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Climate News and Asset Valuations

Insights from Latin America

Muhsin Ciftci and Christina Kolerus

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Climate News and Asset Valuations: Insights from Latin America
Prepared by Muhsin Ciftci and Christina Kolerus

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February 2025

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WORKING PAPERS

Climate News and Asset Valuations: Insights from Latin America

Prepared by Muhsin Ciftci and Christina Kolerus

Climate News and Asset Valuations: Insights from Latin America*

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5 February 2025

Abstract

We study the impact of climate-related news on asset prices in eight Latin American countries. We use both newspapers and official announcements to construct daily, country-specific indices via textual analysis, reflecting media coverage of transition risks, climate opportunities, regulatory actions, and physical risks. Leveraging an unbalanced daily panel data set of 628 firms from 2000 to 2023, we find a significant and robust climate risk premium in Latin America, which is higher for "browner" firms and has increased in more recent years. Focusing on major climate policies announced in official gazettes after the legislative process has been completed, we show that the publication of the laws is associated with a protracted decline in the relative stock prices of high-emissions firms.

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1 Introduction

Climate change and the measures taken to adapt to a new climate and transition to a low-carbon economy introduce large uncertainties into investment decisions and the economy as a whole. Pricing these uncertainties represents an important challenge for financial markets. Latin America, in particular, has extensive exposure to both natural disasters such as droughts, wildfires, and floods, as well as vast opportunities from the energy transition given the region's relatively green energy mix. This pattern of climate change exposure is coupled with active climate policy making, in particular in recent years, as governments adopted wide-ranging transition agendas, such as Brazil's *Ecological Transformation Plan* in 2023, or the *Climate Change Framework Law* in Chile in 2022. In this context, how do market participants in Latin America's largest economies account for climate-related uncertainty? Do they distinguish between the various types and sources of climate-related news? And can "green" policies mitigate this uncertainty?

This paper strives to answer these questions and contribute to the growing body of literature on transition risks and the impact of climate change exposure on financial markets. Recent literature points to the existence of a climate risk premium, although the underlying pricing effects remain ambiguous, as also reflected in inconclusive results around the existence of *carbon* risk premiums.[1]

The primary channel through which climate change and related policies might influence asset prices is uncertainty. Tackling this uncertainty, investors might find it difficult to assess stock valuations and hence require a risk premium ex-ante to hold the stocks and compensate for possible losses from climate change. As Chan and Chen (1991) postulate, firms perceived by the market to have weaker prospects exhibit higher expected stock returns and are penalized with higher cost of capital. Barnett et al. (2020) provide further theoretical foundations for pricing in uncertainty. Another perspective is that investors may follow the trend towards ESG investing and may invest in 'greener' stocks for reasons other than financial gain. Or, investors may be willing to accept a lower level of return on high-exposure stocks in exchange for the possibility of high payoffs in green technologies, Sautner et al. (2023b).

[1] We refer the reader to Giglio et al. (2021) for a comprehensive literature review on interactions between climate change and financial markets.

Studies supporting the carbon or climate risk premium hypothesis, documenting that climate change-related uncertainties are priced in stock, option, and bond markets, include Ilhan et al. (2021); Hsu et al. (2023); Pástor et al. (2021); Bolton and Kacperczyk (2021); Bolton and Kacperczyk (2023); Hengge et al. (2023), covering mainly advanced economies. Gong et al. (2023) also include emerging economies and estimate a pronounced climate risk premium for fossil fuel companies in higher-income countries, but do not find significance in middle- and lower-income countries. Several papers highlight that the markets' understanding of climate risks has evolved, notably with the issuance of the IPCC in 2007 and the Paris agreement in 2015, and climate risk premiums are more pronounced thereafter. On the other hand, Aswani et al. (2024) highlight that stock returns are associated with carbon emissions estimated by data vendors, but not with (actual) carbon emissions disclosed by firms. And while unscaled emissions are correlated with stock returns, they find that emissions intensity does not exhibit a similar relationship. Focusing on environmental damage news, Cavallo et al. (2024) document that stock prices of high emission intensity firms underperform after the release of such news for Latin American and Caribbean countries.

Another segment of the literature focuses on market pricing of physical risks, such as sea level rise, droughts, and floods. The IMF's Global Financial Stability Report (GFSR (2020)) documents that the impact of physical risks on equity markets, banking stocks, and non-life insurance stocks has been modest in the past fifty years. The analysis also does not support the pricing of climate disasters in equity valuations as of 2019, showing that investors may not have paid sufficient attention to physical risks. Faccini et al. (2023) argues that stock market participants, asset managers, and investors react to climate change risks only upon significant policy discussion and intervention, with less concern and thus pricing of physical risks. Consistent with this argument, Sautner et al. (2023b) finds that physical risks are not priced in by firms, using quarterly earnings call transcripts. However, the same study supports firms' pricing of transition risks. On the other hand, other studies document a significant impact of physical risks on asset prices. For instance, Painter (2020); Goldsmith-Pinkham et al. (2022) find that the effects of physical risks (rise in sea levels) are reflected in municipal bonds. Bansal et al. (2016) further document a negative impact of the long-term rise in temperatures on equity valuations.

Regarding the influence of "green" policy making, Hengge et al. (2023) find that, within the European ETS framework and after extracting the surprise component of regulatory actions, policies resulting in a higher carbon price lead to negative abnormal returns for firms with high emission intensities. Despite the presence of a risk premium, legislative actions can lead to a decline in stock prices for "brown" firms. In a theoretical contribution, Pástor et al. (2021) show that, in equilibrium, green assets have lower expected returns because investors enjoy holding them and hedge climate risks. However, green assets outperform when positive shocks hit the ESG factor, which captures changes in the tastes of customers for green products and the tastes of investors for green holdings.

In this paper, we aim to shed light on the pricing of climate-related risks in an emerging market context. Our contribution is multi-fold. First, while most literature focuses on US or European markets, we study the eight largest economies in Latin America, guided by data availability: Brazil, Mexico, Chile, Peru, Colombia, Uruguay, Ecuador and Costa Rica.[2] The region features active, independent media reporting on climate news over an extended period of time (2000-2023). Moreover, focusing on Latin America allows us to capture climate-related upside and downside potential, responding to important challenges identified in Giglio et al. (2021). Second, we compile a comprehensive and comparable set of country-specific climate news indices for the region which reflects well domestic climate events and distinguishes between media reporting and official gazettes. Third, using a comprehensive firm-level data set covering all eight countries in the sample, we test whether and to what extent climate news are priced in. The most related paper to our study is Sautner et al. (2023b) which investigates whether firm level climate exposure is priced in financial markets.

To estimate climate risk premiums, we first build indicators that help us capture climate change exposure. We construct daily exposure indices for each country leveraging more than 30 million newspaper articles from all available media sources over the period of 2000 to 2023, as well as "official news" from local government gazettes during 2017 to 2023. Our textual analysis is guided by climate-related bi-grams identified in Sautner et al. (2023a) from firms' earning calls, and builds on Baker et al. (2016). We construct daily indices reflecting media coverage of climate events including climate opportunities, regulatory action, and physical risks. In addition, we combine climate events with a notion of uncertainty to derive a climate risk sentiment. News from official gazettes comprise presidential decrees, laws, and regulations with

[2] We exclude Argentina due to unavailability of data

legally binding consequences. We expect official gazettes to publish climate-related news at the end of the legislative process, while newspapers would pick up discussions around regulatory changes from the beginning of the process onward. In addition, for an event study environment, we compile a binary series of "major climate legislation", extracting identified events via official gazettes and focusing on major, fully legislated climate policies, broadly following Barrett et al. (2024).

We then combine our climate news indices with a comprehensive set of financial micro data for 628 publicly listed firms starting in 2000. Our dataset comprises financial variables from the asset pricing literature as well as emissions and ESG data, and is complemented by selected country-level controls (Sautner et al. (2023b); Bolton and Kacperczyk (2021); Bua et al. (2024), among many others). To measure the pricing of climate change exposure, we perform cross-sectional regressions of excess returns on climate news, firm- and country-level controls, broadly following Bolton and Kacperczyk (2021). We further examine the influence of factor returns on the estimated climate risk premiums in country-level time series regressions. Finally, we conduct an event study around major climate policy events and employ local projections à la Jorda (2005) to test for a more protracted response of excess returns to legislative climate action.

Our main findings can be summarized as follows. First, we find robust evidence for a climate risk premium in Latin America. The association between climate change exposure and excess stock returns is statistically significant and economically meaningful. A one-standard-deviation increase in the *Climate Risk* news index is associated with a 1.5% increase in annualized excess stock returns. This effect intensifies post-2017, with the increase rising to 3.5% in annualized terms. Restricting the sample to 2017 onward, we also find a positive effect on stock prices from regulatory, opportunity, and physical climate news. Moreover, Latin America's risk premium is increasing over time. Our results are robust to the inclusion of different measures of carbon emissions as well as various methods of calculating standard errors and clustering. Climate risk premiums also remain robust in country-level time series regressions on conventional Fama-French risk factors, and when using option-implied forward-looking expected return proxies of Martin and Wagner (2019) in a small-sample study.

Second, the climate risk premium is higher for "browner" firms. Using the environmental pillar of ESG scores and interacting a firm's rating with climate news, we find that "greener" firms experience significantly lower climate risk premiums. A one-standard-deviation increase in the E-score significantly reduces climate risk premiums across subcategories, with the premium approaching zero for the top quintile. In terms of sectors, news on climate risks play a role in pricing consumer retail, financial, industrial, and real estate sectors, while opportunity-related news affect basic materials, energy, consumer retail, and industrials. Regulatory news mainly affect firms in the technology sector. "Greener" firms feature lower climate risk premiums across all sectors but technology.

Third, an event study focusing on major climate legislation reveals that the stock prices of brown firms, relative to greener counterparts, decrease by 0.5% to 1% within two weeks following official announcements. This is in line with the argument of Pástor et al. (2021); Hengge et al. (2023) that shifts in green sentiment can have an investment-shedding impact on brown stocks, lowering their demand and price.

The remainder of this paper is structured as follows: In section 2, we present a comprehensive dataset covering firm-level financial variables and carbon emissions, as well as macro controls. Next, in section 3, we provide the climate change exposure measures and the methodology we use to construct them. Following this, in section 4 we outline our empirical specifications and discuss the results in detail. In section 5, we examine key events related to legally binding domestic climate policies through an event study, and section 6 discusses robustness checks of our findings. Finally, we conclude the paper in section 7.

2 Data

2.1 Climate news

To build daily indicators of climate news, we source approximately 30 million news articles published between January 2000 and July 2023 by media outlets in Brazil, Mexico, Chile, Peru, Colombia, Costa Rica, Ecuador, and Uruguay. While Brazil and Mexico constitute the largest fraction of newspaper articles (Table A1), the number of sourced articles in each country exceeds 1/2 a million, even in smaller economies reflecting a strong media landscape across Latin America. We leverage Dow Jones Factiva's database to run key word search algorithms on these articles. We do not exclude newspapers in any given country and all countries display a broad spectrum media sources, with a strong presence of local publishing houses (Table A2). In terms of concentration, the largest publishing house takes up only 9 percent of total articles in Brazil and Colombia, and around 15 percent in Chile and Mexico. The share increases to 20 percent in Peru and Ecuador, 30 percent in Uruguay, and 50 percent in Costa Rica.

For both, the official climate policy news index and major climate legislation variable, we examine official, government-issued gazettes for the eight countries named above during the period 2017-2023 (Table A3). Each country in our sample publishes its laws, decrees, and regulations in its own gazette at varying regularity, ranging from 740 publications on average per month in Chile to 25 in Brazil. We further leverage the Climate Policy Database[3] as data source for climate actions to cross-check and fine-tune our official news indicators.

2.2 Firm-level data

We use various data sources to obtain granular firm-level data covering the period 2000-2023 and match firms using ISIN numbers as identifiers. Our sample contains 628 firms across Latin America. We provide the total number of firms by country in Table A4. Brazil dominates the sample with 263 firms (41.88%), followed by Mexico (136 firms, 21.66%) and Chile (125 firms, 19.90%), collectively accounting for over 83% of the dataset. Peru (65 firms, 10.35%) and Colombia (34 firms, 5.41%) provide moderate representation, while Ecuador (3 firms, 0.48%), Uruguay (1 firm, 0.16%), and Costa Rica (1 firm, 0.16%) contribute marginally. This distribution underscores the concentration of firms in the region's larger economies. We further provide the total number of firms by industry groups and sectors in Table A5, Table A6 respectively.

2.2.1 Financial data

We use firm-level financial data obtained from Refinitiv Eikon. For our dependent variable, we obtain stock prices and calculate listed firm's realized excess stock returns at daily frequency using risk-free rates in each country. We exclude excess stock returns exceeding 100% to mitigate the influence of extreme observations. This adjustment leads to the removal of a total of 1017 data points. We incorporate firm-specific characteristics commonly recognized as drivers of stock returns, (Bolton and Kacperczyk, 2021; Sautner et al., 2023b). In particular, we gather firms' (log) total market capitalization, (log) total assets, debt-to-assets ratio, capital expenditures (CAPEX)-to-assets ratio, property-plan-equipment (PPE)-to-total assets ratio, and earnings

[3] https://climatepolicydatabase.org

before interest and taxes (EBIT)-to-total assets ratio and stock price volatility. We also obtain the environmental pillar of ESG scores (E-score) at the firm level to construct brown/green categorizations and assess the differential risk premia between firms. Finally, we construct time-varying market betas for each firm based on a three month rolling window using excess stock returns. To mitigate the impact of outliers in independent variables we winsorize certain variables, provided in Table A7.

2.2.2 Carbon emissions and green taxonomy

We obtain direct and indirect (Scope 1 + Scope 2) carbon emissions, in levels as well as intensity, from Urgentem matching firms via ISIN identifiers. Including emissions data, the final match produces 628 firms with 3107 firm-years of valid data, covering the period 2009-2023. Emissions data from Urgentem are based on the Carbon Disclosure Project (CDP). Direct emissions (scope 1) are measured annually based on the establishments that a particular firm either owns or has control over. Indirect emissions (scope 2) are a result of using electricity or generating heat for the firm's operations. Scope 3 emissions are a by-product of a firm's operations which the firm may not have control of. In our estimations, we include widely reported carbon emissions data on scope 1 and 2, excluding scope 3, focusing on emission intensity. Some regulations target emissions levels while intensity captures a firm's emissions more dynamically, accounting for transformations such as mergers, acquisitions, and shifts in demand.[4] Aswani et al. (2024) argues that emissions intensity is an appropriate choice for assessing carbon performance of individual firms. Finally, we use a one-year lag of emissions to avoid potential look-ahead bias, as emissions data should be available at the time of taking a financial position from an investor's perspective.

