

Climate Adaptation Disclosure: Does it Bring Home the Green?

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Motivation

A growing body of work in climate finance analyses the effects of physical climate **risk** disclosure on firm value (Nagar and Schoenfeld, 2022; Sautner et al., 2023). However, no empirical study has systematically examined how investors price disclosed firms' strategies to **adapt** to these risks.

In this paper, we fill this gap by examining the implications of climate adaptation disclosures on the stock price of UK companies listed on the London Stock Exchange. Historically, UK firms have been granted a high level of discretion for reporting their responses to physical climate risks. This provides an ideal setting for assessing how investors value these voluntary climate-related information releases.

Data

To gauge companies' adaptation to physical climate risks, we combine financial, textual and geo-spatial data related to firm locations and natural disasters from several sources. The final sample covers around 23,000 annual reports for about 2,000 firms listed on the London Stock Exchange Market. The period under investigation spans from 1996 to 2018. Figure 1 shows the geographical distribution of UK parent headquarters and their subsidiaries in the UK.

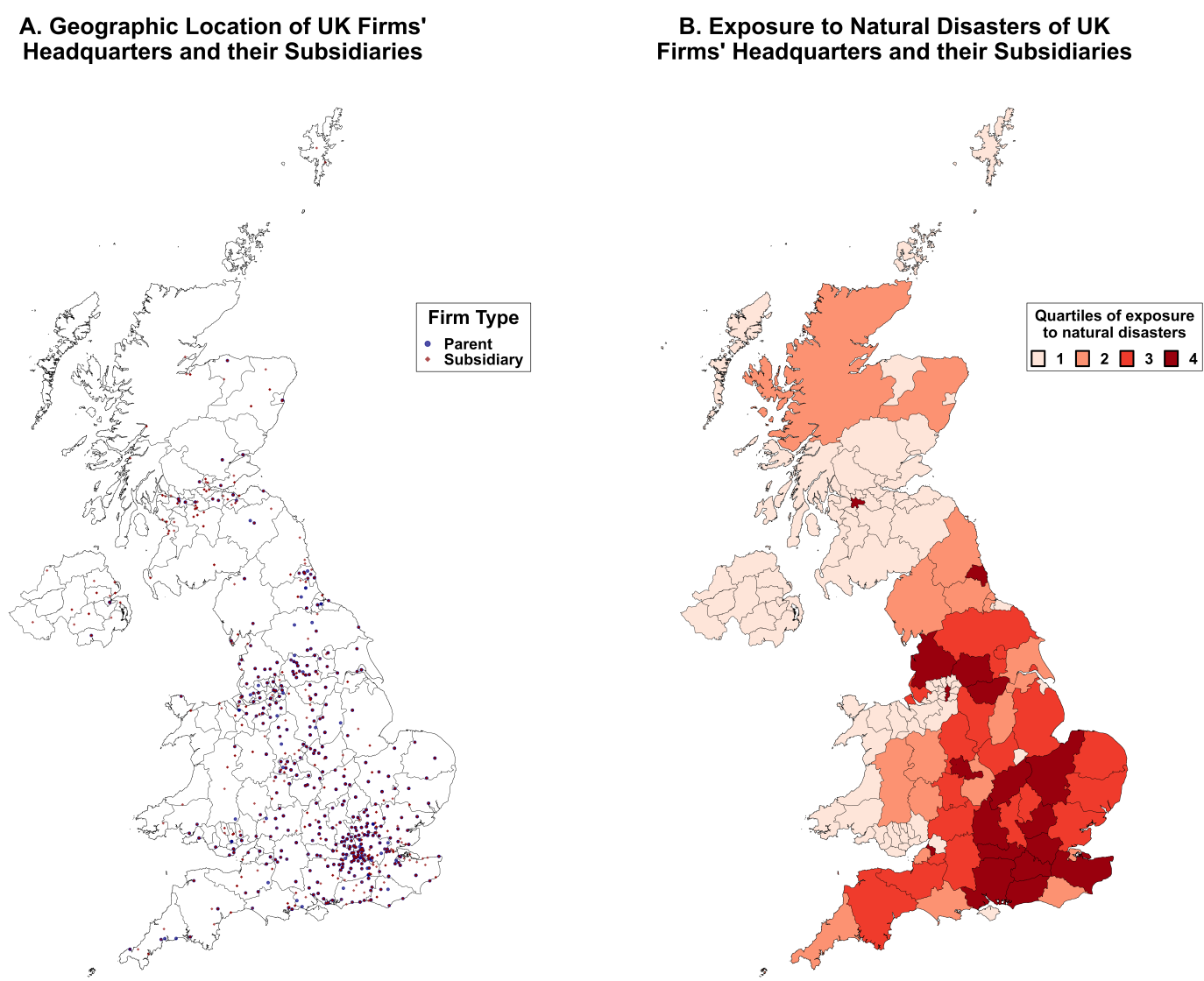


Figure 1. Geographic Distribution of U.K. Parent Companies and their Subsidiaries in the UK

Measuring Climate Adaptation at the Firm Level

To measure climate adaptation disclosure at the firm level, we constructed two distinct dictionaries. The **physical climate-risk dictionary** contains climate-related terms selected through a manual review of climate risk n-grams appearing across corporate annual reports. The **physical climate-adaptation dictionary** contains a list of climate-proactive verbs selected by analysing those appearing in the sentences containing terms in the physical climate risk dictionary.

