes statistically insignificant. Similar to the case of filings, the estimated financial market response is qualitatively similar and we find the 4-factor model may suffer from overfitting (Campbell et al.; 2012, p.154-156). Our results are robust, however, to our choice of test statistic.

Table 3: Robustness tests.

	CAAR (%)
Panel A: All Filings	
Un-weighted abnormal returns	-0.34**
4-factor model	-0.21
Regression-based t-test	-0.30
Equal variance t-test	-0.30*
Panel B: Positive Decisions	
Un-weighted abnormal returns	0.32
4-factor model	0.11
Regression-based t-test	0.34
Equal variance t-test	0.34
Panel C: Negative Decisions	
Un-weighted abnormal returns	-0.97*
4-factor model	-0.85
Regression-based t-test	-0.98*
Equal variance t-test	-0.98*

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

Notes: We report the sensitivity of our results using an event window of (-1, 1) under different specifications. CAAR is cumulative average abnormal return. Un-weighted abnormal returns does not weight abnormal returns by the log of each corporation's market capitalisation, as in our main specification, and uses the test statistic of Patell (1976, p.254-258). The 4-factor model uses the 3-factor model of Fama and French (1993) plus the simple return on the price of oil (West Texas Intermediate) to estimate expected returns and uses the test statistic of Patell (1976, p.254-258). Regression based t-test follows our 1-factor market model and regresses excess abnormal returns on a dummy variable which is one during all the corporation-event windows. Equal variance t-test uses our main specification but assumes equal variance in the residuals.

4.3 Separate Analysis of Climate Litigation Cases

We now contribute new evidence on the financial market response to each *specific* climate litigation filing and decision for corporations between January 2005 and December 2021 (see Appendix). We provide the raw cumulative return in the event window (-1,1), the cumulative abnormal return, and a t-statistic of the statistical significance of the abnormal return. This new data can consequently be used by others to assess how financial markets have responded to specific cases.

We draw a few conclusions from the specific response to climate litigation filings. Overall, most cases are statistically insignificant at the 95% level. The sign of the effect is equally ambiguous. That is, it is not clear that all filings will necessarily have a negative financial market response. As can be seen in the Appendix, many climate litigation filings also target multiple corporations in the same case. This is because plaintiffs often target several Carbon Majors at the same time, something made easier after the identification of the

corporations most responsible for sources of global carbon emissions by Heede (2014). It is also clear that some corporations experience large abnormal returns during the event window, such as *Peabody* in *Kivalina v. Exxon* (-5.70%), *Arch Resources* in *Greenpeace Southeast Asia et al.* (-21.30%), and *Marathon Oil* in *Charleston v. Brabham Oil* (-7.21%). These abnormal returns are, however, statistically insignificant - implying these stocks are volatile. This motivates our careful approach when assessing the aggregate response to climate litigation cases in Section 4.1. Similarly, some salient confounding events occur close to some climate litigation filing dates. On the 8th March 2020, for example, oil demand collapsed after the outbreak of COVID-19 and a price war began between Russia and Saudi Arabia. This coincided with large negative returns for oil stocks such as *Marathon Oil*, *Phillips 66*, *BP*, and *Chevron*, at the same time as the filing of *City & County of Honolulu v. Sunoco LP*. For this reason, we further winsorize returns at the 0.5% level to lower the impact of these extreme confounding returns and also assess the robustness of our results to the inclusion of an oil price factor and other common risk factors.

More specifically, some filings warrant further discussion. In *Milieudefensie v Shell*, *Royal Dutch Shell* experienced a *positive* increase in its share price on the day of the filing (5th April 2019) and a statistically insignificant cumulative abnormal return of -3.33%. The plaintiffs in the case claim *Royal Dutch Shell* has to reduce its emissions on human rights ground. *Royal Dutch Shell*, on the other hand, felt they already has a good emissions target in place. The market may have thought the corporation would win the case, hence the positive abnormal return, although there was evidently uncertainty around the event date. When the court decision was later made, the market was surprised that the court was in favour of the plaintiffs and *Royal Dutch Shell* experienced a large decline in its share price. This highlights how the perception of the permissibility of the legal arguments used in climate litigation filings is an important determinant of the market response.

Furthermore, in *Oakland v. BP*, *BP* experienced a *positive* increase in its share price on the day of the filing (19th September 2017) and a statistically insignificant cumulative abnormal return of 1.76%. The statistically insignificant positive response may be evidence of investors disregarding the case and believing it was unlikely to succeed. Part of this belief may have stemmed from similar failures previously; including the high profile cases of *Kivalina v. Exxon* and *Comer v. Murphy Oil*.

Confirming our intuition that the heterogeneity in climate litigation filings is significant, consider also the case of *Lliuya v. RWE*. The plaintiff, Peruvian farmer Saúl Luciano Lliuya, is suing *RWE* for the proportion

of their role in causing glacial meltwater to increase the volume of water in Lake Palcacocha, threatening to submerge the city of Huaraz, Peru. The plaintiff's aim is to sue for the costs of constructing flood defences. What makes the case notable, however, is the potential for it to set a precedent that corporations are liable for contributions to climate change. Lliuya is seeking $18,239 from *RWE*, a tiny amount, yet the cumulative abnormal return was -5.87% around the filing date, suggesting the novelty of the legal argument is significant for investors.

4.4 Magnitude of the Response to Climate Litigation

We now assess the economic magnitude of the market response to climate litigation. Our focus is on decisions since these provide salient conclusions to litigation proceedings and allow us to avoid comparing filings that are highly heterogeneous. For example, some filings are the first climate litigation case a corporation has ever faced whereas others are relatively commonplace. Decisions, on the other hand, are more comparable across corporations since they all consist of a legal judgement that has a positive or negative outcome for the corporation involved.

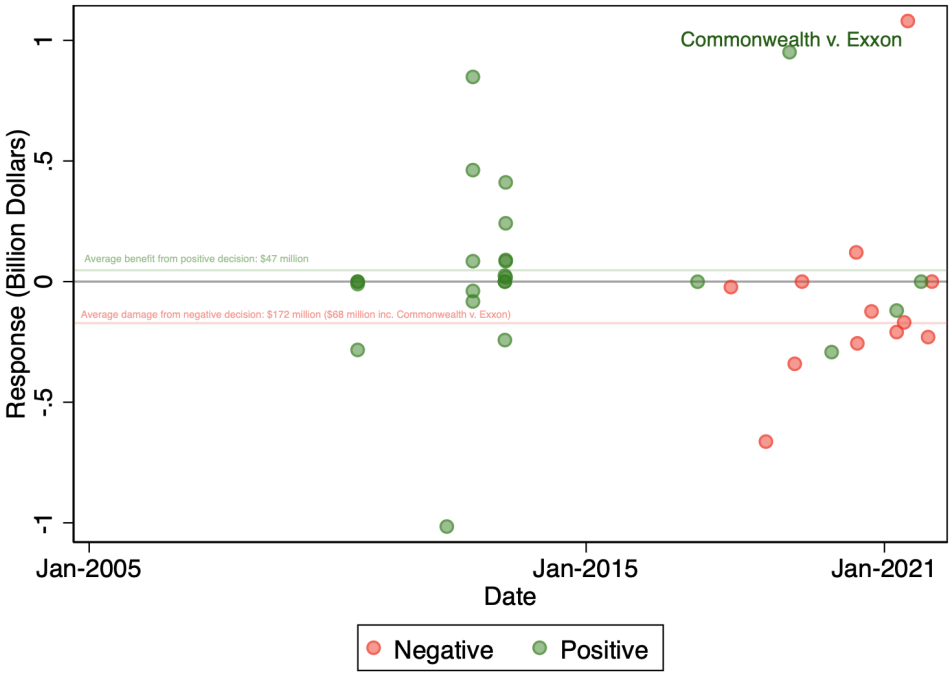
We define the economic magnitude of the financial market's response to climate litigation as the cumulative abnormal return in the window (-1,1) multiplied by the targeted corporation's market capitalisation in the same year. This captures the economic value that investors are attributing to the climate litigation decision when valuing the price of a share at the point of time the decisions is made, thus meaning we also control for inflation. In this approach, we do not capture any price adjustments outside of the event window that may occur if investors update their beliefs about the corporation. However, a benefit is that, given well-functioning financial markets, prices should incorporate all material information from climate litigation court decisions as the information becomes available. This allows us to capture difficult indirect costs such as the probability of future litigation cases and any reputational damage that investors price into the stock that may impact future cash flows or the corporation's discount rate.