Figure A1 shows the emissions profile of firms across different sectors in our sample. In particular, electricity, industrial metals/mining, and waste/disposal services are the most carbon-intensive sectors, while service-related insurance and banking are among the least carbon-intensive ones. In Figure A2, we present the number of firms reporting carbon emissions and E-scores by year. In recent years, there has been a notable increase in the number of firms reporting emissions and environmental scores (E-score), which might be attributed to heightened awareness of climate change in recent times. In Table A6, we provide the number of firms by

[4]For a detailed discussion of the level vs. intensity of carbon emissions and the practical policy implications, we refer the reader to Bolton and Kacperczyk (2021).

sector. When grouped by sector, the electricity sector has the highest number of firms (51), representing 8.12% of the total number of firms. The electricity sector is followed by investment banking and brokerage services (45), banks (42), and food producers (39). While the electricity sector is the most carbon intensive, investment banking and brokerage services and banks are among the least carbon intensive sectors. This ensures that our sample covers a sufficient number of firms on both sides of the carbon emissions distribution. In alternative empirical estimation specifications, we include the E-Scores (Environmental pillar) of the ESG (Environmental, Social and Governance) scores derived from Refinitive Eikon. These are available for 325 firms, resulting in a sub-sample of 2355 firm-years.

2.3 Country-level and macro data

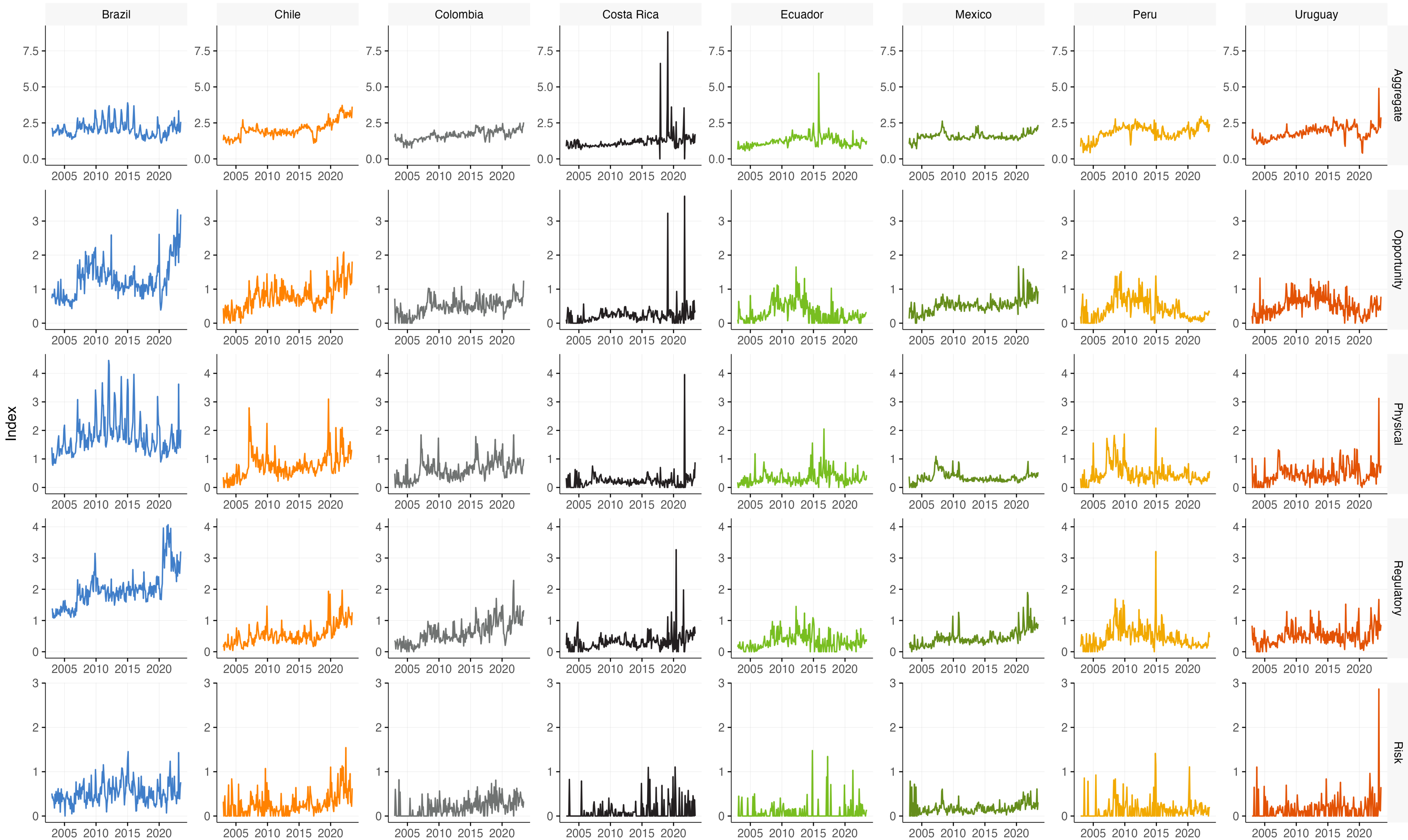
Finally, we combine firm-level data with country-level and global variables. We include VIX to capture financial market movements at both country and global levels over time. Since our sample covers the COVID-19 period, we also incorporate COVID-19 lockdown intensity for each country using the dataset from Hale et al. (2021). Finally, we include the oil price to capture energy and supply related dynamics.

For time series regressions, we further obtain conventional Fama French factor returns from Global factor database of Jensen et al. (2023) for five Latin American countries: Brazil, Mexico, Chile, Peru, and Colombia. Factor returns data are not available for Costa Rica, Uruguay, and Ecuador. Factor returns data include market, value, size, profitability, investment, momentum. We provide summary statistics of all variables in Table A7.

3 Construction of climate news indices

3.1 Climate news from media outlets

We first build a daily indicator by country that reflects the frequency of news articles published between January 2000 and July 2023 related to climate action and exposure, covering topics such as emissions reduction, renewable energy, climate regulation and physical shocks.



Notes: This figure shows media-based climate change news indices at the country level. Each column reflects a country and each row represents indices which measure various types of climate exposure. For illustration, we plot the monthly averages.

Figure 1: Climate news from media outlets

To capture the discussion around climate news in textual analysis, we take climate-related bigrams identified by Sautner et al. (2023a) and translate them into Portuguese and Spanish.[5] We then leverage Dow Jones Factiva's newspaper archives and derive a daily count of articles containing these bigrams or combinations thereof. The resulting frequency is standardized by the total number of articles in a given month.[6]

$$\text{Climate News}_{j,t} = \frac{1}{N_{j,m}} \sum_{b}^{B} (\mathbb{1}[b \in C]) \tag{3.1}$$

where b is a particular bi-gram, $\mathbb{1}$ is an indicator and takes 1 if the bi-gram exists in an article published in country j, C is the set of bi-grams, and $N_{j,m}$ is the total number of articles published each month in country j.

Figure 1, first row, depicts the *Climate News* index (Aggregate) for each country in our sample.[7] There is a mildly positive correlation between country indices across our sample (Table A8), driven by major events at regional and global scale, such as George W. Bush's withdrawal from the Kyoto protocol in 2001 and the Paris agreement in 2015. However, media reporting seems to be primarily driven by country-specific events, resulting in a relatively heterogeneous pattern across indices. There is more variation in the indices of countries with fewer news sources such as Costa Rica and Uruguay.

To better capture the various aspects of climate news, we differentiate climate exposure by subcategories and perform a similar textual analysis using Sautner et al. (2023a)'s topic-based bigrams. For each country, we create daily indices for (1) climate-related regulatory news (*Regulatory*), (2) news related to physical climate events and natural disasters (floods, drought, sea level rise, etc.) (*Physical*), and (3) news about climate-related technological developments and opportunities such as wind power, lithium batteries, and solar parks (*Opportunity*). The subcategories are depicted in Figure 1, second to fourth row.

Although all countries show a post-pandemic uptick in the *Opportunity* news index, the increase is particularly notable in Brazil, where initiatives regarding sustainable agriculture,

[5]Using an adapted key word discovery algorithm, Sautner et al. (2023a)'s bi-grams are derived from quarterly earnings call transcripts of more than 10,000 firms across 34 countries over the period 2002 to 2020. The bigrams are associated with real outcomes related to the net-zero transition and contain information that is priced in options and equity markets.

[6]Standardizing by the total number of articles per day does not change the results qualitatively but increases the indicator's volatility.

[7]We plot monthly averages of our daily indicator for better readability.

deforestation and carbon credits, and biofuels have gained importance, as well as the rapid deployment of wind and solar power, Chen et al. (2024). In Chile, the upward trend can be associated with the increased importance of rare earths for the global energy transition, particularly lithium of which the country disposes important resources. In Peru, the second largest exporter of copper worldwide, a steady decline in the *Opportunity* news index throughout the 2010s is reflective of a lack of investments in mining which, together with relatively low business confidence, has hampered seizing Peru's significant potential so far. Increased law-making in relation to climate change can be observed after the pandemic in Brazil, Chile, Colombia, Mexico and Uruguay, as depicted in the *Regulatory* news index.

Somewhat surprisingly, news about physical events and risks from climate change does not feature a clear upward trend across countries over the past decade. The uptick in the *Physical* news index in the late 2000s, occurring in most countries, seems to have reversed in the 2010s. Some countries show a moderate pick up from 2020 onward (Brazil, Chile, Costa Rica), with the exception of Uruguay, where the spike in 2023 is related to the two El Niño events the country was exposed to throughout the year. For additional validation, we compare the *Physical* news index to actual physical climate events in Brazil, using climate events (e.g., droughts, floods) obtained from the International Disaster Database (EM-DAT).[8] We exclude biological, geophysical (earthquakes) and extra-terrestrial events. As media coverage for these (larger) events might span more than a few days, we plot monthly averages of our *Physical* news index together with the actual events in Figure A3. The occurrence of two or more events tend to correspond closely to spikes of the *Physical* news index. The latter's remaining spikes could reflect natural disasters in neighboring countries or on the global scale. In terms of dynamics, actual events also display an increase throughout the 2000s and decline in the late 2010s, before picking up again more recently.

To complement the set of indices, we relate our textual analysis to a sentiment that captures potentially negative consequences associated with climate news as reported in media outlets. We condition each bi-gram of the aggregate set to be in the same sentence with the words "risk", "uncertainty" or their synonyms in (3.2) similar to the specifications in Hassan et al. (2019).

$$\text{Climate Risk News}_{j,t} = \frac{1}{N_{j,m}} \sum_{b}^{B} (\mathbb{1}[b \in C]) \times \mathbb{1}[b, r \in S] \tag{3.2}$$

[8] https://public.emdat.be/data

where r is a respective risk-related term, S is the set of synonyms of risk and everything else is as in (3.1). Summary statistics of the various indices are reported in Table A7.

To illustrate, we plot monthly averages of the *Climate Risk News* index for Brazil - the country with the highest firm coverage in the sample - from January 2000 until June 2023, Figure 2. We add selected international (blue) and domestic (brown) climate policy events.[9] Our *Climate Risk News* index for Brazil captures these climate events very well, including the US withdrawal from the Kyoto protocol under G.W. Bush, the Kyoto protocol becoming effective, the United Nations climate conferences in Copenhagen and Doha, the signing of Paris agreement, and the US withdrawal from the Paris agreement under the first Trump administration. In addition, our *Climate Risk News* index also captures domestic climate policies such as presidential decrees and laws on bio-fuels, financing climate-related infrastructure projects, and fighting deforestation in the Amazon.

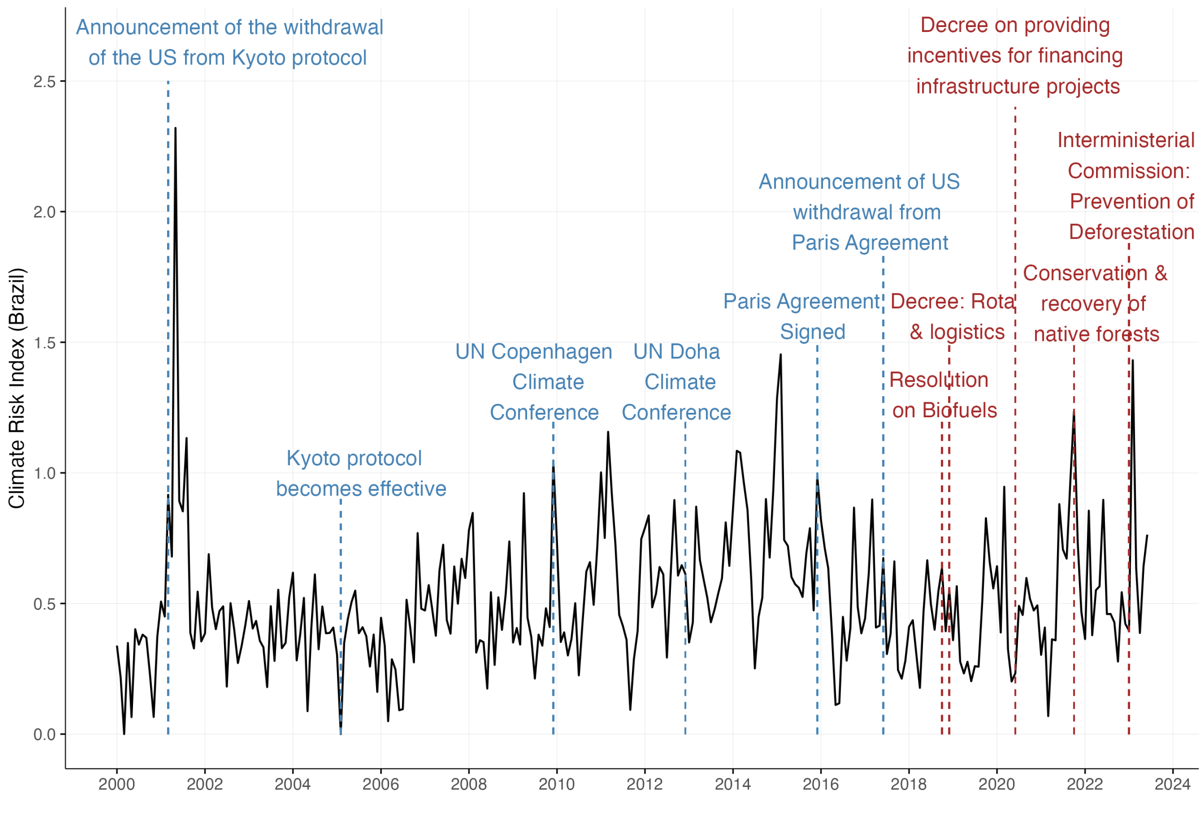


Figure 2: *Climate Risk News* index for Brazil

Notes: This figure shows the *Climate Risk News* index for Brazil. Annotated vertical lines correspond to selected international (in light blue) and national (in red) climate policies.

