



BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

The impact of US hurricanes on the portfolio decisions of
Italian and Dutch institutional investors

by Dirk Broeders, Flavio De Carolis, Simone Di Paolo, Kitty Rang,
Lorenzo Rubeo and Matteo Spuri

October 2026

Number

1060



BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

The impact of US hurricanes on the portfolio decisions of
Italian and Dutch institutional investors

by Dirk Broeders, Flavio De Carolis, Simone Di Paolo, Kitty Rang,
Lorenzo Rubeo and Matteo Spuri

Number 1060 – October 2026

The series Occasional Papers presents studies and documents on issues pertaining to the institutional tasks of Banca d'Italia and the Eurosystem. The Occasional Papers appear alongside the Working Papers series which are specifically aimed at providing original contributions to economic research.

The Occasional Papers include studies conducted within Banca d'Italia, sometimes in cooperation with the Eurosystem or other institutions. The views expressed in the studies are those of the authors and do not involve the responsibility of the institutions to which they belong.

The series is available online at www.bancaditalia.it .

THE IMPACT OF US HURRICANES ON THE PORTFOLIO DECISIONS OF ITALIAN AND DUTCH INSTITUTIONAL INVESTORS

by Dirk Broeders*, Flavio De Carolis†, Simone Di Paolo‡,
Kitty Rang§, Lorenzo Rubeo‡ and Matteo Spuri‡

Abstract

Information frictions are a central mechanism behind market segmentation in cross-border portfolio investment, yet direct evidence on how they shape trading responses to climate shocks remains limited. We use US hurricanes as a particularly suitable setting in which foreign investors face high uncertainty about affected issuers' fundamentals and the geographic distribution of physical damage. Focusing on Italy and the Netherlands, we exploit a novel dataset that links confidential security-level holdings to issuers' fundamentals and hurricane exposure to study how institutional investors adjust US equity and corporate bond portfolios following hurricanes. We find that institutional investors in both countries reduce their holdings of hurricane-exposed US equities, but Dutch investors react more strongly and with broader reallocations, including shifts toward unaffected bonds. Disaggregated results show that Dutch pension funds drive these effects: they cut hurricane-exposed equities and increase holdings of unaffected corporate bonds, deviating from standard within-asset-class rebalancing and instead suggesting a reassessment of asset fundamentals. In contrast, Dutch investment funds reduce equity positions overall but sell fewer exposed equities than non-exposed ones. Overall, the evidence highlights a pronounced heterogeneity in institutional responses and challenges the view that long-horizon investors necessarily stabilize markets after climate-related shocks. It also underscores how geographic and informational distance shape institutional trading under physical climate risk.

JEL Classification: G11, G14, G15, G32, Q54.

Keywords: event study, extreme weather events, institutional ownership, investment.

DOI: 10.32057/0.QEF.2026.1060

* European Central Bank and Maastricht University; Address: Sonnemannstraße 22, 60314 Frankfurt am Main Deutschland.

† Corresponding author, De Nederlandsche Bank, Maastricht University, University of Geneva; E-Mail: f.decarolis@maastrichtuniversity.nl, Address: Tongersestraat 53, 6211 LM Maastricht, The Netherlands.

‡ Banca d'Italia; Via Nazionale 91, 00184 Roma.

§ De Nederlandsche Bank; Westeinde 1, 1017ZN Amsterdam, the Netherlands.

1 Introduction¹

Extreme weather events, such as hurricanes, tornadoes, and tropical cyclones, are increasingly recognized as material threats to corporate financial stability and, by extension, to investors' risk management frameworks.² Not only are these events becoming more frequent and severe due to climate change, but they also entail significant uncertainty regarding their timing, intensity, and geographic scope (de Bandt et al., 2023; Krichene et al., 2023). The financial impact of these events is especially evident in capital markets, where the valuation of affected firms can shift in response to realized losses and to changes in perceived risks. Global climate-related damages are estimated to exceed \$143 billion annually (Newman and Noy, 2023). According to the US National Oceanic and Atmospheric Administration (NOAA), hurricanes alone have caused more economic damage than any other type of natural disaster since 1980.³ Recent estimates have shown that extreme weather events are vastly underestimated in Integrated Assessment Models (IAMs), which are simplified representations of complex physical and social systems that focus on the interaction between the economy, society, and the environment. As climate change accelerates, the intersection of localized climate disasters and globally diversified investment portfolios warrants urgent attention from scholars, investors, and policymakers.