Figure 2 shows that the average economic benefit of a positive decision is $47 million. The average economic damage from a negative decision is $172 million when we do not include the outlier case of *Commonwealth v. Exxon* and $68 million when we do include this case. For comparison, *ExxonMobil*'s average market capitalisation over our sample period is $357 billion. Since it is an outlier that impacts our calculation of the average economic benefit/cost of decisions, the *Commonwealth v. Exxon* case warrants further discussion. The Massachusetts Superior Court denied *ExxonMobil*'s motion to dismiss the climate litigation case against

it but it could not conclude whether the corporation misled a "reasonable consumer" about climate change, whether the corporation had engaged in greenwashing, or whether any of the alleged misleading statements constituted speech protected by the First Amendment in the US constitution. This was received positively by investors. Overall, Figure 2 provides evidence that the most recent climate litigation judgements have had negative decisions for corporations, suggestive of plaintiffs bringing stronger legal arguments to courts with greater success.

We then consider the net benefit of climate litigation. However, to do this, data on litigation costs for corporations is required which is difficult to obtain. This is predominantly because the costs can be direct (e.g., legal and administrative fees) and indirect (spillovers and reputational damage), both of which corporations do not have to diclose. Solana (2020) and Haslem et al. (2017) provide tentative evidence that the annual average cost of outside legal counsel in 2008 was $115 million and major litigation cases could cost $3 million. With this in mind, the financial market response clearly exceeds these values and captures the expectation of lower future cash flows and higher risk for the targeted corporations. This also provides suggestive evidence that climate litigation impacts the reputation of corporations since the financial market response far exceeds the average cost of paying for the litigation.

Figure 2: The magnitude of the market response to climate litigation decisions against corporations.



Notes: Response is the estimated cumulative abnormal return over the event window (-1,1) multiplied by the corporation's market capitalisation in the same year in US dollars.

5 Discussion and Conclusion

Interest is growing on whether climate litigation systematically affects the market value of corporations. Confirming the threat of such litigation, several Carbon Majors, including *Chevron*, *ConocoPhillips*, and *Royal Dutch Shell*, have begun including climate lawsuits as a potential material risk factor to their business (The Economist; 2022). The Network for Greening the Financial System (NGFS), a group of 114 central banks and financial regulators, regards climate litigation to be a "growing source of risk" above and beyond the legal fees and potential damages to be paid to plaintiffs and argues that the risk of litigation should be factored into a company's credit risk.

Yet, for financial markets, climate-related liability risk is particularly difficult to assess and price in advance. Climate litigation is grounded in multiple interacting, evolving natural and human sources and systems, including legal, financial, and biophysical systems. This is compounded by various factors and elements particular to litigation. First, litigation has a behavioral element— potential claimants must decide if, when,

who, and how to sue. Second, climate litigation is not one type of case or a feature of one jurisdiction. Even for similar factual scenarios and causes of action—for example, suits for climate damages against Carbon Majors—courts in different jurisdictions have ruled differently on issues of liability.

This paper systematically examines the evidence behind these claims by combining legal and economic analysis, by constructing a new data set covering a near universe of corporate climate litigation cases in the US and Europe, and by using a value-weighted multi event study methodology. Our results tentatively suggest that climate litigation can affect company value and climate litigation risk is starting to materialise for some corporations involved in carbon-intensive business activities. Effects are stronger for cases against Carbon Majors, those filed after 2019, and those deemed to be more "novel". This result is consistent with general trends suggesting climate considerations are indeed become more prominent for investors. However, we also find that the effects are extremely small in magnitude and only significant at the 95 or 90% level, if at all. We have shown that results are also sensitive to various model specification choices. The robustness of these estimates will increase as more cases are filed and the sample size can increase the statistical power of similar analysis.

While the magnitude of the effect is small, the overall financial impact of climate litigation may be more. For the defendants, the most obvious being legal costs and fines. Litigation, independent on the result, could also lead to other costs such as changes in credit ratings and capital costs (Solana; 2020), asset confiscation, and restrictions or higher costs of insurance (Caldecott et al.; 2021). Whilst we have examined the impact of stock prices to corporate climate litigation filings and decisions, such financial market impacts can also occur at various stages during the legal proceeding itself, and after the final judgment, award, or decision. Similarly, more direct costs can occur from the pre-filing stage until the final court judgement and beyond (Solana; 2020).

The exponential increase in adverse climate impacts globally means that Carbon Major corporations may be liable for billions of dollars' worth of damages for existing as well as future climate impacts, and not all climate change damage is covered by the insurance policies held by Carbon Major companies (Ganguly et al.; 2018). The scale of the liability for damages may vary depending on whether they arise out of past emissions or out of future emissions if there is no change of course in their emissions. For those cases where assigning liability requires attribution of the defendants' emissions to the claimant's harm, the magnitude of these climate damages could be substantial. One such example can be seen in traditional climate damage cases

against Carbon Majors, that is, corporations such as oil and gas corporations that are responsible for large amounts of carbon emissions. Not all climate-related liability arises from attribution, as defendants may be liable for a failure to manage or disclose climate risks that have nothing to do with their own emissions, such as the potential liability for directors' duties.

Corporations may also be indirectly affected by successful high-profile cases brought against governments, that can increase transition risks. In some instances, Carbon Majors might experience the indirect regulatory impacts of cases brought against financiers, pension funds, and university endowments. Some of these cases might intend to pressure Carbon Majors and are brought as part of a broader strategy by social movements or organisations to increase the viability of ongoing campaigns against major emitters (Bouwer and Setzer; 2020).

Climate litigation is undoubtedly on the rise (Setzer and Higham; 2022). Success tends to breeds success. More corporate litigation cases are recording outcomes favourable to the parties seeking more action on climate. Evidence such as the results from this paper that climate litigation devalues companies may lead to further shareholder litigation. Overall, the courts may continue to provide a promising new front in the fight against reducing global carbon emissions.