[9] We distill domestic climate policies from our search in official gazettes (see next section).

We further compare our country-level *Climate Risk News* indices to the *Global Climate Policy Uncertainty* index, derived by Gavriilidis (2021) in Figure A4, since both are constructed using climate-related terms in conjunction with risk, uncertainty, and instability. While there is some overlap between our measures and global climate policy uncertainty (especially in recent years), our risk measure displays different patterns for each country. We believe that our *Climate Risk News* indices capture country-specific news that does not receive the same press coverage when aggregated at the global level. As such, this paper contributes to the existing literature by adding important country-specific nuances of climate risks for Latin America.

While we use empirically derived climate-related bi-grams proven to predict real outcomes related to climate change (Sautner et al. (2023a)), our constructed indicators of interest are likely to be measured with some noise. We therefore assume that our index is correlated with the true signal of news and further measured with some random noise. Laudati and Pesaran (2023) argue that as the number of news articles increases, noise becomes, on average, *reasonably small* and estimates become consistent. In our case, the climate change exposure measures are constructed using more than 30 million news articles, reducing noise to a great extent.

3.2 Climate policy news in official gazettes

To better understand differences between regulatory action and media reporting, we distinguish between official gazettes, i.e. government bulletins or official publication outlets, and news outlets in general as source of publications for climate bi-grams. We expect official gazettes to publish climate-related news at the end of the legislative process, while media outlets would pick up discussions around regulatory changes and possible new climate policies at the beginning of the process. Media reporting would also happen upon law approval. Translating news pieces from these sources into separate indicators also allows us to test possible differences in the impact of regulatory initiation and final approval on asset prices. Similar to daily newspapers, we examine the official gazettes of our eight sample countries using textual analysis (Table A3). Given the publication history across our sample, the time horizon is limited to 2017 to 2023. We count bi-grams related to aggregate, opportunity, and physical news, and construct the corresponding indices. For robustness, we also perform textual analysis including a notion of uncertainty. As expected for regulatory publications, we only counted very few entries.

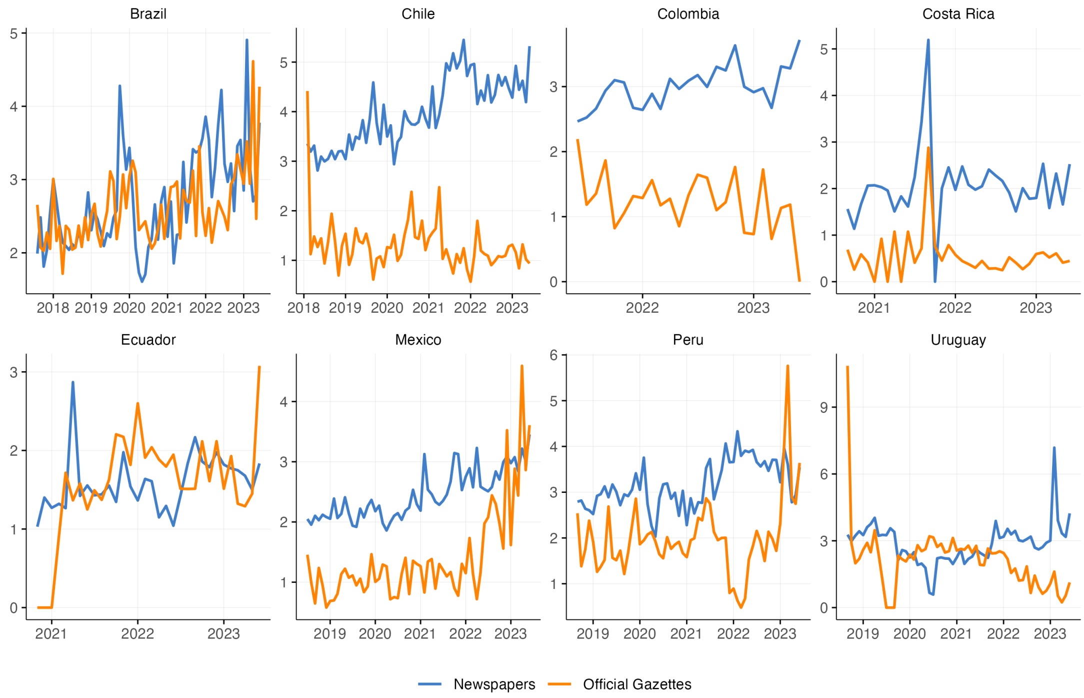


Figure 3: Media-based and official climate news indices

Notes: This figure shows aggregate climate change exposure measures based on media outlets and official gazettes. We plot the last five years, aggregating data at monthly frequency.

Comparing aggregate climate exposure indices from media outlets and official gazettes (Figure 3) shows a surprising synchronization in trends for Brazil and, to some extend Mexico, while the indices in Colombia, Peru and Uruguay seem to have taken divergent paths more recently. In the latter countries, new legislation might not have been necessary to address climate risks floated in the media. Alternatively, news outlets are picking up global or regional climate discourse that cannot be addressed by domestic policies.

Building on the above analysis, we construct a binary indicator variable of *Major Climate Policy Events* that uses the aggregate climate news index from official gazettes and concentrates on the most important legislation. We *manually* check official gazettes and verify that the publication refers to a law, decree or regulation on climate action that is fully legislated. We further leverage the Climate Policy Database and crosscheck related policies for Latin American countries with information from the official gazettes. We only include policies that are legally binding. To this end, we exclude government plans or projections on climate policies that have not yet been implemented and are therefore not legally binding. We detect 57 events in total and our identified events are listed in Table A9.

4 Empirical specification and baseline estimates

4.1 Latin America's climate risk premium

In the baseline specification, we test how climate news affects stock returns in selected Latin American countries. We relate excess stock returns to climate exposure measures, various firm-level controls which are commonly accepted as main drivers of stock returns, and country-level risk and COVID variables, as well as oil prices. We estimate the following cross-sectional regression, as outlined by Bolton and Kacperczyk (2021); Aswani et al. (2024):

$$\begin{aligned} r_{i,j,t} = \beta_0 &+ \beta_1 \text{Climate News}_{j,t} + \beta_2 \text{Firm Controls}_{i,j,t-1} \\ &+ \beta_3 \text{Macro Controls}_{j,t} + \mu_t + \gamma_j + \epsilon_{i,j,t} \end{aligned} \tag{4.1}$$

where $r_{i,j,t}$ represents the excess stock return of firm i in country j at time t. Climate News$_{j,t}$ represents the set of measures of exposure to climate change derived from newspapers for country j. Firm Controls$_{i,j,t-1}$ include time-varying market betas, log-total assets, debt-to-assets, log-market capitalization, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. At the macro level, we include (i) oil price changes, (ii) volatility measures (VIX) to capture market risk sentiment, and (iii) lockdown intensity to account for large price fluctuations occurring during the COVID19 pandemic. We consider these controls useful, as the COVID waves in our sample countries were not aligned and COVID indices were shown to capture risks in addition to VIX.[10] μ_t and γ_j represent time and country fixed effects. Finally, $\epsilon_{i,t}$ is the disturbance term, and β_1 is our coefficient of interest. We winsorize certain variables to remove the effect of outliers (Table A7) and further standardize all variables to have zero mean and unit standard deviation in each estimation to facilitate interpretation. In Table 1, we provide baseline estimation results for all media-based climate news indices for the period of 2000 to 2023. The dependent variable is excess stock returns.

Our results indicate a positive and statistically significant relationship between climate news and excess stock returns, with the exception of aggregate and opportunity-based climate news. The strongest impact on excess returns comes from news about climate risk and uncertainty: a

[10] For instance, Buda et al. (2023) use lockdown intensity to measure the real effects of monetary policy shocks at daily frequency.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	0.006***				
	(0.001)				
Aggregate		0.001			
		(0.001)			
Regulatory			0.003***		
			(0.001)		
Opportunity				-0.001	
				(0.001)	
Physical					0.001*
					(0.001)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	2,035,501	2,035,501	2,035,501	2,035,501	2,035,501
R^2	0.003	0.003	0.003	0.003	0.003

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table 1: Stock returns and climate news: Full sample

Notes: This table presents our baseline results covering eight Latin American countries. The sample period spans from January 2000 to June 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, market volatility and COVID lockdown intensity.

one standard deviation increase in the *Climate Risk News* index is associated with a 0.6 basis point increase in excess stock returns. The impact of regulatory and physical news is about half and a sixth of the magnitude of the *Climate Risk News* index, respectively. In annualized terms, these figures approximately correspond to an impact of climate news on excess returns of 1.5%, 0.75% and 0.25%, respectively. Our results support the existence of a climate risk premium in Latin America's largest economies.[11] That is, investors demand a positive risk premium to hold stocks exposed to climate-related uncertainty and transition risks.

In light of the recent debate in the literature on the *direct* effect of firms' carbon emissions on stock returns, we further control for emissions using the baseline specification. We restrict our sample to the post-Paris agreement period, when at least 100 firms provide emissions data (Figure A2), and estimate the baseline specification with and without carbon emissions. We report the results in Table 2. Columns (i) to (v) display baseline results for the post-Paris agreement sample, excluding emissions, and columns (vi) to (x) include carbon emissions intensity.[12]

The impact of climate-related news remains consistently positive and statistically significant, regardless of whether carbon emissions are included as a variable (a detailed discussion of the climate risk premium following the Paris Agreement is provided in the next subsection). The coefficients for carbon intensity remain positive, but they lack statistical significance. The role of emissions is influenced by correlations among covariates and the presence of missing observations. For instance, when variables such as the ratio of earnings before interest and taxes to total assets, stock volatility, and lockdown intensity measures are excluded, emissions intensity becomes statistically significant with a positive coefficient. However, when we restrict the sample to the last three years — when the majority of firms began reporting emissions data — yields statistically significant coefficients for carbon emissions intensity (Table A12). While this result may be influenced by sample selection, it could also reflect an increase in climate awareness in recent years.

[11]Given the distribution of firms across countries, the climate risk premium is driven by Brazilian, Mexican and Chilean firms, followed by Peru and Colombia (Table A4).

[12]Following the arguments of Aswani et al. (2024), we use emissions intensity, albeit qualitatively and quantitatively similar results are obtained using the level of emissions, see Table A11.

Model:	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Variables										
Climate Risk	0.014***					0.014***				
	(0.002)					(0.002)				
Aggregate		0.016***					0.016***			
		(0.003)					(0.003)			
Regulatory			0.004*					0.004*		
			(0.002)					(0.002)		
Opportunity				0.016***					0.016***	
				(0.002)					(0.002)	
Physical					0.007***					0.007***
					(0.002)					(0.002)
Emissions Intensity						0.002	0.002	0.002	0.002	0.002
						(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-effects										
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Statistics										
Observations	333,247	333,247	333,247	333,247	333,247	333,247	333,247	333,247	333,247	333,247
R^2	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table 2: Stock returns and climate news: Post-2017

Notes: This table presents the baseline results with and without emissions for eight Latin American countries for the sample period of January 2017 to June 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and COVID lockdown intensity. Finally, we include the log of carbon emissions from the previous year to avoid look-ahead bias.

4.1.1 Climate risk premium over time

Investors typically adjust their risk premium in response to changes in preferences, technological advances, and market sentiment, including attention paid to climate-related topics. To this end, we estimate the time-varying risk premium based on rolling regressions with a sample size of one and a half years, moving the sample window by one month at a time. Figure 4 shows the evolution of the climate risk premium over time, depicting the sensitivity of stocks to the *Climate Risk News* index. We provide the mean estimate (solid line) as well as 68% and 90% confidence intervals (shaded areas) based on robust standard errors. We estimate the climate risk premium with and without carbon emissions.

The region's climate risk premium exhibits an upward trajectory with fluctuations notably around crises times. Until the second quarter of 2012, the premium is mostly negative or insignificant, with the exception of 2008. From the second quarter of 2012 onward, the risk premium turns positive, except for a brief dip in 2014 around the taper tantrum episode. A significant rise occurs shortly before 2015 and aligns with the ratification of the Paris Agreement in December 2015. Between 2018 and 2020, the premium declines but remains positive and significant, then surges and stabilizes around 4% annually. Including carbon emissions in the analysis reveals a broadly similar pattern.

A similar pattern emerges for the other climate news indicators, as shown in Table 2 for the post-2017 period. Compared to the full sample, both the climate risk premiums and the statistical significance of all climate change exposure measures increase in the years following the Paris Agreement. Specifically, a one-standard-deviation increase in the *Climate Risk* index corresponds to a 1.4 basis point (bps) increase in equity returns, equivalent to an annualized return of 3.5%. Similarly, a one-standard-deviation increase in the *Aggregate*, *Regulatory*, *Opportunity*, and *Physical* indices is associated with equity return increases of 1.4 bps, 0.4 bps, 1.6 bps, and 0.7 bps, respectively, translating to annualized gains of 4%, 1%, 4%, and 1.8%, respectively.

The notable rise in the opportunity risk premium is particularly striking, reflecting the region's significant advancements in solar energy, lithium batteries, and other green technologies, as well as investors' increasing recognition of these developments. The amplification of the climate risk premium after 2017 aligns with findings from prior research in the literature, including Bolton and Kacperczyk (2021) and Bua et al. (2024), among others.