Institutional investors face growing exposure to climate-related physical risks, as their portfolios often contain securities issued by firms located in disaster-prone areas or operating in sectors vulnerable to physical shocks. In segmented financial markets that are divided by geography, regulation, or information frictions, foreign investors may struggle to interpret localized events swiftly or accurately, particularly in jurisdictions where they lack an operational presence or access to relevant data. These information frictions impede the efficient flow and

¹We would like to thank the participants of the De Nederlandsche Bank internal seminar series, MORSE PhD workshop 2024, the Expert Group on Climate Change Statistics of the Eurosystem, and the Summer School on Finance and Product Markets 2024 for their feedback. We are also grateful to Rob Bauer, Justin Dijk, Patty Duijm, Silvia Fabiani, Alfonso Rosolia, Massimiliano Affinito, Luigi Infante, Laura Mellone, Francesca Monacelli, Amanda Carmignani, Laura Graziani Palmieri and Danilo Liberati for their valuable feedback. The views expressed are our own and do not represent an official statement from the Eurosystem.

²Our analysis focuses on hurricanes, a subset of tropical cyclones, to ensure consistency in storm intensity and data quality.

³See for more details: NOAA Hurricane Costs. Our framework is specific to hurricanes, whose large and well-measured spatial footprints allow ZIP-code-level exposure matching using NOAA wind-field data. For example, pluvial and riverine floods are highly localised, requiring fine-resolution inundation models rather than the geospatial approach used here, making the method not directly generalisable to such hazards.

interpretation of climate-related information across investors and markets.

Institutional investors based in Europe, for example, may encounter difficulties in evaluating the financial repercussions of hurricanes affecting US firms due to limited access to localized or firm-specific climate risk data. This informational asymmetry is compounded by the fragmented nature of the reporting on global climate risk, wherein climate-related disclosures and statistical indicators remain inconsistent across jurisdictions (ECB, 2023; ECB, 2024). As a result, investors face heightened uncertainty about firm fundamentals, such as cash flows and firms' sales revenue, that can lead to suboptimal trading responses, including overreaction, fire sales, or delayed reallocation (Starks, 2023). These dynamics can distort price discovery and, in aggregate, pose risks to financial stability (Merton, 1987; Kruttli et al., 2025; Bauer et al., 2025).

In this paper, our goal is to answer the following question: *To what extent do information frictions shape the responses of European institutional investors to US hurricanes, and how do these responses differ across investor types and asset classes?* We examine the portfolio trading behavior of pension funds, insurers and investment funds in Italy and the Netherlands as two EU countries with substantial financial exposure to US markets after hurricanes that affected US headquartered issuers between 2020 and 2023. Throughout the paper, we refer to these three categories collectively as *institutional investors*. The literature has shown how US-based investors respond to hurricanes in the equity market, with reactions varying by geographic proximity to the event and by portfolio composition (Alok et al., 2020; Blanco et al., 2024). Other studies have also examined the effect of hurricanes on US equity and bond prices (Braun et al., 2023; Huynh and Xia, 2023; Kruttli et al., 2025). We contribute to this literature by examining how European institutional investors adjust their portfolio allocations in response to hurricanes in the US. Our analysis focuses on heterogeneity in trading behavior across investor types and asset classes. Information frictions in our setting arise from both the geographical distance between Europe and the US and differences in legal and institutional frameworks, which may impede timely and efficient investor responses to US-based shocks. Because the literature often associates investor types with different typical investment horizons—for instance, pension funds generally being longer-term than investment funds—our results may also reflect such horizon-related behaviour. This interpretation remains indirect, as investment horizons are not observed in our data.