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Appendix

Financial market response to each climate litigation filing

Individual financial market response to climate litigation filings. We report the cumulative average abnormal return (CAAR) around the date of a climate litigation filing made against firms between January 2005 to December 2021 under our preferred specification. Our preferred specification uses an event window of (-1, 1), cumulative abnormal returns weighted by the log of each firm's market capitalisation, excess returns winsorized at the 0.5% level, an estimation window of (-520, -20), and uses a market model to estimate expected returns.

Date	Company	Case	Return	CAR	t-statistic
20/09/2006	General Motors Co	California v. GM Corp.	-1.72%	-1.45%	-0.29
07/05/2007	Volkswagen	Germanwatch vs. Volkswagen	-2.94%	-3.39%	-1.28
16/01/2008	General Motors Co	Australian Competition & Consumer Commission v. GM	-3.44%	4.76%	1.32
12/02/2008	Duke Energy	Sierra Club v. Duke Energy Indiana	1.36%	-0.75%	-0.42
26/02/2008	BP	Native Village of Kivalina v. ExxonMobil Corp.	3.58%	-0.66%	-0.39
26/02/2008	Chevron	Native Village of Kivalina v. ExxonMobil Corp.	3.25%	0.92%	0.59
26/02/2008	ExxonMobil	Native Village of Kivalina v. ExxonMobil Corp.	2.54%	0.11%	0.08
26/02/2008	Peabody	Native Village of Kivalina v. ExxonMobil Corp.	-1.41%	-6.76%	-1.96
26/02/2008	Royal Dutch Shell	Native Village of Kivalina v. ExxonMobil Corp.	2.82%	-1.34%	-0.78
09/05/2008	American Electric Power	Connecticut v. Am. Elec. Power	0.82%	0.67%	0.32
16/07/2008	Duke Energy	Southern Alliance for Clean Energy v. Duke Energy	-0.11%	-2.09%	-1.07
23/10/2008	Dominion Energy	Burton v. Dominion Nuclear Connecticut, Inc.	-2.16%	2.19%	1.14
24/06/2010	Dominion Energy	Conservation Law Foundation v. Dominion Energy New	-1.69%	-0.05%	-0.04
09/09/2010	Alliant Energy	Sierra Club v. Wisconsin Power & Light Co.	0.40%	-0.79%	-0.53
28/01/2011	DTE Energy	United States v. DTE Energy	-0.56%	-0.11%	-0.08
27/05/2011	Chevron	Comer v. Murphy Oil USA, Inc.	1.61%	-0.21%	-0.16

27/05/2011	ExxonMobil	Comer v. Murphy Oil USA, Inc.	1.83%	0.34%	0.28
27/05/2011	Honeywell International	Comer v. Murphy Oil USA, Inc.	1.16%	-1.35%	-1.04
27/05/2011	Murphy Oil Corp	Comer v. Murphy Oil USA, Inc.	1.03%	-1.70%	-0.77
27/05/2011	Royal Dutch Shell	Comer v. Murphy Oil USA, Inc.	1.99%	0.27%	0.18
28/11/2011	Equinor	Norwegian Climate Network et al vs Statoil	5.39%	0.41%	0.18
09/03/2012	Walmart Inc	California Health Communities Network v. City of P	2.03%	1.45%	1.12
22/02/2013	Dominion Energy	Conservation Law Foundation v. Dominion Energy Bra	-0.31%	0.53%	0.48
30/12/2013	Flughafen Wien	In re Vienna-Schwechat Airport Expansion	0.78%	-1.31%	-0.72
02/07/2014	Global Partners	Northwest Environmental Defense Center v. Cascade	0.90%	0.17%	0.05
03/09/2014	Costco Wholesale Corp	United States v. Costco Wholesale Corp. No. 3:14-	3.36%	3.49%	2.57
25/03/2015	US Steel	Nucor Steel-Arkansas v. Big River Steel, LLC, No.	2.67%	4.37%	0.93
09/06/2015	Arch Resources	Roe v. Arch Coal, Inc.	-7.96%	-9.42%	-1.28
11/06/2015	Arch Resources	Lynn v. Peabody Energy Corp.	-24.65%	-26.24%	-3.56
22/09/2015	Anadarko	In re Greenpeace Southeast Asia et al., 2015-__ (C	-3.51%	-2.60%	-1.06
22/09/2015	Anglo America	In re Greenpeace Southeast Asia et al., 2015-__ (C	-10.49%	-4.62%	-1.49
22/09/2015	APA Corp	In re Greenpeace Southeast Asia et al., 2015-__ (C	-6.11%	-5.63%	-2.12
22/09/2015	Arch Resources	In re Greenpeace Southeast Asia et al., 2015-__ (C	-21.20%	-21.30%	-1.49
22/09/2015	BP	In re Greenpeace Southeast Asia et al., 2015-__ (C	-3.02%	1.03%	0.52
22/09/2015	Chevron	In re Greenpeace Southeast Asia et al., 2015-__ (C	-2.09%	-1.87%	-1.22
22/09/2015	CNX Resources	In re Greenpeace Southeast Asia et al., 2015-__ (C	-16.16%	-14.95%	-3.82
22/09/2015	Conocophillips	In re Greenpeace Southeast Asia et al., 2015-__ (C	-1.02%	-0.59%	-0.32
22/09/2015	Devon Energy Corp	In re Greenpeace Southeast Asia et al., 2015-__ (C	-4.09%	-3.70%	-1.47
22/09/2015	Eni Spa	In re Greenpeace Southeast Asia et al., 2015-__ (C	-1.49%	4.55%	3.01
22/09/2015	ExxonMobil	In re Greenpeace Southeast Asia et al., 2015-__ (C	-0.51%	-0.29%	-0.23
22/09/2015	Glencore	In re Greenpeace Southeast Asia et al., 2015-__ (C	-15.38%	-9.14%	-2.83
22/09/2015	Heidelberg Cement	In re Greenpeace Southeast Asia et al., 2015-__ (C	-4.33%	-0.13%	-0.07