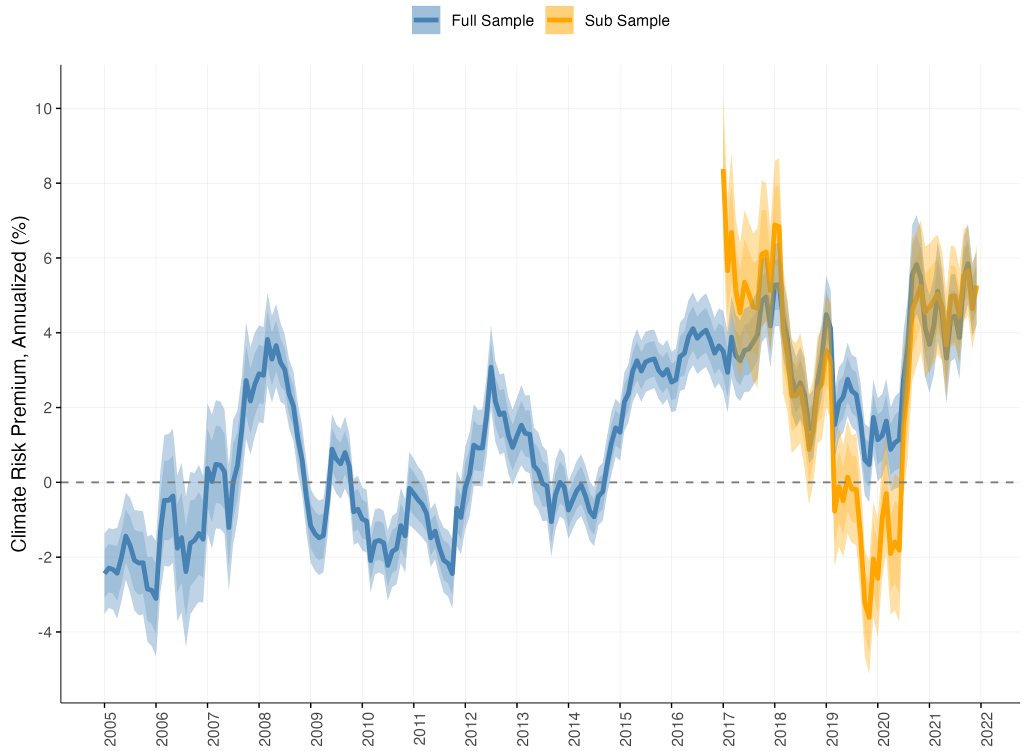


Figure 4: Latin America's climate risk premium over time

Notes: This figure shows the time-varying climate risk premium based on rolling regressions. The sample size is one and a half years, and in each step, we move the sample window by one month and re-estimate the model. The solid line represents the mean, and the shaded areas are the (robust) 68% and 90% confidence intervals, respectively. Blue color denotes the baseline results; orange color the baseline results including emissions.

4.1.2 Climate risk premium by country

Given the availability of relevant data, we estimate climate risk premiums for Brazil, Chile, Mexico, and Peru, focusing specifically on the *Climate Risk* index. These estimates aim to capture the extent to which equity returns are influenced by climate-related factors in each country. We report the average climate risk premiums at the country level in Figure 5. The magnitude of these estimates aligns broadly with findings in the existing literature. For instance, Sautner et al. (2023b) calculate a climate risk premium for the United States ranging from 0 to 3 percent annually over the period 2003–2023. In the context of emerging markets, our findings indicate that an annualized risk premium of 2 to 2.5 percent in Brazil and Mexico, and approximately 1 percent in Chile, is consistent with the broader trend. For Peru, however, the climate risk premium is statistically insignificant under the baseline specification and the magnitude is comparably small. Overall, the observed country-level variations highlight the interplay between climate risk and investor sentiment across different national contexts.

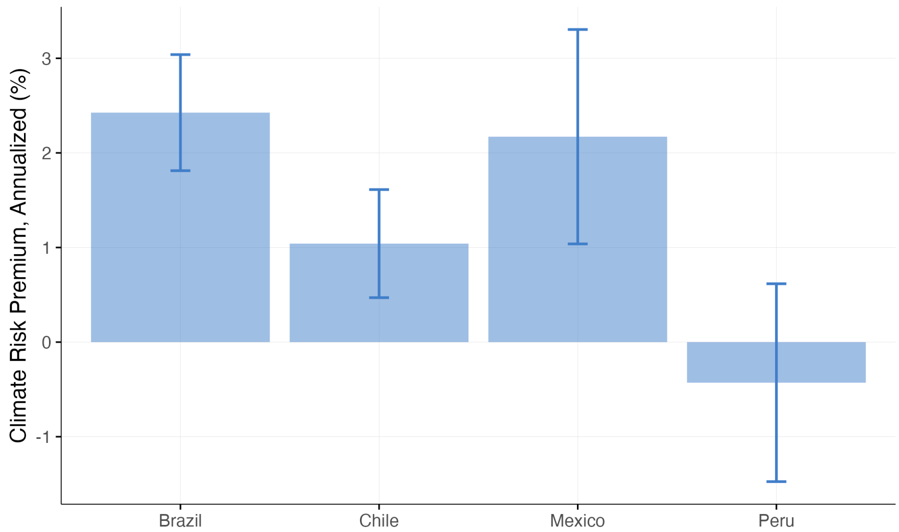


Figure 5: Annualized climate risk premium by country

Notes: This figure shows the average, annualized climate risk premium for sample countries with a *sufficiently* large number of firms. We exclude Colombia, Uruguay, Costa Rica and Ecuador. We provide the number of firms per country in Table A4.

4.1.3 Climate risk premium and factor returns

In this section, we investigate relationship between conventional Fama-French factor returns and the climate risk premium derived in the baseline specification for the *Climate Risk* news index. The underlying premise is that if our estimated climate risk premium truly captures climate-related risks, the variation in this premium should not be absorbed by the conventional Fama-French factors that typically influence stock returns. In other words, even after controlling for the returns of the Fama-French factors, our climate risk premium should align with the baseline specification and remain robust, similar to Bolton and Kacperczyk (2021). To this end, we perform time series regressions on traditional factor returns by country focusing on the same subset as above. In particular we estimate the following:

$$\psi_t = \alpha_0 + \alpha_1 F_t + \epsilon_t \tag{4.2}$$

where ψ_t is the climate risk premium and F_t stands for the conventional Fama-French risk factors, Fama and French (2015) and momentum. These factors include the market risk premium, which accounts for the excess return of the market over the risk-free rate; the size factor (SMB, or Small Minus Big), which captures the tendency of smaller companies to outperform larger ones; and the value factor (HML, or High Minus Low), which reflects the outperformance of value stocks with high book-to-market ratios over growth stocks. The profitability factor (RMW, or Robust Minus Weak) is used to measure the premium associated with companies with profitability. The investment factor (CMA, or Conservative Minus Aggressive) indicates that firms with more conservative investment strategies tend to yield higher returns. Finally, the momentum factor (MOM) highlights the phenomenon where stocks with strong past performance continue to perform well in the short term. Collectively, these six factors offer a comprehensive framework for analyzing and predicting the drivers of stock returns, as shown in extensive literature, Fama and French (2015); Carhart (1997).

α_0 measures the residual climate risk premium and α_1 shows the sensitivity of our risk premium to the six traditional risk factors. Our coefficient of interest is α_0. We provide the results of time series regressions at the country level in Table 3. The first five columns show the regression results for the full sample, where we derive the risk premium excluding carbon emissions. In the second half of the table, we show the post-2017 where we also include carbon emissions. We report Newey-West adjusted heteroskedasticity and autocorrelation robust standard errors in parentheses using 6 lags. Our results show that our climate risk premium remains statistically significant and the magnitude is very close to the baseline specifications. In particular, in the baseline cross-sectional regressions (Table 1) the coefficient of the climate risk premium is 0.006, while in our time series regressions, the coefficient remains between 0.006 and 0.007. Furthermore, in the cross-sectional regressions of the post-2017 sample (Table 2), our climate risk coefficient is 0.014. In the time series regressions, it remains between 0.012 and 0.013. While our climate risk premium is marginally absorbed by the risk factors in the post-2017 sample, the risk premium residual - α_0 - remains statistically and economically significant in all specifications, even when controlling for conventional risk factors. All in all, the time series regressions corroborate that our climate risk premium is not driven by the usual market risk factors, but captures the pricing of climate risks by investors.

Model:	Brazil (i)	Mexico (ii)	Chile (iii)	Peru (iv)	Colombia (v)	Brazil (vi)	Mexico (vii)	Chile (viii)	Peru (ix)	Colombia (x)
Variables										
Constant	0.006***	0.006***	0.006***	0.007***	0.007***	0.012***	0.012***	0.013***	0.013***	0.013***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Market	-0.010	-0.010	-0.007	-0.018*	-0.020***	0.009	0.012	0.037**	0.020	0.009
	(0.007)	(0.009)	(0.011)	(0.010)	(0.007)	(0.012)	(0.013)	(0.016)	(0.022)	(0.031)
Size	-0.008	0.001	0.056*	-0.012	-0.052**	0.021	0.039	0.005	-0.058**	-0.057
	(0.029)	(0.025)	(0.029)	(0.018)	(0.022)	(0.048)	(0.053)	(0.042)	(0.025)	(0.079)
Value	0.052*	0.087**	0.054	0.022	-0.039**	-0.018	0.183***	-0.054	0.003	-0.010
	(0.028)	(0.040)	(0.036)	(0.024)	(0.017)	(0.036)	(0.044)	(0.061)	(0.055)	(0.031)
Investment	0.002	-0.020	-0.087*	-0.018	0.006	0.104	-0.223***	-0.051	0.054	0.078***
	(0.018)	(0.042)	(0.045)	(0.021)	(0.022)	(0.083)	(0.068)	(0.073)	(0.045)	(0.026)
Momentum	0.015	0.036	0.016	0.007	-0.020	-0.025	0.084	0.011	-0.011	0.006
	(0.014)	(0.024)	(0.024)	(0.013)	(0.015)	(0.030)	(0.052)	(0.044)	(0.023)	(0.039)
Profitability	-0.028	-0.054	-0.034	-0.006	-0.001	0.105**	-0.038	-0.076	0.016	-0.055*
	(0.030)	(0.043)	(0.042)	(0.019)	(0.014)	(0.047)	(0.084)	(0.050)	(0.022)	(0.031)
Statistics										
Observations	228	228	228	211	222	72	72	72	72	72
R^2	0.037	0.037	0.051	0.020	0.083	0.141	0.110	0.084	0.068	0.079

NeweyWest standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table 3: Time series regressions: Climate risk premium and factor returns

Notes: This table presents the results of time-series regressions of climate risk premia on factor returns at the country level. We report Newey-West adjusted heteroskedasticity and autocorrelation robust standard errors in parentheses using 6 lags.

4.2 A lower climate risk premium for "green" firms

In theory, all else equal, greener firms are perceived as less risky and may attract investors for non-pecuniary reasons (e.g., Pástor et al. (2021); Sautner et al. (2023b); Bolton and Kacperczyk (2021)) and hence may require lower returns. This should be the case, in particular, when subject to higher climate-related uncertainty. To test this hypothesis, we interact our climate news indices with both the environmental (E) pillar of ESG scores and carbon emissions intensity. We show the estimation results in Table 4 for both the full sample and the post-2017 subsample.

In columns (i) through (v), where we interact each climate change exposure measure with the E-score for the full sample, the news indices' coefficients remain positive and statistically significant, with only minor changes in magnitude.[13] Among the interactions, *Regulatory*, *Opportunity* and *Physical* indices yield negative and statistically significant coefficients. Specifically, a one standard deviation increase in the E-score corresponds to a reduction in required returns of 0.3 bps, 0.3 bps and 0.2 bps for regulatory, opportunity and physical related news, respectively. Focusing on the post-2017 period, depicted in columns (vi) through (x), all interaction effects are statistically significant, with magnitudes ranging from 0.5 to 0.7 basis points, translating into an annual reduction in required returns of 1.3% to 1.8% for a one standard deviation increase in the E-score. Our estimation results are theoretically consistent with the arguments of Pástor et al. (2021) that, in equilibrium, brown assets yield higher returns because investors perceive them as riskier and are willing to hold the green assets with lower returns.

[13] Data availability of the E-Score limits the number of observations relative to the full sample baseline regression.

Model:	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Variables										
Climate Risk	0.011***					0.012***				
	(0.001)					(0.002)				
Climate Risk × E Score	0.000					-0.007***				
	(0.001)					(0.002)				
Aggregate		0.004***					0.012***			
		(0.001)					(0.003)			
Aggregate × E Score		-0.002					-0.005**			
		(0.002)					(0.002)			
Regulatory			0.001					0.002		
			(0.002)					(0.002)		
Regulatory × E Score			-0.003***					-0.005***		
			(0.001)					(0.002)		
Opportunity				0.003**					0.015***	
				(0.002)					(0.003)	
Opportunity × E Score				-0.003**					-0.007***	
				(0.001)					(0.002)	
Physical					0.003**					0.007***
					(0.001)					(0.002)
Physical × E Score					-0.002*					-0.007***
					(0.001)					(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-effects										
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Statistics										
Observations	556,466	556,466	556,466	556,466	556,466	301,892	301,892	301,892	301,892	301,892
R^2	0.004	0.004	0.004	0.004	0.004	0.008	0.008	0.008	0.008	0.008

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table 4: Stock returns and climate news: (Interaction effects)

Notes: This table presents the results of regressions for firms in major Latin American countries. The first five columns show the estimation of the full sample, and the last five columns show the subsample starting from 2017. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity.

We replicate the analysis by interacting climate change exposure measures with carbon emissions intensity, and present the results in Table A13. The main effects of each climate exposure measure remain positive and statistically significant, consistent with the baseline findings. For the interaction terms, only the interaction between regulatory exposure and emissions intensity is positive and statistically significant. For firms emitting one standard deviation more than the average, the required risk premium increases by 0.3 basis points, equivalent to an annualized increase in required returns of 0.75%. For the *Opportunity* and *Physical* exposure measures, the interaction coefficients are positive but statistically insignificant. Conversely, the coefficients for *Climate Risk* and *Climate Exposure* (aggregate) are negative yet statistically insignificant. Overall, the results using E-scores and carbon emissions complement one another, reinforcing the robustness of our findings.

4.3 Industry level heterogeneity

E-scores and emissions tend to cluster in certain industries, raising the question of whether investors account for climate-related risks at the industry level rather than the firm level (Bolton and Kacperczyk (2021)). When including industry fixed effects in our baseline specifications (Table A10), the results remain highly consistent both quantitatively and qualitatively suggesting that investors do price climate change exposure at the firm level. However, to better understand possible nuances in pricing climate uncertainty given characteristics of firms within certain industries, we analyze news-related climate risk premiums as well as their interactions with environmental scores on a more disaggregated, industry level.

First, when estimating the differential effect of each industry (relative to the utilities industry), as shown in Table A19 for the *Climate Risk* index, we find that industries such as real estate, consumer discretionary, and basic materials exhibit pronounced climate risk premiums. In contrast, industries such as financials, energy, and technology display less consistent or insignificant effects.[14] This heterogeneity underscores the interaction between industry-specific characteristics and broader climate challenges. For instance, the real estate sector exhibits greater sensitivity due to its exposure to physical risks, such as extreme weather events, while the consumer discretionary sector may be more affected by evolving consumer preferences for

[14] Energy, for instance, comprises very heterogeneous firms in terms of climate exposure, from traditional power plants to renewables.

sustainability. Moreover, firm heterogeneity within industry, notably along environmental scores and thus climate sensitivity, may mask the existence of a premium in the respective sector.