The combination of these two dictionaries allows us to capture different dynamics across firms, such as:

- Companies **investing** in tangible assets to deal with **flood** exposure (e.g., flood walls).
- Firms taking actions to **ensure** their supply chains are resilient to the effects of **frost** damages (e.g., by switching supplier).

In our validation tests, we show that the climate adaptation measure, constructed from the combination of the two climate-related dictionaries, captures differences in future (i) **capital investment**, (ii) **innovation**, and (iii) **sustainable performances** across companies.

How do Investors Price Climate Adaptation Disclosure?

Framework

Climate adaptation disclosure is expected to mitigate negative impacts on firm value when climate risks materialise. However, theoretical models on corporate disclosure provide conflicting predictions due to the risk of investors misinterpreting this information. A recent interview with FTSE100 stakeholders suggests that the costs of investors' misconceptions may outweigh the benefits of such disclosure (Tang, 2022).

Methodology

To investigate how climate adaptation disclosure affects firm value, we used an event study methodology. We considered all UK natural disasters causing at least £100 million in damage (2018 CPI-adjusted) as reported by EM-DAT. We then estimated the following model:

$$CAR_{i,t} = \alpha_i + \beta_1 D_{i,t}^{Impacted} + \beta_2 D_{i,t-1}^{No\ Adaptation} + \beta_3 D_{i,t-1}^{Adaptation} + \beta_4 D_{i,t}^{Impacted} \times D_{i,t-1}^{No\ Adaptation} + \beta_5 D_{i,t}^{Impacted} \times D_{i,t-1}^{Adaptation} + \mathbf{X}_{i,t} + \theta_i + \varepsilon_{i,t}. \quad (1)$$