22/09/2015	Hess Corp	In re Greenpeace Southeast Asia et al., 2015-__ (C	-4.56%	-4.14%	-1.75
22/09/2015	Husky Energy	In re Greenpeace Southeast Asia et al., 2015-__ (C	-4.82%	-5.01%	-1.75
22/09/2015	Marathon Oil	In re Greenpeace Southeast Asia et al., 2015-__ (C	-3.39%	-2.08%	-0.78
22/09/2015	Murphy Oil Corp	In re Greenpeace Southeast Asia et al., 2015-__ (C	-7.24%	-7.05%	-2.98
22/09/2015	Occidental	In re Greenpeace Southeast Asia et al., 2015-__ (C	-3.05%	-2.68%	-1.43
22/09/2015	Ovintiv Inc	In re Greenpeace Southeast Asia et al., 2015-__ (C	-8.64%	-8.21%	-2.44
22/09/2015	Peabody	In re Greenpeace Southeast Asia et al., 2015-__ (C	-21.02%	-20.12%	-2.40
22/09/2015	Repsol SA	In re Greenpeace Southeast Asia et al., 2015-__ (C	-8.29%	-2.59%	-2.12
22/09/2015	Royal Dutch Shell	In re Greenpeace Southeast Asia et al., 2015-__ (C	-3.14%	1.38%	0.71
22/09/2015	RWE	In re Greenpeace Southeast Asia et al., 2015-__ (C	-8.95%	-3.40%	-1.39
22/09/2015	Suncor Energy	In re Greenpeace Southeast Asia et al., 2015-__ (C	-1.10%	-0.72%	-0.29
22/09/2015	Total Energies SE	In re Greenpeace Southeast Asia et al., 2015-__ (C	-1.34%	3.85%	2.33
23/11/2015	RWE	Lliuya v. RWE	-9.18%	-5.87%	-1.67
07/12/2015	Sempra Energy	California v. Southern California Gas Co.	-3.03%	-3.51%	-2.02
26/01/2016	Sempra Energy	California ex rel. South Coast Air Quality Managem	-2.45%	-1.90%	-1.08
02/02/2016	Sempra Energy	People v. Southern California Gas Co.	0.94%	1.92%	1.10
03/02/2016	Global Partners	Benton v. Global Companies, LLC, No. 1:16-cv-00125	0.75%	0.86%	0.17
19/04/2016	Sempra Energy	Shupak v. Reed	-2.08%	-3.12%	-1.75
25/07/2016	Sempra Energy	California v. Southern California Gas Co., No. BC6	-0.61%	-0.61%	-0.34
29/09/2016	ExxonMobil	Conservation Law Foundation v. ExxonMobil Corp.	4.84%	2.71%	1.64
07/11/2016	ExxonMobil	Ramirez v. Exxon Mobil Corp.	2.86%	1.49%	0.90
23/11/2016	ExxonMobil	Fentress v. Exxon Mobil Corp.	0.73%	-0.26%	-0.16
17/07/2017	Anadarko	County of San Mateo v. Chevron Corp.	-1.48%	-0.84%	-0.30
17/07/2017	APA Corp	County of San Mateo v. Chevron Corp.	-1.04%	-0.55%	-0.18
17/07/2017	BP	County of San Mateo v. Chevron Corp.	0.49%	0.51%	0.30
17/07/2017	Chevron	County of San Mateo v. Chevron Corp.	-0.39%	-0.40%	-0.31

17/07/2017	Conocophillips	County of San Mateo v. Chevron Corp.	-0.41%	0.01%	0.00
17/07/2017	Devon Energy Corp	County of San Mateo v. Chevron Corp.	0.53%	1.35%	0.43
17/07/2017	Eni Spa	County of San Mateo v. Chevron Corp.	0.84%	0.93%	0.60
17/07/2017	ExxonMobil	County of San Mateo v. Chevron Corp.	-0.46%	-0.36%	-0.30
17/07/2017	Hess Corp	County of San Mateo v. Chevron Corp.	0.13%	0.95%	0.31
17/07/2017	Marathon Petroleum	County of San Mateo v. Chevron Corp.	1.83%	1.07%	0.39
17/07/2017	Occidental	County of San Mateo v. Chevron Corp.	1.24%	1.60%	0.82
17/07/2017	Ovintiv Inc	County of San Mateo v. Chevron Corp.	2.82%	3.61%	0.89
17/07/2017	Repsol SA	County of San Mateo v. Chevron Corp.	0.43%	-0.06%	-0.04
17/07/2017	Royal Dutch Shell	County of San Mateo v. Chevron Corp.	0.63%	0.72%	0.42
17/07/2017	Total Energies SE	County of San Mateo v. Chevron Corp.	0.92%	0.93%	0.76
28/08/2017	Royal Dutch Shell	Conservation Law Foundation, Inc. v. Shell Oil Pro	0.61%	0.85%	0.53
19/09/2017	BP	City of Oakland v. BP p.l.c.	1.74%	1.76%	1.06
20/09/2017	Chevron	City of Oakland v. BP p.l.c.	1.11%	0.09%	0.07
21/09/2017	ExxonMobil	City of Oakland v. BP p.l.c.	-0.37%	-0.43%	-0.38
22/09/2017	Conocophillips	City of Oakland v. BP p.l.c.	3.38%	1.59%	0.66
16/11/2017	Arkema	Harris County v. Arkema, Inc.	-0.21%	0.29%	0.20
20/12/2017	Anadarko	County of Santa Cruz v. Chevron Corp.	6.91%	5.76%	2.01
20/12/2017	APA Corp	County of Santa Cruz v. Chevron Corp.	8.30%	7.55%	2.53
20/12/2017	BP	County of Santa Cruz v. Chevron Corp.	1.96%	1.28%	0.91
20/12/2017	Chevron	County of Santa Cruz v. Chevron Corp.	4.24%	3.56%	2.97
20/12/2017	Conocophillips	County of Santa Cruz v. Chevron Corp.	6.76%	5.37%	2.56
20/12/2017	Devon Energy Corp	County of Santa Cruz v. Chevron Corp.	7.34%	5.70%	1.98
20/12/2017	Eni Spa	County of Santa Cruz v. Chevron Corp.	0.50%	-0.25%	-0.19
20/12/2017	ExxonMobil	County of Santa Cruz v. Chevron Corp.	1.10%	0.92%	0.88
20/12/2017	Hess Corp	County of Santa Cruz v. Chevron Corp.	6.24%	4.92%	1.58

20/12/2017	Occidental	County of Santa Cruz v. Chevron Corp.	2.26%	1.46%	0.80
20/12/2017	Ovintiv Inc	County of Santa Cruz v. Chevron Corp.	11.58%	9.57%	2.60
20/12/2017	Phillips 66	County of Santa Cruz v. Chevron Corp.	0.12%	-0.51%	-0.38
20/12/2017	Repsol SA	County of Santa Cruz v. Chevron Corp.	1.05%	-0.07%	-0.05
20/12/2017	Royal Dutch Shell	County of Santa Cruz v. Chevron Corp.	1.38%	0.67%	0.56
09/01/2018	BP	City of New York v. BP p.l.c.	-0.29%	-0.58%	-0.41
09/01/2018	Chevron	City of New York v. BP p.l.c.	0.60%	0.47%	0.39
09/01/2018	Conocophillips	City of New York v. BP p.l.c.	1.35%	1.34%	0.69
09/01/2018	ExxonMobil	City of New York v. BP p.l.c.	-0.77%	-0.82%	-0.78
09/01/2018	Royal Dutch Shell	City of New York v. BP p.l.c.	0.60%	0.13%	0.10
22/01/2018	Hess Corp	City of Richmond v Chevron	-0.37%	-1.02%	-0.35
23/01/2018	APA Corp	City of Richmond v Chevron	4.46%	4.10%	1.35
24/01/2018	BP	City of Richmond v Chevron	1.33%	1.05%	0.75
25/01/2018	Chevron	City of Richmond v Chevron	0.13%	-0.06%	-0.05
26/01/2018	ExxonMobil	City of Richmond v Chevron	-0.58%	0.20%	0.20
29/01/2018	Ovintiv Inc	City of Richmond v Chevron	-5.81%	-2.43%	-0.65
30/01/2018	Anadarko	City of Richmond v Chevron	-2.91%	-0.39%	-0.15
31/01/2018	Royal Dutch Shell	City of Richmond v Chevron	-3.31%	-2.74%	-2.16
01/02/2018	Devon Energy Corp	City of Richmond v Chevron	-3.49%	-0.81%	-0.30
02/02/2018	Repsol SA	City of Richmond v Chevron	-2.60%	1.44%	1.19
05/02/2018	Phillips 66	City of Richmond v Chevron	-3.92%	0.44%	0.33
06/02/2018	Marathon Petroleum	City of Richmond v Chevron	-3.39%	0.43%	0.23
17/04/2018	ExxonMobil	Board of County Commissioners of Boulder County v.	1.77%	0.83%	0.71
17/04/2018	Suncor Energy	Board of County Commissioners of Boulder County v.	1.67%	0.33%	0.18
09/05/2018	BP	King County v. BP p.l.c.	2.16%	1.40%	1.01
10/05/2018	Chevron	King County v. BP p.l.c.	2.57%	0.32%	0.23