Second, we provide a detailed breakdown of the effects of all climate news indices conditional on firms' E-scores, as visualized in Figure 6. The striped bars represent the interaction effects, capturing how firms' characteristics within industries influence the pricing of climate risks. Across industries, climate risk premiums are consistently positive, and interaction effects are predominantly negative, indicating that risk premiums decrease for greener firms within a given industry - with the exception of the technology sector. For industries such as basic materials, consumer discretionary, consumer staples, and energy, the *Opportunity* measure exhibits the strongest effects. In contrast, the response in industries such as financials, industrials, and real estate is primarily driven by *Climate Risk* exposure. Industrials, real estate, and consumer discretionary display positive and significant risk premiums across exposure types. Other industries, however, only price specific types of risks, indicating variability in how investors perceive and value climate-related exposures.

Overall, the findings highlight that climate risk pricing varies significantly across industries and exposure types. This underscores the necessity of granular analysis to account for the nuanced ways climate risks and opportunities affect financial outcomes. Such insights reinforce the critical importance of tailoring climate risk assessments to the unique characteristics of each industry and exposure type when evaluating their financial and policy implications.

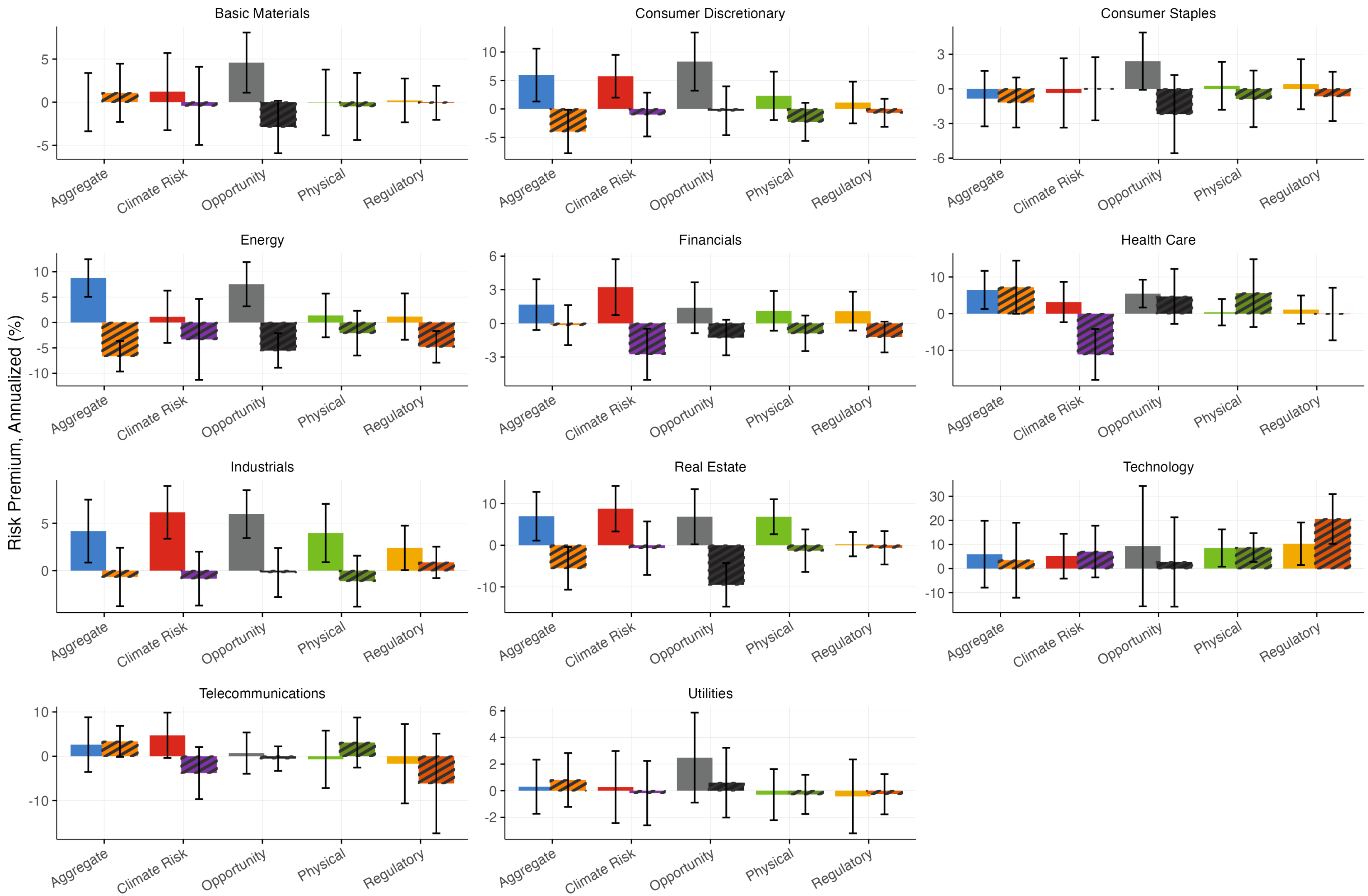


Figure 6: Industry level heterogeneity

Notes: This figure shows the annualized risk premiums by industry groups and interacted with E-Scores. The striped bars represent the interactions terms.

4.4 Official news

We replicate our baseline regressions using the official news indices, purely based on textual analysis, Table 5. We focus on the *Aggregate*, *Opportunity* and *Physical* news indices, excluding the *Climate Risk* and *Regulatory* news indices, as instances of the term "risk" are rarely observed in official publications and official news primarily consists of regulatory announcements. We expect official gazettes to publish climate-related news at the end of the legislative process, as opposed to media outlets that pick up discussions about regulatory changes and possible new climate policies at the beginning of the process. As our analysis uses high-frequency data, we can rule out the potential concern of reverse causality that government[15] actions to tackle climate change is itself driven by changes in stock prices or financial market sentiments, given the time to prepare, debate and pass laws (or regulations), David et al. (2022).

Official news on regulations related to *Aggregate* and *Physical* climate risks feature a negative coefficient. Laws or decrees could include emergency aid to respond to a large natural disaster, capturing an overall negative shock to the country. They could also entail public investments in adaptation to build resilient infrastructure and weather these disasters, possibly lowering climate-related uncertainty. Legislation on opportunity-related climate policies is associated with a positive but insignificant climate risk premium, which is about a quarter of the premium estimated using media news.

[15]Here we use government in a broader sense, referring to parliament, presidency, or administration, given the different political systems of each country.

Model:	(i)	(ii)	(iii)
Variables			
Aggregate	-0.003*		
	(0.001)		
Opportunity		0.002	
		(0.001)	
Physical			-0.016***
			(0.002)
Firm Controls	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes
Fixed-effects			
Country FE	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes
Statistics			
Observations	620,430	620,430	620,430
R^2	0.004	0.004	0.004

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table 5: Stock returns and Official news

Notes: This table presents the results of the firm-level regressions for the main Latin American countries. The sample period spans from January 2017 to June 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity.

5 An event study approach

In this section, we focus on major climate legislation and analyze the behavior of firms' stock prices around these events (listed in Table A9). We use local projections à la Jorda (2005) to measure the dynamics of stock prices over time following an empirical specification similar to Ottonello and Winberry (2020); Jordà et al. (2015). In particular, we run panel local projections at the firm level as follows:

$$\begin{aligned} p_{i,t+h} - p_{i,t-1} = \alpha_{i,h} + \beta_{0,h} I(Leg_{i,t}) + \beta_{1,h} I(Leg_{i,t}) \times Category_{i,t} \\ + \delta Z_{i,t-1} + \gamma_{t,h} + u_{i,t+h} \end{aligned} \tag{5.1}$$

where $p_{i,t+h}$ represents the (log) stock price of firm i at horizon $t+h$ and the parameter $\alpha_{i,h}$ denotes a time-invariant firm fixed effect in each period. The indicator function $I(Leg_{i,t})$ takes a value of 1 if there is a major climate legislation published in official gazettes by authorities on a particular day, and 0 otherwise. The variable $Category_{i,t}$ represents the classification of a firm being brown (assuming the value 1), 0 otherwise. The coefficient of the interaction terms ($\beta_{1,h}$) in each period captures the differing responses between firm profiles - brown and green firms - to official announcements. $Z_{i,t-1}$ includes the set of controls as in the baseline specification as well as their lags up to one week and the lags of dependent variable. $\gamma_{t,h}$ is the time fixed effect and $u_{i,t+h}$ is the disturbance term. We cluster the standard errors at the firm level. However, robust standard errors for autocorrelation and heteroskedasticity using the Newey-West estimator with 6 lags for the confidence intervals 68% and 90% yield almost identical results. We provide point estimates and confidence intervals together. To assess whether our results are influenced by potential anticipation effects, we adopt the empirical framework outlined in David et al. (2022), analyzing multiple time horizons. We present the estimated anticipation effects in Table A16. Our findings indicate no significant evidence of anticipatory effects across the various time horizons considered.

In absence of a straightforward definition for identifying a firm as either brown or green, we propose alternative approaches based on carbon emissions and the environmental pillar of ESG scores (E-Score). In the first instance, we classify a firm as "brown" if its carbon emissions is equal to or larger than the 75^{th} of emissions, and "green" otherwise, within each industry group and each year. We do this for two reasons: (i) Due to the nature of the industry in which the firm operates in, a firm may emit much more than a firm in the financial services or banking even if it invests more in green energy and sustainable projects. To account for this possibility, we create the dummy variable conditioning on the industry in which the firm operates in. (ii) We allow for the time variation in the firm profile - that is - a firm in 2010 might be classified as brown and in the next year it might switch to green category. Apart from carbon emissions, we also rely on the environmental pillar of ESG scores (E-score) conditioning on the industry in each year, similar to carbon emissions. We label a firm brown if its E score is below the 25^{th} percentile (industry) each year.[16] We derive very similar results when we define brown firms using the threshold as the median of carbon emissions and E-scores. Using carbon emissions might be more resilient to green-washing by firms, whereas using the ESG (E-Score) dates back to earlier time periods and have more reporting firms.

We report the results for stock prices in Figure 7, depicting the cumulative differential response of brown relative to green firms' stock prices to the announcement of major climate legislation within two weeks. We report the point estimate (solid blue line) and the robust confidence intervals 68% and 90% (shaded areas). Differential impulse responses for brown firms as per emissions-based classification are shown on the left (i), and E-Scores on the right (ii). We cluster the standard errors at the firm level as in baseline specification. Correcting the standard errors of the local projections using the Newey-West estimator with 6 lags (or 12) yields almost identical results.

High-emission firms' stock prices significantly underperform compared to brown firms, with a cumulative differential of 0.6% after one week (left-hand side, panel (i)). This underperformance persists over the two-week estimation window, though with reduced statistical significance. Similarly, low E-Score firms experience a relative underperformance of 0.5%, which diminishes by the end of the two-week period. The marginal effect of major climate legislation on brown firms, as depicted in Figure A5, shows a significant decline in stock prices within the first week under both classification schemes.

Our empirical results are consistent with the arguments of Pástor et al. (2021) that brown firms tend to require higher (expected) returns in equilibrium, but when faced with a shift in the ESG factor, green firms outperform brown ones. Major climate legislation packages, as

[16] There exists no common consensus on the threshold that defines a company or portfolio as brown/green. Some studies use the 75^{th} percentile of carbon emissions or 25^{th} percentile of environmental pillars of ESG (E-Score) as a threshold (Bua et al. (2024)), others use the median value as a threshold to construct green/brown portfolios, Berthold (2024) among many others.

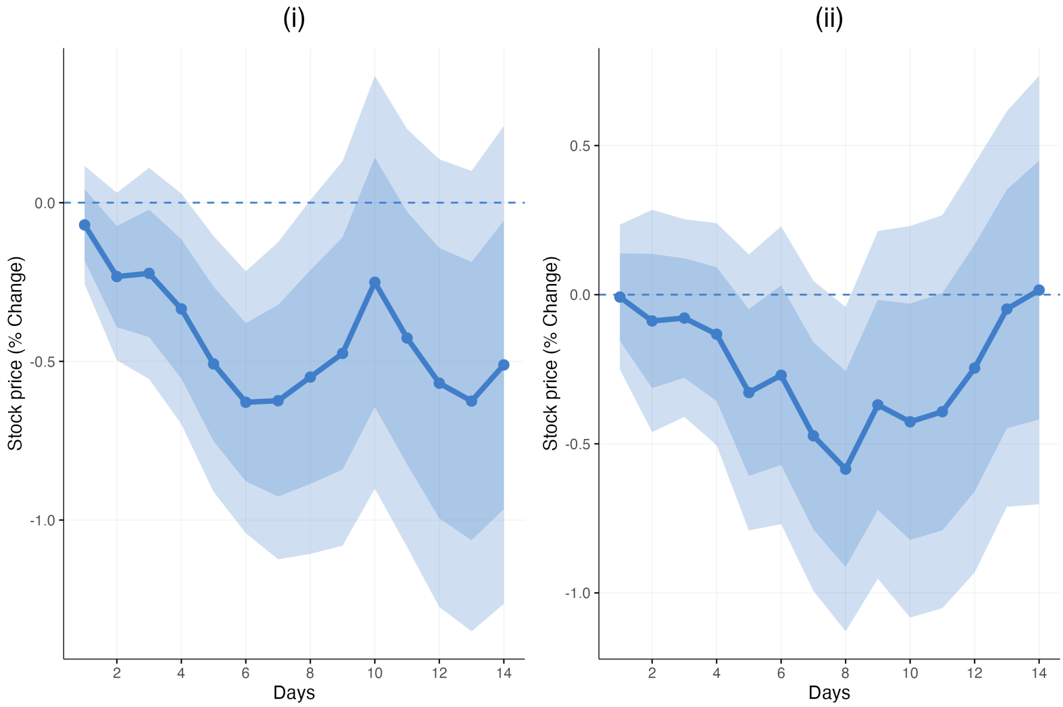


Figure 7: Major climate legislation: Differential response of brown versus green firms' stock prices

Notes: This figure shows the cumulative differential response between brown and green firms' to major climate legislations. The blue solid line is the point estimate, the shaded areas indicate (robust) 68% and 90% confidence intervals, respectively. We estimate the impulse response on based on (i) a brown firm classification using total emissions and (ii) the environmental pillar of the ESG score (E-score), within industry group and year. We cluster the standard errors of the local projections at the firm level.

identified above, could have the potential to signal such a shift in the ESG factor. At the same time, they could help address climate-related uncertainty, either by charting a path on how to leverage climate opportunities, such as providing support for renewables via electricity sector reform, or how to address mitigation and adaptation challenges, for instance, by legislating a carbon market framework.