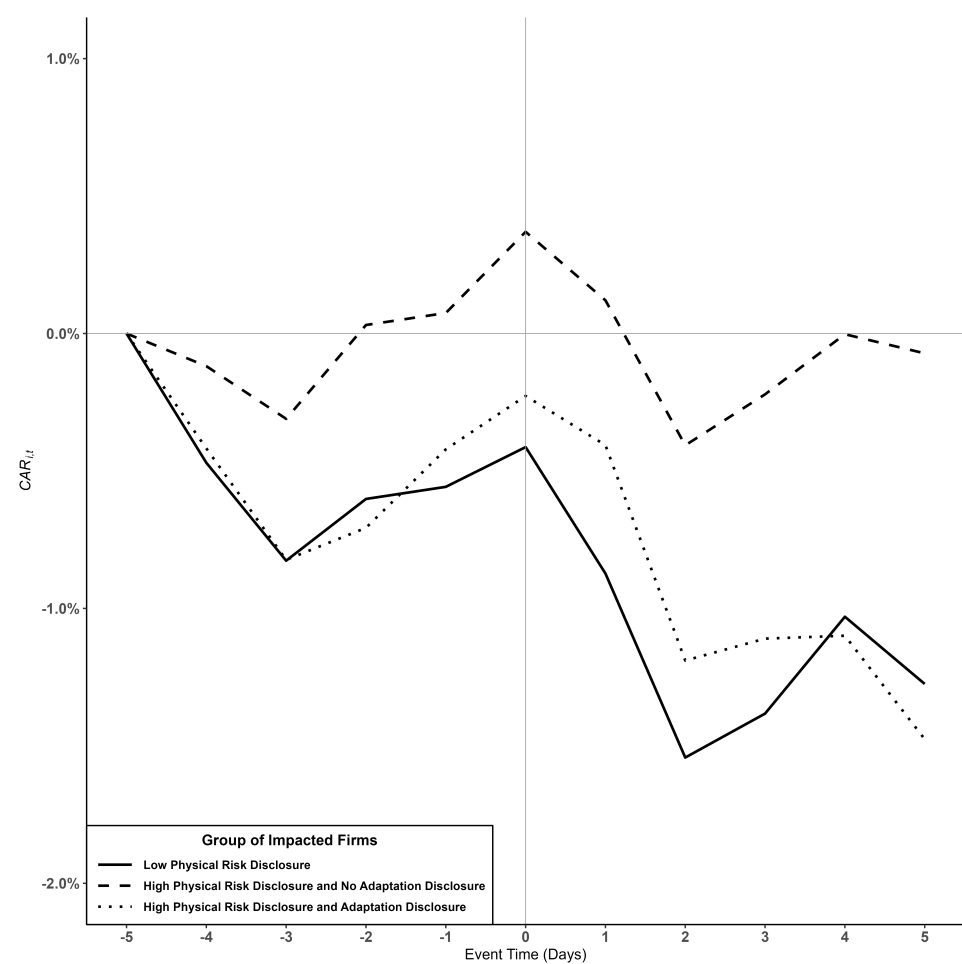


Figure 2. Abnormal Returns around Disaster Events

Here, $CAR_{i,t}$ represents the cumulative abnormal returns (CAR) of firm i around natural disasters. $D_{i,t}^{Impacted}$ equals one if the firm's headquarters is in an affected area. $D_{i,t-1}^{No\ Adaptation}$ equals one if the firm disclosed its physical climate risk exposure the year before the disaster, while $D_{i,t-1}^{Adaptation}$ equals one if a firm discloses *both* about physical climate risk exposure *and* climate adaptation strategies. We consider two climate adaptation specifications. The first captures the *presence* of any type of climate adaptation strategy in a firm's annual report. The second proxies for the *intensity* with which firms want to signal their climate adaptation strategies. $\mathbf{X}_{i,t}$ is a vector of control variables. θ_i represents firm fixed effects. Standard errors are double clustered at the firm-year levels. Figure 2 shows the average CAR around natural disaster events.

Baseline Results

Consistent with Figure 2, Table 1 shows that affected firms disclosing climate adaptation are valued similarly to non-disclosing firms. On the other hand, firms disclosing climate risks experience a lower loss in value around natural disasters.

Table 1. Baseline Results (Main Coefficients)

Dependent Variable:	$CAR_{i,t}[-5, +5]$	
Specification:	(1)	(2)
$D_{i,t}^{Impacted}$	-0.023*** (-5.023)	-0.023*** (-5.025)
$D_{i,t}^{Impacted} \times D_{i,t-1}^{No\ Adaptation}$	0.017*** (-4.354)	0.014** (-2.372)
$D_{i,t}^{Impacted} \times D_{i,t-1}^{Adaptation}$	0.005 (-0.447)	-0.011 (-0.897)
Obs.	11,535	11,535
R^2 Adj.	0.03	0.03
Controls	YES	YES
Firm FE	YES	YES

Why Do Investors Price Climate Adaptation Disclosure in this way?

A change in equity returns after an event can result from lower expected cash flows, higher uncertainty (discounting), or both (Liu et al., 2017). In Table 2, we thus analyzed whether our results were driven by a **cash-flow** or **discount rate** channel. To test these channels, we estimated models similar to those in eq. (1), but replaced market-adjusted returns with the variable of interest for each empirical test.

Table 2. Channels (Main Coefficients - First Climate Adaptation Specification)

Dependent Variable:	$Downgrade_i$	ΔROA_i	D_i^{Short}	$\Delta Volat_i$	$\Delta Spread_i$	$\Delta Volume_i$
Specification:	(1)	(2)	(3)	(4)	(5)	(6)
$D_{i,t}^{Impacted}$	0.003 (-0.151)	-0.006 (-1.007)	-0.018 (-0.902)	-0.018 (-0.222)	0.185*** (-3.053)	-1.076*** (-4.422)
$D_{i,t}^{Impacted} \times D_{i,t-1}^{No\ Adaptation}$	-0.014 (-0.202)	0.008 (-0.887)	-0.056 (-0.886)	-0.161 (-1.531)	-0.092** (-2.404)	1.012*** (-3.542)
$D_{i,t}^{Impacted} \times D_{i,t-1}^{Adaptation}$	0.015 (-0.359)	0.006 (-0.339)	0.067 (-1.012)	0.116 (-0.625)	-0.028 (-0.534)	0.360 (-1.246)
Obs.	8,307	11,277	2,308	11,000	11,000	10,094
R^2 Adj.	0.142	0.334	0.422	0.149	0.202	0.218
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Cash Flow Channel

As shown in Column (1), Table 2, analysts do not revise earnings estimates downward for firms impacted by natural disasters, regardless of their climate disclosure strategy. Additionally, we do not find evidence of lower realized cash flows (Column (2)) or increased short-selling activities (Column (3)) for impacted firms. Overall, these findings tend to reject the hypothesis that the results in Table 2 can be explained by a cash flow channel.

Discount Rate Channel

The firm value results in the event study align with the discount rate hypothesis based on the ambiguity story (Rehse et al., 2019). While affected firms show no change in risk (volatility, see Column (4)), both no-disclosure and climate-adaptation firms experience increased closing spreads and reduced trading volume. Conversely, no-adaptation disclosing firms display higher liquidity after natural disasters. These results indicate that while firm transparency about physical climate risks exposure can alleviate investors' ambiguity during times of high information uncertainty, the same does not apply to disclosure of climate adaptation.

Conclusions & Policy Implications

- A mandatory framework for physical climate risk disclosure can reduce investors' uncertainty about material climate change effects, improving stock liquidity and firm value.
- Our findings suggest that regulations aligned with the *standardised* framework proposed by the Task Force on Climate-related Financial Disclosures can reduce perceived ambiguity in evaluating climate adaptation disclosure.
- Point 2. above is justified from the fact that, as shown in Table 2, investors' penalties on firms disclosing climate adaptation are due to the ambiguity in assessing fundamentals after a natural disaster, rather than speculative reasons.

References

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