11/05/2018	ExxonMobil	King County v. BP p.l.c.	3.38%	2.24%	1.86
02/07/2018	BP	Rhode Island v. Chevron Corp.	0.71%	-0.97%	-0.65
02/07/2018	Chevron	Rhode Island v. Chevron Corp.	-0.73%	-0.88%	-0.59
02/07/2018	Conocophillips	Rhode Island v. Chevron Corp.	1.70%	0.97%	0.47
02/07/2018	ExxonMobil	Rhode Island v. Chevron Corp.	0.34%	0.40%	0.29
02/07/2018	Hess Corp	Rhode Island v. Chevron Corp.	0.69%	-0.28%	-0.09
02/07/2018	Marathon Petroleum	Rhode Island v. Chevron Corp.	1.90%	1.00%	0.46
02/07/2018	Phillips 66	Rhode Island v. Chevron Corp.	-1.09%	-1.95%	-1.23
02/07/2018	Royal Dutch Shell	Rhode Island v. Chevron Corp.	-0.51%	-2.00%	-1.49
05/07/2018	Total Energies SE	Friends of the Earth et al. v. Prefect of of Bouch	1.88%	-0.03%	-0.03
20/07/2018	BP	Mayor & City Council of Baltimore v. BP p.l.c.	1.09%	0.93%	0.60
20/07/2018	Chevron	Mayor & City Council of Baltimore v. BP p.l.c.	-0.16%	0.07%	0.05
20/07/2018	CNX Resources	Mayor & City Council of Baltimore v. BP p.l.c.	1.29%	1.16%	0.31
20/07/2018	Conocophillips	Mayor & City Council of Baltimore v. BP p.l.c.	-0.11%	-0.21%	-0.10
20/07/2018	Consol Energy	Mayor & City Council of Baltimore v. BP p.l.c.	-1.37%	-2.51%	-0.35
20/07/2018	ExxonMobil	Mayor & City Council of Baltimore v. BP p.l.c.	-1.00%	-0.59%	-0.43
20/07/2018	Hess Corp	Mayor & City Council of Baltimore v. BP p.l.c.	0.16%	0.13%	0.04
20/07/2018	Marathon Petroleum	Mayor & City Council of Baltimore v. BP p.l.c.	0.61%	0.55%	0.24
20/07/2018	Phillips 66	Mayor & City Council of Baltimore v. BP p.l.c.	-0.41%	-0.56%	-0.35
20/07/2018	Royal Dutch Shell	Mayor & City Council of Baltimore v. BP p.l.c.	1.38%	1.15%	0.82
06/08/2018	Powszechny Zakład Ubezpieczeń	Development YES – Open-Pit Mines NO v. Group PZU	1.00%	0.47%	0.18
24/10/2018	ExxonMobil	People of the State of New York v. Exxon Mobil Cor	-3.51%	-1.30%	-0.89
31/10/2018	ExxonMobil	Mapuche Confederation of Neuquén v. YPF et al.	4.63%	2.10%	1.44
31/10/2018	Total Energies SE	Mapuche Confederation of Neuquén v. YPF et al.	-0.31%	-3.04%	-2.36
14/11/2018	Anadarko	Pacific Coast Federation of Fishermen's Associatio	-1.31%	-1.77%	-0.69
14/11/2018	APA Corp	Pacific Coast Federation of Fishermen's Associatio	2.66%	2.54%	0.76

14/11/2018	BP	Pacific Coast Federation of Fishermen's Associatio	-0.75%	-1.01%	-0.62
14/11/2018	Chevron	Pacific Coast Federation of Fishermen's Associatio	0.61%	0.62%	0.38
14/11/2018	Conocophillips	Pacific Coast Federation of Fishermen's Associatio	0.15%	-0.39%	-0.17
14/11/2018	Devon Energy Corp	Pacific Coast Federation of Fishermen's Associatio	-2.96%	-3.25%	-0.96
14/11/2018	Eni Spa	Pacific Coast Federation of Fishermen's Associatio	-2.37%	-2.28%	-1.67
14/11/2018	ExxonMobil	Pacific Coast Federation of Fishermen's Associatio	-2.04%	-2.08%	-1.41
14/11/2018	Hess Corp	Pacific Coast Federation of Fishermen's Associatio	-0.36%	-1.00%	-0.33
14/11/2018	Occidental	Pacific Coast Federation of Fishermen's Associatio	0.64%	0.36%	0.18
14/11/2018	Ovintiv Inc	Pacific Coast Federation of Fishermen's Associatio	-7.76%	-8.02%	-2.24
14/11/2018	Phillips 66	Pacific Coast Federation of Fishermen's Associatio	-1.44%	-1.82%	-1.01
14/11/2018	Repsol SA	Pacific Coast Federation of Fishermen's Associatio	0.31%	0.99%	0.61
14/11/2018	Royal Dutch Shell	Pacific Coast Federation of Fishermen's Associatio	-0.28%	-0.53%	-0.35
14/11/2018	Total Energies SE	Pacific Coast Federation of Fishermen's Associatio	0.76%	0.79%	0.61
16/11/2018	Edison International	Barnes v. Edison International	1.99%	2.31%	0.88
06/12/2018	TransDigm Group	New York City Employees' Retirement System v. Tr	-7.96%	-2.34%	-1.16
10/12/2018	Innospec	California Fueling, LLC v. Best Energy Solutions &	-1.18%	1.98%	0.96
08/02/2019	Edison International	Von Oeyen v. Southern California Edison Co.	5.00%	5.44%	1.55
22/03/2019	Edison International	City of Torrance v. Southern California Edison Co.	1.61%	2.00%	0.55
05/04/2019	Royal Dutch Shell	Milieudefensie et al. v. Royal Dutch Shell plc.	2.15%	1.75%	1.06
02/05/2019	ExxonMobil	In re Exxon Mobil Corp. Derivative Litigation Tex	-3.53%	-3.13%	-2.07
06/08/2019	ExxonMobil	Saratoga Advantage Trust Energy & Basic Materials	-1.73%	0.40%	0.28
29/08/2019	Edison International	Public Watchdogs v. Southern California Edison Co.	-1.43%	-3.53%	-0.93
05/09/2019	ExxonMobil	Stourbridge Investments v Avery	3.42%	0.29%	0.20
09/10/2019	Energy Transfers	Spoon v. Bayou Bridge Pipeline LLC	-2.27%	-2.15%	-0.95
24/10/2019	ExxonMobil	Commonwealth v. Exxon Mobil Corp.	0.24%	-0.26%	-0.19
29/10/2019	Total Energies SE	Friends of the Earth et al. v. Total	0.57%	1.29%	0.89