6 Robustness

6.1 Investor awareness and coarse categorization

The change in investor perceptions and attentions to climate-related news could affect our carbon risk premium. This could be influenced by international agreements and treaties on climate change, as well as local laws, regulations, and decrees. One of the key events affecting climate awareness globally is the Paris Agreement. Bolton and Kacperczyk (2021) argues that investors may require a higher risk premium when climate change awareness is high. To test this, we re-estimate the baseline model on a rolling window basis and provide the time-varying risk premia in Figure 4. In particular, we maintain a window length of 1.5 years and roll the window by one month at each interval.

The evolution of the climate risk premium over time reveals a steady increase on average; however, this trend does not necessarily align directly with the signing of the Paris Agreement. Notably, the climate risk premium remains predominantly positive after the second quarter of 2012, with a marked increase both before and in the years following the agreement. This pattern may suggest that investors incorporated cumulative risks into the market based on anticipatory expectations or reactions to subsequent policy responses. In contrast, prior to 2012—particularly following the global financial crisis—the climate risk premium often turned negative or declined, potentially influenced by capital flows into emerging markets and monetary easing. The climate risk premium remains positive and aligns closely with the baseline risk premium when carbon emissions are included in the estimations, although it exhibits greater variability.

A second issue is the impact of major carbon emitting industries on the climate risk premium. A natural question is whether the climate risk premium is driven by most carbon-intensive sectors as in Figure A1. To investigate the impact of salient carbon-intensive sectors, we re-estimate the baseline model excluding the top carbon-intensive sector from the sample: Electricity. We provide the results in Table A14. Across all categories, the results remain qualitatively the same, but the magnitudes change. In particular, the risk premium associated with each category is now higher than the baseline specification. This ensures that our results are not only driven by specific carbon intensive sectors but rather have broad implications across the whole sample.

6.2 Forward-looking expected return proxies

We calculate the options-implied forward-looking expected return proxy of Martin and Wagner (2019), following the arguments in Sautner et al. (2023b). The option implied expected return proxy takes the second moment condition as a sufficient statistic for risk taking behavior of investors. Using a very small subset of our sample, in line with the realized excess returns, our results mostly show a positive, statistically significant, and economically meaningful association between climate risk and forward-looking excess stock returns. We provide the estimation results in Table A15. However, we emphasize that our results cannot necessarily be generalized to the population due to the lack of a number of firms. The coefficient estimates are larger in magnitude compared to baseline specification across all categories.

7 Conclusion

This paper examines the impact of climate change exposure on asset prices at the firm level. Leveraging comprehensive data from media sources and official gazettes across eight Latin American countries, we develop robust and country-specific measures of climate change exposure which distinguish between climate-related risks, opportunities, regulatory action and physical news. When estimating these measures' impact on stock returns, our analyses reveal a positive and statistically significant relationship between climate news and excess stock returns, with notable heterogeneity across industries and exposure types. These findings lend support to the existence of a climate risk premium in Latin America, as investors price in higher uncertainty from climate change, previously documented in the literature mainly for advanced markets. We further find that the climate risk premium is larger for "browner" firms and follows an upward trend over time, with a greater role of opportunity-related news in more recent years. However, focusing on announcements of major (domestic) climate legislation, high-emission firms experience a protracted underperformance, possibly indicating a shift in the ESG factor or a decline in climate-related uncertainty. This study contributes to the growing literature on the intersection of climate change and finance, offering new insights into how climate risks and policies shape asset pricing dynamics.

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A Appendix

Country	Share Newspapers (%)	Share Official (%)
Brazil	38.90	1.60
Mexico	37.01	21.79
Chile	8.62	47.21
Peru	5.68	27.75
Colombia	4.38	0.14
Costa Rica	1.58	0.16
Uruguay	2.53	0.61
Ecuador	1.31	0.74

Notes:
This table shows the share of official news articles reflects differing approaches to publications in official gazette across countries. Some countries publish one item per article (reflected in Chile's and Peru's higher share), while others gather multiple law items in one news article. Our indices are computed on a country level and reflect a climate news count standardized by the total number of articles.
* Source: Factiva

Table A1: Share of articles by country

Table A2: Top 10 Newspapers by Country

Country	Name
Brazil	O Globo (Brazil, Portuguese Language)
Brazil	Folha de São Paulo (Portuguese Language)
Brazil	O Estado de São Paulo (Portuguese Language)
Brazil	AE Noticiário (Portuguese Language)
Brazil	O Globo Tempo Real (Brazil, Portuguese Language)
Brazil	Reuters - All sources
Brazil	Estado de Minas (Brazil, Portuguese Language)
Brazil	O Dia (Brazil, Portuguese Language)
Brazil	Investimentos e Notícias (Tempo Real) (Brazil, Portuguese Language)
Brazil	Safras & Mercado-BR (Brazil, Portuguese Language)
Chile	El Mercurio (Chile, Spanish Language)
Chile	La Tercera (Chile, Spanish Language)
Chile	Diario Oficial de la República de Chile (Spanish Language)
Chile	BioBio (Chile, Spanish Language)
Chile	La Nación (Chile, Spanish Language)
Chile	CE NoticiasFinancieras (Latin America, Spanish Language)
Chile	ValorFuturo (Chile, Spanish Language)
Chile	Diario Financiero (Chile, Spanish Language)
Chile	Reuters - All sources
Chile	Diario Financiero Online (Chile, Spanish Language)
Colombia	El Tiempo (Colombia, Spanish Language)
Colombia	El Espectador (Colombia, Spanish Language)
Colombia	Portafolio (Colombia, Spanish Language)
Colombia	CE NoticiasFinancieras (Latin America, Spanish Language)
Colombia	Agencia EFE - All sources
Colombia	Semana (Colombia, Spanish Language)

Colombia	Agence France Presse - All sources
Colombia	Reuters - All sources
Colombia	El Nuevo Siglo (Colombia, Spanish Language)
Colombia	Europa Press - All sources
Costa Rica	La Nación (Costa Rica, Spanish Language)
Costa Rica	El Financiero (Costa Rica, Spanish Language)
Costa Rica	Agence France Presse - All sources
Costa Rica	CE NoticiasFinancieras (Latin America, Spanish Language)
Costa Rica	Agencia Mexicana de Noticias, NOTIMEX (Spanish Language)
Costa Rica	Reuters - All sources
Costa Rica	Agencia EFE - All sources
Costa Rica	Europa Press - All sources
Costa Rica	The Associated Press - All sources
Costa Rica	Revista Summa (Spanish language)
Ecuador	El Comercio (Ecuador, Spanish Language)
Ecuador	Agence France Presse - All sources
Ecuador	Reuters - All sources
Ecuador	Agencia EFE - All sources
Ecuador	CE NoticiasFinancieras (Latin America, Spanish Language)
Ecuador	Europa Press - All sources
Ecuador	Publimetro - All sources
Ecuador	Agencia Mexicana de Noticias, NOTIMEX (Spanish Language)
Ecuador	The Associated Press - All sources
Ecuador	Hoy (Ecuador, Spanish Language)
Mexico	Agencia Mexicana de Noticias, NOTIMEX (Spanish Language)
Mexico	CE NoticiasFinancieras (Latin America, Spanish Language)
Mexico	Servicio Universal de Noticias (Mexico, Spanish Language)
Mexico	Reforma (Mexico, Spanish Language)
Mexico	El Universal (Mexico, Spanish Language)
Mexico	El Norte (Monterrey, Mexico, Spanish Language)
Mexico	Mural (Guadalajara, Mexico, Spanish Language)
Mexico	Milenio (Mexico, Spanish Language)
Mexico	El Norte.com (Monterrey, Mexico, Spanish Language)
Mexico	Reforma.com (Mexico City, Spanish Language)
Peru	La República (Peru, Spanish Language)
Peru	El Comercio (Peru, Spanish Language)
Peru	Perú 21 Online (Peru, Spanish Language)
Peru	Diario Oficial de Peru (Spanish Language)
Peru	Reuters - All sources
Peru	Gestión Online (Peru, Spanish Language)
Peru	Agence France Presse - All sources
Peru	Diario Correo (Peru, Spanish Language)
Peru	CE NoticiasFinancieras (Latin America, Spanish Language)
Peru	Agencia EFE - All sources
Uruguay	El Pais - All sources
Uruguay	La República (Uruguay, Spanish Language)
Uruguay	Agence France Presse - All sources
Uruguay	CE NoticiasFinancieras (Latin America, Spanish Language)
Uruguay	La Diaria (Uruguay, Spanish Language, Abstracts)
Uruguay	Reuters - All sources
Uruguay	Agencia EFE - All sources
Uruguay	El País (Uruguay, Spanish Language)
Uruguay	Infobae (Argentina, Spanish Language)
Uruguay	Europa Press - All sources

Country	**Name of official gazette**	**Language**
Brazil	Diário Oficial da União (DOU)	Portuguese
Mexico	Diario Oficial de la Federación	Spanish
Chile	Diario Oficial de la República de Chile	Spanish
Colombia	Diario Oficial	Spanish
Peru	El Peruano	Spanish
Uruguay	Diario Oficial	Spanish
Costa Rica	La Gaceta Diario Oficial	Spanish
Ecuador	Registro Oficial del Ecuador	Spanish

Table A3: List of official gazettes of Latin American countries

Country	Count	Percentage
Brazil	263	41.88
Mexico	136	21.66
Chile	125	19.90
Peru	65	10.35
Colombia	34	5.41
Ecuador	3	0.48
Uruguay	1	0.16
Costa Rica	1	0.16

Table A4: Number of firms by country

Industry	Count	Percentage
Financials	111	17.68
Consumer Discretionary	104	16.56
Industrials	95	15.13
Basic Materials	73	11.62
Consumer Staples	70	11.15
Utilities	67	10.67
Real Estate	50	7.96
Energy	23	3.66
Health Care	15	2.39
Telecommunications	14	2.23
Technology	6	0.96

Table A5: Number of firms by industry

Sector	Number of firms	Percentage
Electricity	51	8.12
Investment Banking and Brokerage Services	45	7.17
Banks	42	6.69
Food Producers	39	6.21
Industrial Metals and Mining	39	6.21
Real Estate Investment and Services	36	5.73
Industrial Transportation	33	5.25
Construction and Materials	31	4.94
Travel and Leisure	25	3.98
Retailers	21	3.34
Oil, Gas and Coal	20	3.18
Personal Care, Drug and Grocery Stores	18	2.87
Household Goods and Home Construction	17	2.71
Personal Goods	16	2.55
Chemicals	15	2.39
General Industrials	14	2.23
Gas, Water and Multi-utilities	14	2.23
Real Estate Investment Trusts	14	2.23
Beverages	13	2.07
Non-life Insurance	12	1.91
Telecommunications Service Providers	12	1.91
Industrial Materials	12	1.91
Consumer Services	10	1.59
Automobiles and Parts	9	1.43
Finance and Credit Services	8	1.27
Industrial Support Services	8	1.27
Health Care Providers	7	1.11
Precious Metals and Mining	7	1.11
Industrial Engineering	6	0.96
Software and Computer Services	5	0.80
Media	5	0.80
Pharmaceuticals and Biotechnology	5	0.80
Alternative Energy	3	0.48
Medical Equipment and Services	3	0.48
Life Insurance	2	0.32
Waste and Disposal Services	2	0.32
Telecommunications Equipment	2	0.32
Aerospace and Defense	2	0.32
Electronic and Electrical Equipment	1	0.16
Technology Hardware and Equipment	1	0.16
Mortgage Real Estate Investment Trusts	1	0.16
Closed End Investments	1	0.16
Leisure Goods	1	0.16

Table A6: Number of firms by sector

Variable	Mean	Std	Min	25%	50%	75%	Max	Obs
Firm Level variables								
Excess Stock Seturn	0.03	2.69	-99.24	-0.28	-0.02	0.21	99.99	2,654,720
E Score	43.57	27.53	0.00	18.93	46.06	66.11	97.51	609,727
ESG Score	47.47	20.93	1.25	32.22	48.84	63.25	93.86	609,727
Debt / Assets	26.68	18.42	0.00	12.54	26.11	38.05	82.17	2,326,366
Capex / Assets	4.03	4.36	0.00	0.73	2.84	5.64	23.11	2,217,944
Book / Market	1.82	2.02	-0.91	0.72	1.30	2.21	13.64	2,412,253
PPE / Assets	32.28	26.51	-1.26	4.78	30.35	52.05	99.32	2,323,242
EBIT / Assets	8.09	10.36	-30.49	3.29	7.28	12.18	49.92	2,274,766
Log Market Cap	9.01	3.32	-3.91	6.71	8.79	11.35	19.29	2,477,025
Emissions (1 + 2)	3.92	1.96	0.03	2.49	3.76	5.55	9.56	607,287
Emissions Intensity (1 + 2)	10.54	3.00	0.08	8.53	10.46	12.67	19.10	607,287
Stock volatility	0.39	0.24	0.00	0.24	0.34	0.48	5.34	2,630,496
Beta	0.43	0.51	-0.76	0.00	0.31	0.78	2.06	119,730
Newspapers and official gazettes								
Newspapers Aggregate	1.70	1.05	0.00	1.09	1.61	2.19	35.39	62,442
Newspapers Regulatory	0.66	1.12	0.00	0.00	0.06	1.07	61.60	62,442
Newspapers Opportunity	0.56	1.04	0.00	0.00	0.00	0.87	63.44	62,442
Newspapers Physical	0.63	1.10	0.00	0.00	0.00	0.99	67.29	62,442
Newspapers Risk	0.21	1.01	0.00	0.00	0.00	0.00	44.64	62,442
Official Aggregate	0.67	0.99	0.00	0.00	0.28	1.16	15.56	11,991
Official Opportunity	0.22	0.85	0.00	0.00	0.00	0.00	16.78	11,991
Official Regulatory	0.28	0.87	0.00	0.00	0.00	0.00	16.82	11,991
Official Physical	0.32	0.89	0.00	0.00	0.00	0.00	11.82	11,991
Time Series variables								
Market	0.05	1.56	-17.55	-0.68	0.08	0.82	16.28	29,778
Size	0.00	0.84	-8.56	-0.43	0.01	0.45	7.09	19,579
Value	0.02	0.63	-7.72	-0.26	0.01	0.29	9.45	23,760
Investment	0.00	0.57	-7.16	-0.27	0.00	0.27	6.30	23,522
Profitability	0.01	0.67	-7.56	-0.29	0.00	0.30	7.60	22,741
Momentum	0.03	0.84	-8.63	-0.37	0.03	0.43	8.06	22,997
Others								
Oil Price Change	0.05	2.59	-47.47	-1.15	0.07	1.28	50.99	6,166
Corona Stringency	16.13	26.93	0.00	0.00	0.00	27.14	96.30	15,108
VIX	23.12	10.14	9.14	16.37	21.33	27.31	82.69	15,108

Notes:
This table shows the variables used in estimations. To remove the effect of outliers we winsorize (1) Book to market, (2) Debt to assets, (3) EBIT to assets and (4) Market beta at 1%. We further drop the excess stock returns larger than 100%.