12/11/2019	Ascent Resources	Specific instance under the OECD Guidelines for Mu	-7.57%	-6.47%	-0.30
02/12/2019	ExxonMobil	In re Exxon Mobil Corp. Derivative Litigation N.J	-1.19%	1.33%	0.97
03/12/2019	BP	Complaint against BP in respect of violations of t	-0.31%	0.39%	0.21
20/12/2019	Eni Spa	Italian Competition Authority Ruling Eni's Diesel+	1.20%	1.62%	1.36
28/01/2020	Total Energies SE	Notre Affaire a Tous and Others v. Total	-2.66%	-1.88%	-1.47
09/03/2020	BP	City & County of Honolulu v. Sunoco LP	-21.93%	-9.77%	-5.52
09/03/2020	Chevron	City & County of Honolulu v. Sunoco LP	-11.95%	-3.34%	-2.20
09/03/2020	Conocophillips	City & County of Honolulu v. Sunoco LP	-27.43%	-14.41%	-5.86
09/03/2020	Energy Transfers	City & County of Honolulu v. Sunoco LP	-33.53%	-24.16%	-10.60
09/03/2020	ExxonMobil	City & County of Honolulu v. Sunoco LP	-13.35%	-3.16%	-2.29
09/03/2020	Marathon Oil	City & County of Honolulu v. Sunoco LP	-38.08%	-18.30%	-5.57
09/03/2020	Phillips 66	City & County of Honolulu v. Sunoco LP	-12.08%	-2.30%	-1.24
09/03/2020	Royal Dutch Shell	City & County of Honolulu v. Sunoco LP	-19.92%	-8.34%	-5.61
15/05/2020	ExxonMobil	Beyond Pesticides v. Exxon Mobil Corp.	8.13%	1.07%	0.49
24/06/2020	ExxonMobil	State of Minnesota v. American Petroleum Institute	-2.60%	-0.22%	-0.09
25/06/2020	BP	District of Columbia v. Exxon Mobil Corp.	-6.72%	-0.57%	-0.18
25/06/2020	Chevron	District of Columbia v. Exxon Mobil Corp.	-5.45%	1.03%	0.35
25/06/2020	ExxonMobil	District of Columbia v. Exxon Mobil Corp.	-6.64%	-1.19%	-0.50
25/06/2020	Royal Dutch Shell	District of Columbia v. Exxon Mobil Corp.	-6.49%	-0.09%	-0.03
18/08/2020	ExxonMobil	Walkover v Woods	-2.90%	-0.04%	-0.01
02/09/2020	BP	City of Hoboken v. Exxon Mobil Corp.	-2.35%	-1.80%	-0.56
02/09/2020	Chevron	City of Hoboken v. Exxon Mobil Corp.	-1.97%	-2.23%	-0.72
02/09/2020	Conocophillips	City of Hoboken v. Exxon Mobil Corp.	-5.10%	-5.59%	-1.32
02/09/2020	ExxonMobil	City of Hoboken v. Exxon Mobil Corp.	-2.09%	-2.40%	-0.95
02/09/2020	Phillips 66	City of Hoboken v. Exxon Mobil Corp.	2.09%	1.59%	0.42
02/09/2020	Royal Dutch Shell	City of Hoboken v. Exxon Mobil Corp.	-3.00%	-2.43%	-0.74

09/09/2020	BP	City of Charleston v. Brabham Oil Co.	-4.34%	-4.79%	-1.47
09/09/2020	Chevron	City of Charleston v. Brabham Oil Co.	-4.62%	-0.48%	-0.15
09/09/2020	Conocophillips	City of Charleston v. Brabham Oil Co.	-8.31%	-4.51%	-1.06
09/09/2020	ExxonMobil	City of Charleston v. Brabham Oil Co.	-5.41%	-1.83%	-0.73
09/09/2020	Hess Corp	City of Charleston v. Brabham Oil Co.	-7.65%	-3.76%	-0.69
09/09/2020	Marathon Oil	City of Charleston v. Brabham Oil Co.	-11.80%	-7.21%	-1.01
09/09/2020	Murphy Oil Corp	City of Charleston v. Brabham Oil Co.	-18.58%	-15.44%	-2.15
09/09/2020	Phillips 66	City of Charleston v. Brabham Oil Co.	-6.22%	-2.20%	-0.58
09/09/2020	Royal Dutch Shell	City of Charleston v. Brabham Oil Co.	-3.59%	-3.97%	-1.22
14/09/2020	ExxonMobil	Connecticut v. Exxon Mobil Corp.	-1.98%	-2.56%	-1.01
09/10/2020	APA Corp	Delaware v. BP America Inc.	-2.40%	-5.86%	-0.57
09/10/2020	Chevron	Delaware v. BP America Inc.	1.02%	-1.71%	-0.55
09/10/2020	CNX Resources	Delaware v. BP America Inc.	4.89%	2.95%	0.32
09/10/2020	Conocophillips	Delaware v. BP America Inc.	3.68%	1.15%	0.27
09/10/2020	Consol Energy	Delaware v. BP America Inc.	5.79%	4.10%	0.36
09/10/2020	Devon Energy Corp	Delaware v. BP America Inc.	0.05%	-2.13%	-0.32
09/10/2020	ExxonMobil	Delaware v. BP America Inc.	3.46%	1.93%	0.75
09/10/2020	Hess Corp	Delaware v. BP America Inc.	2.57%	-0.07%	-0.01
09/10/2020	Marathon Oil	Delaware v. BP America Inc.	4.02%	2.23%	0.31
09/10/2020	Marathon Petroleum	Delaware v. BP America Inc.	4.55%	1.62%	0.30
09/10/2020	Murphy Oil Corp	Delaware v. BP America Inc.	0.98%	-1.38%	-0.19
09/10/2020	Occidental	Delaware v. BP America Inc.	5.44%	3.25%	0.43
09/10/2020	Ovintiv Inc	Delaware v. BP America Inc.	7.46%	3.80%	0.36
09/10/2020	Phillips 66	Delaware v. BP America Inc.	2.97%	0.84%	0.22
09/10/2020	Royal Dutch Shell	Delaware v. BP America Inc.	3.36%	2.90%	0.89
09/10/2020	Total Energies SE	Delaware v. BP America Inc.	2.22%	0.71%	0.26

12/10/2020	BP	County of Maui v. Sunoco LP	-3.47%	-0.58%	-0.18
12/10/2020	Chevron	County of Maui v. Sunoco LP	-2.42%	-1.03%	-0.33
12/10/2020	Conocophillips	County of Maui v. Sunoco LP	-1.81%	0.19%	0.04
12/10/2020	ExxonMobil	County of Maui v. Sunoco LP	-2.98%	-0.78%	-0.30
12/10/2020	Marathon Petroleum	County of Maui v. Sunoco LP	-5.63%	-3.52%	-0.66
12/10/2020	Phillips 66	County of Maui v. Sunoco LP	-4.42%	-2.15%	-0.56
12/10/2020	Royal Dutch Shell	County of Maui v. Sunoco LP	-1.23%	2.03%	0.62
11/11/2020	Williams Companies	Adorers of the Blood of Christ v. Transcontinental	0.06%	0.85%	0.19
16/12/2020	Walmart Inc	Greenpeace, Inc. v. Walmart Inc.	0.31%	-0.71%	-0.27
22/02/2021	BP	Annapolis v API	6.16%	0.47%	0.13
22/02/2021	Chevron	Annapolis v API	4.81%	0.23%	0.07
22/02/2021	CNX Resources	Annapolis v API	-6.08%	-11.99%	-1.31
22/02/2021	Conocophillips	Annapolis v API	9.01%	3.87%	0.84
22/02/2021	Consol Energy	Annapolis v API	5.32%	-3.10%	-0.26
22/02/2021	ExxonMobil	Annapolis v API	5.74%	0.94%	0.31
22/02/2021	Hess Corp	Annapolis v API	11.95%	5.01%	0.89
22/02/2021	Marathon Oil	Annapolis v API	20.97%	12.83%	1.68
22/02/2021	Phillips 66	Annapolis v API	7.82%	1.80%	0.40
22/02/2021	Royal Dutch Shell	Annapolis v API	4.09%	-1.54%	-0.43
02/03/2021	Groupe Casino	Envol Vert et al. v. Casino	-2.58%	-4.32%	-1.18
04/03/2021	Campbell Soup Company	Last Beach Cleanup v. TerraCycle, Inc.	2.12%	2.33%	0.69
04/03/2021	Colgate-Palmolive Co	Last Beach Cleanup v. TerraCycle, Inc.	0.87%	1.36%	0.62
04/03/2021	Nestle	Last Beach Cleanup v. TerraCycle, Inc.	-0.95%	3.00%	1.99
04/03/2021	Proctor & Gamble	Last Beach Cleanup v. TerraCycle, Inc.	1.72%	0.83%	0.38
04/03/2021	The Clorox Co	Last Beach Cleanup v. TerraCycle, Inc.	2.99%	5.33%	1.61
04/03/2021	The Coca-Cola Company	Last Beach Cleanup v. TerraCycle, Inc.	1.38%	-1.11%	-0.51

22/04/2021	BP	City of New York v. American Petroleum Institute,	-0.31%	0.18%	0.06
22/04/2021	ExxonMobil	City of New York v. American Petroleum Institute,	0.52%	-1.09%	-0.37
22/04/2021	Royal Dutch Shell	City of New York v. American Petroleum Institute,	0.01%	0.12%	0.04
22/04/2021	Marathon Petroleum	Patrick Pouyanné (CEO of TotalEnergies) v. Greenp	1.88%	-2.12%	-0.51
26/04/2021	BP	Anne Arundel v BP	0.67%	-1.32%	-0.47
26/04/2021	Chevron	Anne Arundel v BP	1.73%	-0.22%	-0.09
26/04/2021	CNX Resources	Anne Arundel v BP	4.56%	1.54%	0.21
26/04/2021	Conocophillips	Anne Arundel v BP	3.68%	0.93%	0.23
26/04/2021	Consol Energy	Anne Arundel v BP	7.23%	3.06%	0.32
26/04/2021	ExxonMobil	Anne Arundel v BP	2.05%	-0.04%	-0.01
26/04/2021	Hess Corp	Anne Arundel v BP	5.06%	1.62%	0.35
26/04/2021	Marathon Oil	Anne Arundel v BP	6.73%	2.48%	0.39
26/04/2021	Phillips 66	Anne Arundel v BP	4.16%	1.19%	0.31
26/04/2021	Royal Dutch Shell	Anne Arundel v BP	-0.03%	-1.82%	-0.65
08/06/2021	The Coca-Cola Company	Earth Island Institute v. Coca-Cola Co.	-1.36%	0.38%	0.23
16/06/2021	The Coca-Cola Company	Swartz and Muto v. Coca-Cola Co.	-1.08%	0.24%	0.15
07/07/2021	Royal Dutch Shell	Conservation Law Foundation v. Shell Oil Co.	-2.44%	2.98%	1.26
14/09/2021	ExxonMobil	State of Vermont v Exxon	4.52%	3.04%	1.20
14/09/2021	Royal Dutch Shell	State of Vermont v Exxon	4.00%	1.40%	0.59
14/09/2021	Sunoco LP	State of Vermont v Exxon	0.68%	-0.12%	-0.05
16/09/2021	HSBC	Complaint to Ad Standards on HSBC's Great Barrie	0.40%	2.09%	-
20/09/2021	BMW	Deutsche Umwelthilfe (DUH) v. BMW	-4.18%	-0.98%	-0.46
20/09/2021	Mercedes-Benz AG	Deutsche Umwelthilfe (DUH) v. Mercedes-Benz AG	-4.29%	-1.30%	-0.57
09/11/2021	Volkswagen	Kaiser et al v. Volkswagen AG	-5.95%	-5.25%	-1.22

Financial market response to each climate litigation decision

Individual financial market response to climate litigation decisions. We split court decisions between those that have positive outcomes for firms (positive decisions) and those that have negative outcomes for firms (negative decisions). We report the cumulative abnormal return (CAR) around the date of a climate litigation court decision between January 2005 to December 2021 under our preferred specification. Our preferred specification uses an event window of (-1, 1), cumulative abnormal returns weighted by the log of each firm's market capitalisation, excess returns winsorized at the 0.5% level, an estimation window of (-520, -20), and uses a market model to estimate expected returns. Return is the raw cumulative return over the same window.

Date	Outcome	Company name	Case	Return	CAR	t-statistic
17/09/2007	P	General Motors Co	California v. GM Corp.	7.3%	5.1%	1.59
20/11/2007	P	Volkswagen	Germanwatch vs. Volkswagen	-3.6%	-3.9%	-1.43
29/04/2008	N	De Longhi Spa	Australian Competition & Consumer Commission v. De	2.3%	1.7%	0.45
25/06/2008	N	Goodyear Tire & Rubber Co	Australian Competition & Consumer Commission v. Go	-8.6%	-4.4%	-1.17
18/09/2008	N	General Motors Co	Australian Competition & Consumer Commission v. GM	21.1%	6.2%	1.18
02/12/2008	N	Duke Energy	Southern Alliance for Clean Energy v. Duke Energy	-5.1%	-3.3%	-1.20
24/06/2009	P	General Motors Co	California v. GM Corp.	-3.1%	-6.6%	-0.45
13/05/2010	P	American Electric Power	Connecticut v. Am. Elec. Power	-0.4%	0.6%	0.33
28/05/2010	P	Honeywell International	Comer v. Murphy Oil USA, Inc.	-0.4%	-1.0%	-0.57
28/05/2010	P	Murphy Oil Corp	Comer v. Murphy Oil USA, Inc.	0.3%	0.5%	0.24
28/05/2010	P	Chevron	Comer v. Murphy Oil USA, Inc.	1.1%	0.7%	0.57
28/05/2010	P	ExxonMobil	Comer v. Murphy Oil USA, Inc.	0.0%	-0.5%	-0.35
28/05/2010	P	Royal Dutch Shell	Comer v. Murphy Oil USA, Inc.	4.0%	0.5%	0.32
24/11/2010	P	Duke Energy	Sierra Club v. Duke Energy Indiana	-0.6%	0.2%	0.17
19/04/2011	P	Dominion Energy	Burton v. Dominion Nuclear Connecticut, Inc.	0.0%	-1.0%	-0.84
20/06/2011	P	American Electric Power	Connecticut v. Am. Elec. Power	1.4%	0.0%	0.02
13/03/2012	P	Equinor	Norwegian Climate Network et al vs Statoil	-1.0%	-1.9%	-0.93