Table A7: Summary Statistics

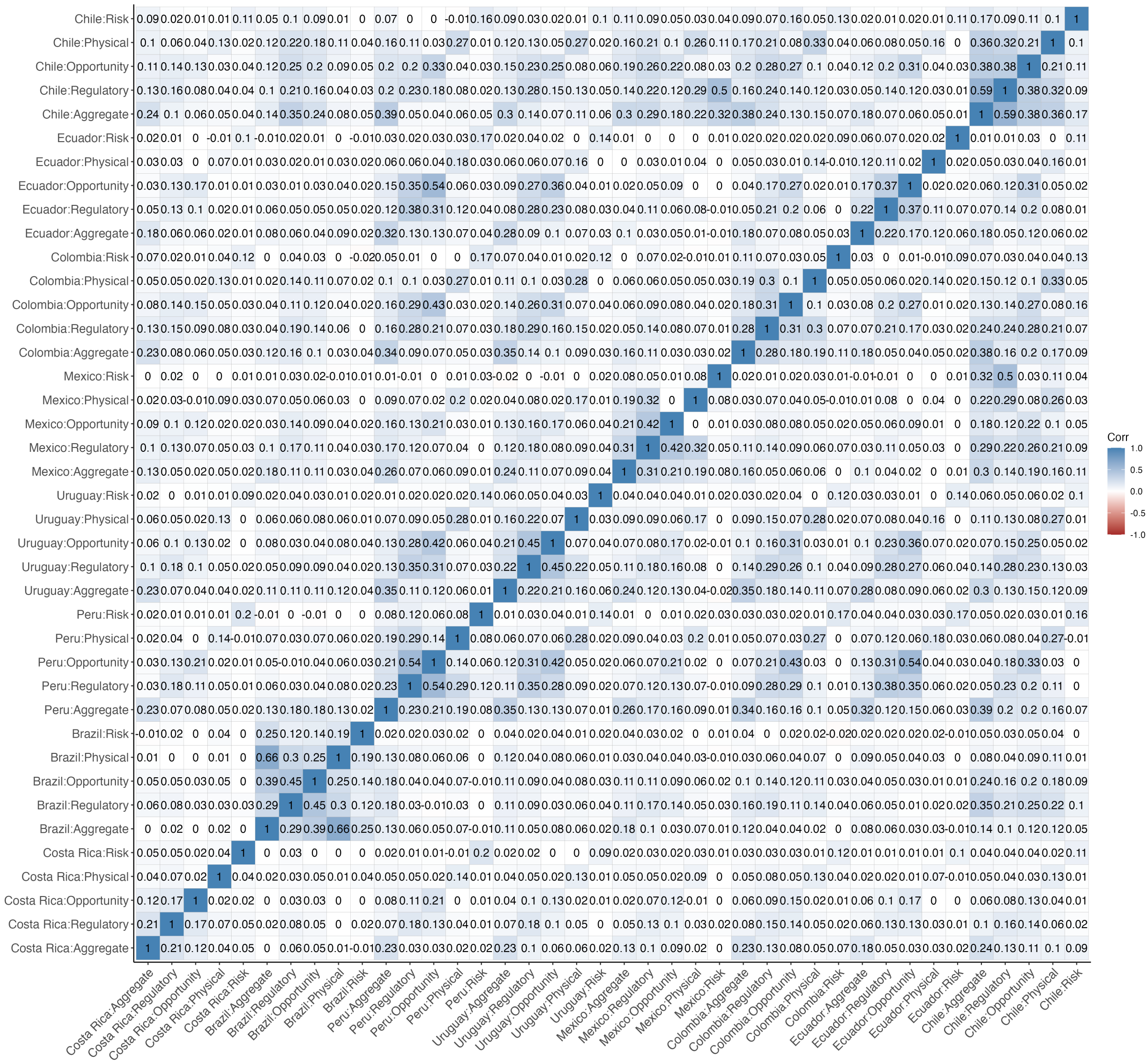

Table A8: Correlation matrix of newspaper indices: Within and across countries

Country	Publication Date	Title
Brazil	2017-06-27	Establishing the Brazilian Forum on Climate Change
Brazil	2018-03-16	RenovaBio
Brazil	2018-07-05	Procedures and conditions for carrying out electric vehicle recharging activities
Brazil	2018-08-02	Efficiency Standards for Refrigerators and Freezers Brazil
Brazil	2018-08-02	Reduction of losses of distribution transformers Brazil
Brazil	2018-10-29	Resolution on Biofuels
Brazil	2018-11-21	Resolution on requirements of the Air Pollution Control Programme for Motor Vehicles
Brazil	2018-12-11	Rota 2030 Mobility and Logistics
Brazil	2019-11-29	Instituting the National Commission for the Reduction of GHG Emissions from Deforestation and Forest Degradation
Brazil	2019-11-29	Instituting the Executive Committee for the Control of Illegal Deforestation and the Recovery of Native Vegetation
Brazil	2019-11-29	Establishing the Inter-ministerial Committee on Climate Change
Brazil	2020-01-20	Resolution from ANP Brazil
Brazil	2020-06-05	Provide incentives for financing infrastructure projects with environmental and social benefits
Brazil	2020-12-28	Resolution on Micro and small-scale distributed generation
Brazil	2020-12-29	Demand response pilot program
Brazil	2021-01-14	National Policy for Payment for Environmental Services
Brazil	2021-03-02	Law on power sector
Brazil	2021-05-17	Fuel of the Future Brazil
Brazil	2021-10-04	Cédula de Produtores Rural Verde
Brazil	2022-01-06	Law on a just energy transition
Brazil	2022-01-07	Law on micro and mini distributed generation
Brazil	2022-01-07	Policy on net metering for micro and small renewable power generation
Brazil	2022-03-22	National Programme for the Reduction of Methane Emissions - Zero Methane
Brazil	2022-05-19	Creating the National System for the Reduction of Greenhouse Gas Emissions
Brazil	2023-01-02	Creation of the Permanent Interministerial Commission for the Prevention and Control of Deforestation
Brazil	2023-01-02	Decree on the Amazon Fund Brazil
Brazil	2023-06-06	Decree on establishing the National Committee for REDD
Brazil	2023-06-06	Decree on establishing the Interministerial Committee on Climate Change
Brazil	2023-06-06	Decree on the Low Carbon Industry Technical Committee
Brazil	2023-10-27	Nationally Determined Contribution
Chile	2018-02-14	Minimum Energy Performance Standards for air conditioners
Chile	2020-04-09	Nationally Determined Contribution
Chile	2022-06-13	Climate Change Framework Law Chile
Colombia	2018-07-27	Establishing guidelines for climate change management
Colombia	2019-08-20	Law issuing the National Development Plan 2018-2022 'Pact for Colombia, Pact for Equity
Colombia	2021-12-22	Law on low carbon development
Costa Rica	2018-01-25	Law on incentives and promotion of electric transportation
Costa Rica	2018-05-23	Decree on creating the National Measuring System for Climate Change
Costa Rica	2019-02-27	National Plan for Electric Transport
Mexico	2018-02-19	Heavy-duty Vehicle Emission Standards
Mexico	2018-06-05	General Law for Sustainable Forest Development
Mexico	2018-07-17	Energy Efficiency in Split Air Conditioners, Free Discharge, and Without Air Ducts
Mexico	2018-08-28	Thermal Efficiency Regulation of Solar Water Heaters
Mexico	2018-08-28	Thermal Performance, Gas Saving and Safety Requirements of Solar Water Heaters and Solar Water Heaters Suing LP Gas as Fuel or Natural Gas
Mexico	2018-11-06	Guidelines for the prevention and comprehensive control of methane emissions from the hydrocarbons sector
Mexico	2020-07-07	Sectoral Program for the Environment and Natural Resources
Mexico	2020-08-06	Special Programme on Climate Change
Mexico	2020-10-14	Institutional Program of the National Institute of Ecology and Climate Change
Mexico	2021-03-08	Emissions Trading System Mexico
Mexico	2021-04-26	Amending and adding various provisions of the General Law for Sustainable Forestry Development
Mexico	2021-12-28	Support for sustainable forestry development
Mexico	2022-08-23	Decree on decentralising public body Lithium
Peru	2018-04-01	Heavy-duty vehicle emission standards
Peru	2018-04-18	Framework Law on Climate Change
Peru	2019-07-28	National Program for Sustainable Urban Transport
Peru	2022-01-25	Declaring the climate emergency of national interest
Peru	2022-05-10	Establishing a special depreciation regime and modifies depreciation terms

Table A9: List of Identified Climate Related Events

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	0.006***				
	(0.001)				
Aggregate		0.001			
		(0.001)			
Regulatory			0.003***		
			(0.001)		
Opportunity				-0.001	
				(0.001)	
Physical					0.001*
					(0.001)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Industry FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	2,035,501	2,035,501	2,035,501	2,035,501	2,035,501
R^2	0.003	0.003	0.003	0.003	0.003

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A10: Stock returns and climate change exposure (Adding industry fixed effects)

Notes: This table presents the results of the firm-level regressions for the main Latin American countries. The sample period spans from January 2000 to December 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day and industry fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	0.014***				
	(0.002)				
Aggregate		0.016***			
		(0.003)			
Regulatory			0.004*		
			(0.002)		
Opportunity				0.016***	
				(0.002)	
Physical					0.007***
					(0.002)
Emissions Level	0.003	0.003	0.003	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	333,247	333,247	333,247	333,247	333,247
R^2	0.009	0.009	0.009	0.009	0.009

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A11: Stock returns and climate change exposure: Subsample (2017) with emissions level

Notes: This table presents the results of the firm-level regressions for the main Latin American countries. The sample period spans from January 2017 to June 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity. Finally, we include the log of carbon emissions from the previous year to avoid look-ahead bias.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	0.014***				
	(0.002)				
Aggregate		0.020***			
		(0.003)			
Regulatory			0.006**		
			(0.003)		
Opportunity				0.016***	
				(0.003)	
Physical					0.005
					(0.003)
Emissions Intensity	0.004**	0.004**	0.004**	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	277,954	277,954	277,954	277,954	277,954
R^2	0.011	0.011	0.011	0.011	0.011

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A12: Stock returns and climate change exposure: (Sample 2019-2021)

Notes: This table presents the results of the firm-level regressions for the main Latin American countries. The sample period spans from January 2019 to December 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity.

Model:	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Variables										
Climate Risk	0.017***					0.020***				
	(0.002)					(0.003)				
Aggregate		0.010***					0.018***			
		(0.002)					(0.003)			
Regulatory			0.003					0.010***		
			(0.002)					(0.003)		
Opportunity				0.011***					0.016***	
				(0.002)					(0.003)	
Physical					0.003					0.002
					(0.002)					(0.004)
Climate Risk × Emissions Intensity	-0.003					-0.004				
	(0.002)					(0.002)				
Aggregate × Emissions Intensity		-0.002					-0.002			
		(0.002)					(0.002)			
Regulatory × Emissions Intensity			0.002					0.003**		
			(0.001)					(0.001)		
Opportunity × Emissions Intensity				0.002					0.003	
				(0.002)					(0.002)	
Physical × Emissions Intensity					-0.001					0.000
					(0.001)					(0.003)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-effects										
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Statistics										
Observations	401,371	401,371	401,371	401,371	401,371	235,739	235,739	235,739	235,739	235,739
R^2	0.007	0.007	0.007	0.007	0.007	0.014	0.013	0.013	0.013	0.013

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A13: Stock returns and climate change exposure: Carbon Emissions

Notes: This table presents the results of regressions for firms in major Latin American countries. The first five columns show the estimation of the full sample, and the last five columns show the subsample starting from 2019, due to lack of number of firms. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity. Finally, we include the log of carbon emissions from the previous year to avoid look-ahead bias.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	0.006***				
	(0.001)				
Aggregate		0.001			
		(0.001)			
Regulatory			0.003***		
			(0.001)		
Opportunity				-0.001	
				(0.001)	
Physical					0.002*
					(0.001)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	1,860,542	1,860,542	1,860,542	1,860,542	1,860,542
R^2	0.003	0.003	0.003	0.003	0.003

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A14: Stock returns and climate change exposure: Excluding salient sectors

Notes: This table presents the results of the firm-level regressions for the main Latin American countries. The sample period spans from January 2000 to June 2023. We standardize all variables to have zero mean and unit standard deviation. This specification excludes the top carbon-intensive sector (Electricity) from the sample. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	-0.016***				
	(0.003)				
Aggregate		0.048***			
		(0.008)			
Regulatory			0.030***		
			(0.006)		
Opportunity				0.029***	
				(0.007)	
Physical					0.010**
					(0.003)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	25,465	25,465	25,465	25,465	25,465
R^2	0.145	0.145	0.145	0.145	0.145

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A15: Forward-looking expected return proxies and climate change exposure

Notes: This table presents the results of regressions for 13 firms in major Latin American countries. The sample period spans from January 2000 to June 2023. The dependent variable is forward looking expected excess stock returns, based on option implied prices following Martin and Wagner (2019). Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, the market volatility and covid lockdown intensity.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Event(t+1)	-0.001	-0.001	-0.002	-0.002	-0.002
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Event(t+7)		0.000	0.000	0.000	0.000
		(0.002)	(0.002)	(0.002)	(0.002)
Event(t+14)			0.000	0.000	-0.001
			(0.001)	(0.001)	(0.001)
Event(t+21)				0.001	0.001
				(0.001)	(0.001)
Event(t+28)					-0.001
					(0.001)
Lagged Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	823,863	816,330	807,557	798,790	790,021
R^2	0.001	0.001	0.001	0.001	0.001

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A16: Anticipation effects

Notes: **Notes**: This table presents the results for potential anticipation effects. The empirical specification closely follows David et al. (2022). The sample period is January 2017 to June 2023. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. For illustrative purposes, we only report the forward values of the coefficients of the identified events.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	0.014***				
	(0.002)				
Aggregate		0.015***			
		(0.003)			
Regulatory			0.009***		
			(0.002)		
Opportunity				0.017***	
				(0.003)	
Physical					0.004*
					(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	333,247	333,247	333,247	333,247	333,247
R^2	0.013	0.013	0.013	0.013	0.013

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A17: Stock returns and climate change exposure: (Firm Fixed effects)

Notes: This table presents our baseline results covering eight Latin American countries. The sample period spans from January 2017 to June 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, firm, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, market volatility and COVID lockdown intensity.