21/09/2012	P	BP	Native Village of Kivalina v. ExxonMobil Corp.	-0.2%	0.4%	0.20
21/09/2012	P	ExxonMobil	Native Village of Kivalina v. ExxonMobil Corp.	1.4%	1.6%	1.49
21/09/2012	P	Royal Dutch Shell	Native Village of Kivalina v. ExxonMobil Corp.	-1.9%	-1.5%	-1.06
21/09/2012	P	Peabody	Native Village of Kivalina v. ExxonMobil Corp.	-7.7%	-5.7%	-1.42
21/09/2012	P	Chevron	Native Village of Kivalina v. ExxonMobil Corp.	1.0%	1.3%	0.97
14/05/2013	P	Honeywell International	Comer v. Murphy Oil USA, Inc.	2.7%	1.2%	0.85
14/05/2013	P	ExxonMobil	Comer v. Murphy Oil USA, Inc.	1.2%	-0.2%	-0.18
14/05/2013	P	Chevron	Comer v. Murphy Oil USA, Inc.	0.6%	-1.0%	-1.00
14/05/2013	P	Murphy Oil Corp	Comer v. Murphy Oil USA, Inc.	2.9%	0.8%	0.38
14/05/2013	P	Royal Dutch Shell	Comer v. Murphy Oil USA, Inc.	-0.3%	-0.4%	-0.35
20/05/2013	P	Royal Dutch Shell	Native Village of Kivalina v. ExxonMobil Corp.	1.6%	1.1%	1.00
20/05/2013	P	Chevron	Native Village of Kivalina v. ExxonMobil Corp.	2.6%	1.1%	1.10
20/05/2013	P	ExxonMobil	Native Village of Kivalina v. ExxonMobil Corp.	2.3%	1.2%	1.38
20/05/2013	P	BP	Native Village of Kivalina v. ExxonMobil Corp.	1.8%	1.1%	0.68
20/05/2013	P	Peabody	Native Village of Kivalina v. ExxonMobil Corp.	5.1%	2.8%	0.63
03/09/2014	N	Walmart Inc	California Health Communities Network v. City of P	1.4%	1.7%	1.64
08/06/2016	P	US Steel	Nucor Steel-Arkansas v. Big River Steel, LLC, No.	9.1%	7.3%	1.01
13/09/2016	N	Sempra Energy	People v. Southern California Gas Co.	1.2%	1.7%	0.94
07/02/2017	N	Sempra Energy	California ex rel. South Coast Air Quality Managem	1.4%	1.0%	0.49
01/06/2017	P	Flughafen Wien	In re Vienna-Schwechat Airport Expansion	3.8%	2.2%	0.90
30/11/2017	N	RWE	Lliuya v. RWE	-2.1%	-1.9%	-0.74
28/03/2018	P	Flughafen Wien	In re Vienna-Schwechat Airport Expansion	-1.9%	-1.0%	-0.49
08/08/2018	N	Sempra Energy	California v. Southern California Gas Co.	-0.5%	-0.7%	-0.28
14/08/2018	N	ExxonMobil	Ramirez v. Exxon Mobil Corp.	-3.2%	-2.2%	-1.58
18/01/2019	N	TransDigm Group	New York City Employees' Retirement System v. Tr	-1.4%	-2.0%	-1.08
04/02/2019	P	ExxonMobil	Fentress v. Exxon Mobil Corp.	3.2%	2.6%	1.61

25/02/2019	P	Sempra Energy	California v. Southern California Gas Co.	1.1%	0.7%	0.29
14/03/2019	N	ExxonMobil	Conservation Law Foundation v. ExxonMobil Corp.	0.2%	-0.9%	-0.59
06/05/2019	N	ExxonMobil	City of Birmingham Relief & Retirement System v. E	-0.7%	0.2%	0.12
26/07/2019	N	Powszechny Zakład Ubezpieczeń	Development YES – Open-Pit Mines NO v. Group PZU	-3.6%	-3.5%	-1.53
10/12/2019	P	ExxonMobil	People of the State of New York v. Exxon Mobil Cor	-0.8%	-0.7%	-0.52
05/02/2020	N	Ryanair	ASA Ruling on Ryanair Ltd t/a Ryanair Ltd	0.6%	-2.9%	-0.92
08/06/2020	N	Royal Dutch Shell	Advertising Standards Authority's Ruling on Shell	4.9%	0.0%	-0.01
16/06/2020	N	BP	Complaint against BP in respect of violations	-1.8%	-5.0%	-1.59
28/09/2020	N	Royal Dutch Shell	Conservation Law Foundation, Inc. v. Shell Oil Pro	-2.1%	-2.9%	-0.89
17/03/2021	N	Edison International	City of Torrance v. Southern California Edison Co.	-1.7%	-1.2%	-0.38
01/04/2021	N	Total Energies SE	Friends of the Earth et al. v. Prefect of of Bouch	-2.5%	-1.8%	-0.65
01/04/2021	P	BP	City of New York v. BP p.l.c.	-3.3%	-1.4%	-0.41
27/04/2021	P	Edison International	Barnes v. Edison International	-1.3%	-1.4%	-0.51
26/05/2021	N	Royal Dutch Shell	Milieudefensie et al. v. Royal Dutch Shell plc.	-3.7%	-3.3%	-1.39
22/06/2021	N	ExxonMobil	Commonwealth v. Exxon Mobil Corp.	6.3%	3.8%	1.46
20/09/2021	P	Walmart Inc	Greenpeace, Inc. v. Walmart Inc.	-1.4%	0.3%	0.15
28/09/2021	P	BP	King County v. BP p.l.c.	3.6%	-0.8%	-0.31
30/09/2021	P	Williams Companies	Adorers of the Blood of Christ v. Transcontinental	1.2%	1.0%	0.44
15/11/2021	P	Colgate-Palmolive Co	Last Beach Cleanup v. TerraCycle, Inc.	-0.1%	-0.9%	-0.61
15/11/2021	P	Nestle	Last Beach Cleanup v. TerraCycle, Inc.	-0.8%	-1.6%	-1.34
15/11/2021	P	The Coca-Cola Company	Last Beach Cleanup v. TerraCycle, Inc.	-0.9%	-1.6%	-1.11
15/11/2021	P	The Clorox Co	Last Beach Cleanup v. TerraCycle, Inc.	2.4%	2.2%	0.82
15/11/2021	P	Campbell Soup Company	Last Beach Cleanup v. TerraCycle, Inc.	1.1%	1.0%	0.44
15/11/2021	P	Proctor & Gamble	Last Beach Cleanup v. TerraCycle, Inc.	0.5%	-0.4%	-0.27
18/11/2021	N	Total Energies SE	Notre Affaire a Tous and Others v. Total	-4.8%	-1.4%	-0.78
06/12/2021	P	Edison International	Public Watchdogs v. Southern California Edison Co.	2.7%	1.2%	0.61

16/12/2021	N	Total Energies SE	Friends of the Earth et al. v. Total	-0.2%	0.2%	0.10