Model:	(i)	(ii)	(iii)	(iv)	(v)
Variables					
Climate Risk	0.014***				
	(0.002)				
Aggregate		0.016***			
		(0.003)			
Regulatory			0.004*		
			(0.002)		
Opportunity				0.016***	
				(0.002)	
Physical					0.007***
					(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
Country FE	Yes	Yes	Yes	Yes	Yes
Year-Month-Day FE	Yes	Yes	Yes	Yes	Yes
Statistics					
Observations	333,247	333,247	333,247	333,247	333,247
R^2	0.009	0.009	0.009	0.009	0.009

Clustered (firm-year-month) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A18: Stock returns and climate change exposure: (Clustering standard errors by firm-year-month)

Notes: This table presents our baseline results covering eight Latin American countries. The sample period spans from January 2017 to June 2023. We standardize all variables to have zero mean and unit standard deviation. The dependent variable is excess stock returns. Robust standard errors are reported in parentheses. All specifications include country, year-month-day fixed effects. We winsorize certain variables to remove the effect of extreme observations, provided in Table A7. We regress excess stock returns on time-varying market betas and widely accepted drivers of stock returns. These include log-total assets, debt-to-assets, stock price volatility, book-to-market ratio, property, plant and equipment (PPE)-to-assets, earnings before interest and taxes (EBIT)-to-assets, and capital expenditures-to-assets. We further incorporate oil price changes, market volatility and COVID lockdown intensity.

Model:	(i)
Variables	
Climate Risk	-0.005
	(0.004)
Climate Risk × Energy	0.009
	(0.011)
Climate Risk × Industrials	0.018***
	(0.005)
Climate Risk × Financials	0.011**
	(0.005)
Climate Risk × Health	0.019
	(0.013)
Climate Risk × Real	0.029***
	(0.006)
Climate Risk × ConsumerDisc	0.023***
	(0.005)
Climate Risk × ConsumerStap	0.012**
	(0.005)
Climate Risk × Technology	0.012
	(0.011)
Climate Risk × Telecommunications	0.026*
	(0.015)
Climate Risk × BasicMaterials	0.014**
	(0.006)
Firm Controls	Yes
Country Controls	Yes
Fixed-effects	
Country FE	Yes
Year-Month-Day FE	Yes
Statistics	
Observations	777,248
R^2	0.004

Clustered (firm) standard-errors in parentheses
****: 0.01, **: 0.05, *: 0.1*

Table A19: Climate risk premium by industry

Notes: This table presents the climate risk premiums by industry groups. We compare all industries with Utilities industry. Sample spans from 2017 onwards.

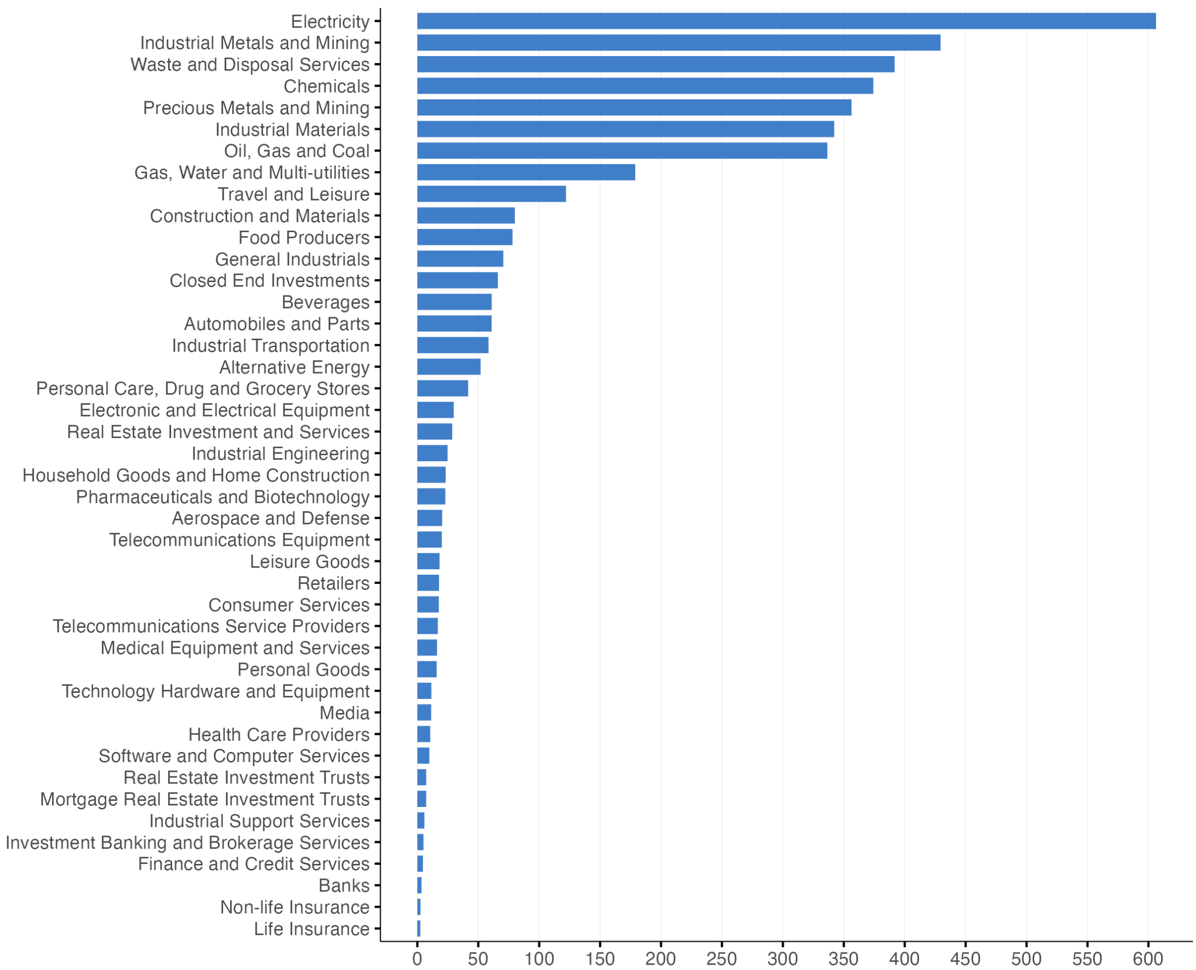

Figure A1: Median carbon intensity by sector (tCO_2 / mn \$ revenue)

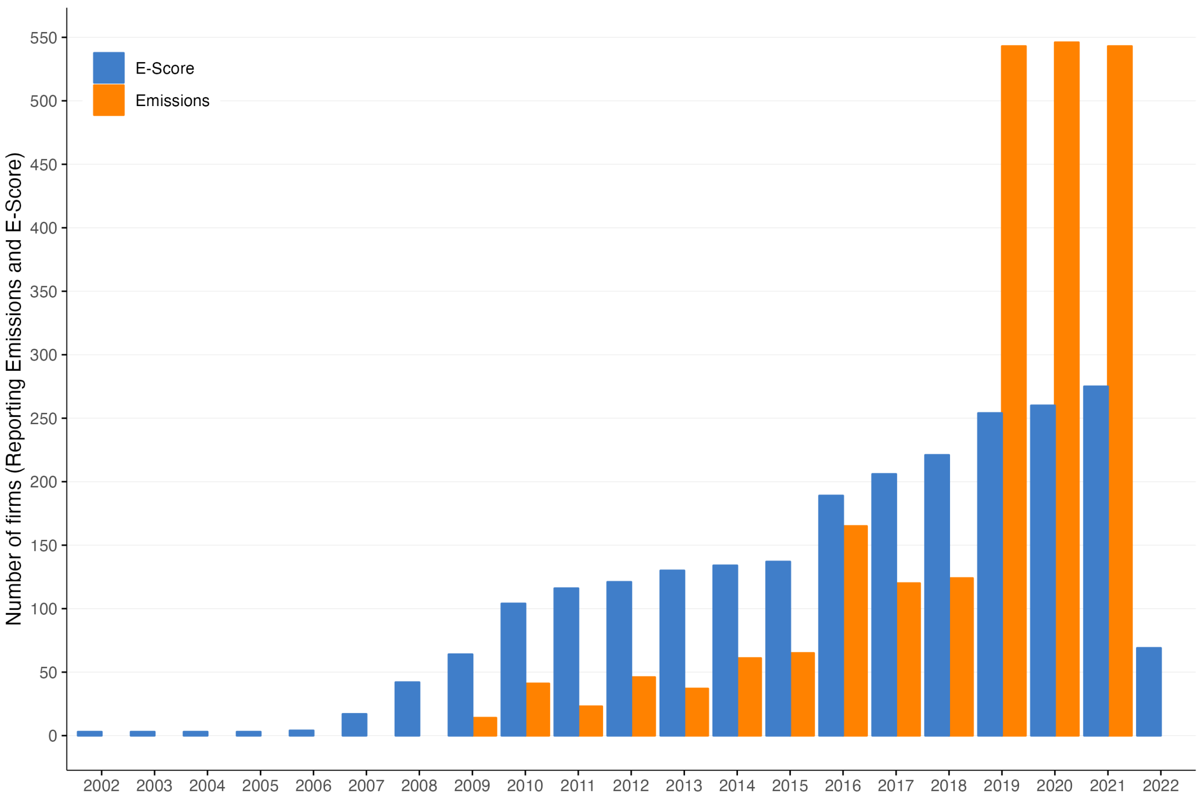

Figure A2: Number of firms reporting carbon emissions and E-Score per year

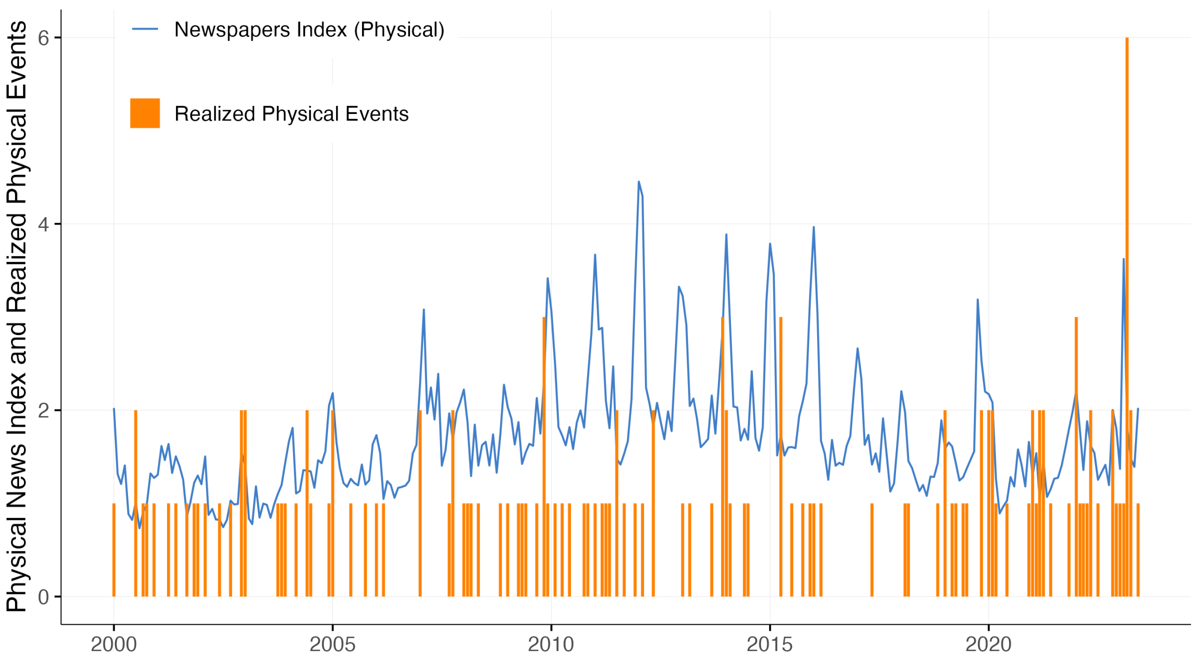

Figure A3: Physical climate events in Brazil: News and materialized events

Notes: This figure illustrates the frequency of physical climate news alongside the occurrence of physical climate events taken from the EM-DAT database. The vertical orange lines represent the number of physical climate events reported per month in Brazil.

Figure A4: Country level climate risks vs global climate policy uncertainty

Notes: This figure compares the country level climate risk indicator to climate policy uncertainty by Gavriilidis (2021). See `https://www.policyuncertainty.com/index.html` for more details.

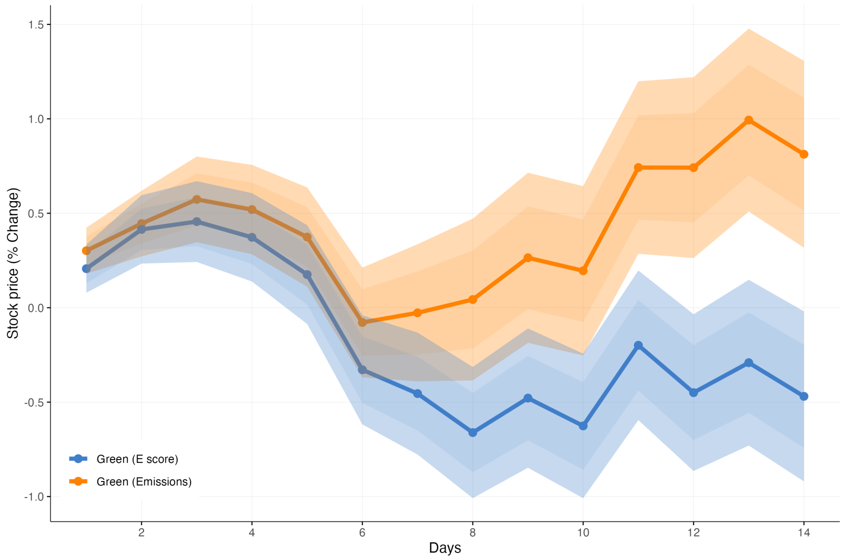

Figure A5: The effect of major climate legislation on green firms

Notes: This figure shows the impact of major climate events on green firms (Total impact). All other specifications remain the same as in local projections.

B Acknowledgments

We acknowledge that we benefit from Bergé (2018) and `https://www.tidy-finance.org` for high-dimensional fixed effects estimations and financial calculations.

PUBLICATIONS

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