Our empirical setting is well suited to address this question due to the importance of US investments to both Italy and the Netherlands. Italian institutional investors hold substantial positions, with the US being the top destination for total foreign portfolio investments since 2020.⁴ As of the end of 2024, the US is the primary destination for Dutch pension fund investments in non-financial firms, with total holdings in US firms amounting to €293 billion, comprising €254 billion in equities and €39 billion in bonds.⁵ Despite this exposure, current Eurosystem statistics do not track investors' vulnerability to climate hazards outside the EU (ECB, 2023; ECB, 2024).

To examine the responses of investors, we analyze two separate datasets with proprietary institutional investors' security holdings provided by Banca d'Italia (BdI) and De Nederlandsche Bank (DNB) integrated with firm-level balance sheet and location data from Orbis⁶ and FactSet⁷, as well as hurricane impact data from NOAA's IBTrACS⁸ archive. These datasets allow us to link institutional ownership with the physical footprint of hurricane events by identifying whether issuers in investors' portfolios were exposed to wind speeds at the ZIP-code level that exceed the category 2 threshold of the Saffir-Simpson scale, which is categorized as "*Extremely dangerous winds will cause extensive damage*" by the World Meteorological Organization (WMO). Our sample spans the period from January 2020 to December 2023 and comprises seven hurricanes. This span contains hundreds of investors with portfolios of several thousand securities, covering both equities and bonds issued by US non-financial issuers and excluding all other assets such as government bonds – bonds will refer to instruments issued by US non-financial issuers henceforth. We present the results for Italy and the Netherlands separately. For this, we use the granular input datasets underlying the *Securities Holdings Statistics by Sector (SHSS)* provided by the European Central Bank (ECB). We cannot integrate the two datasets due to confidentiality constraints,

⁴This information comes from the Italian Central Bank (BdI) (Source: Banca d'Italia - Direct investment by counterpart country).

⁵This is roughly 55% of all foreign portfolio investments of Dutch pension funds in non-financial corporations for 2024. This information comes from De Nederlandsche Bank (DNB) (Source: DNB - Dutch pension funds invest more in US companies than in European companies).

⁶Orbis is a global database providing firm-level financial and ownership information. See (<https://www.bvdinfo.com>) for details.

⁷Factset provides financial market and reference data on securities and institutional investors. See (<https://www.factset.com>) for details.

⁸NOAA's IBTrACS (International Best Track Archive for Climate Stewardship) provides comprehensive global data on tropical cyclones. See (<https://www.ncdc.noaa.gov/ibtracs>) for details.

as they are only accessible within the firewalls of the respective national central banks. Given the size of the portfolios and the breadth of securities held, it is plausible that certain assets are simultaneously held by both Italian and Dutch institutional investors. Moreover, in the Eurosystem's shared SHSS data, the holder dimension is aggregated at the sector level, leading to a loss of within-sector variation and making it unsuitable for our analysis. For this reason, we rely exclusively on the confidential micro-data underlying the SHSS, which are accessible only within each central bank and preserve the investor–security heterogeneity required for our trading analysis, at the cost of not being able to merge the Italian and Dutch datasets across jurisdictions.

Our empirical strategy proceeds in two steps. First, we examine whether hurricanes influence issuer-level outcomes up to four months after the event, in particular asset returns and firms' sales revenue. To do so, we estimate fixed effects regressions that account for security-specific, time-specific, and firm-level characteristics. Second, we analyze whether, and in what way, institutional investors adjust their portfolios in response to these shocks by trading stocks and bonds in the first month after the event. Although institutional investors are primarily concerned with asset allocation and overall economic exposure, measured as the number of securities multiplied by their prices, we focus on actual trading behavior, such as changes in the number of securities held. Such trading may reflect rebalancing strategies or security-specific considerations, as discussed in Bikker et al. (2010). Using a multivariate panel fixed effects framework, we examine investors' behavior along both the intensive margin that is captured by changes in the size of holdings and the extensive margin that is measured by the likelihood of initiating buy, sell, or in general a trade decision in a given security.

Our key findings regarding firm-level outcomes are as follows: First, the financial instruments issued by US firms affected by hurricanes have negative excess returns in the immediate aftermath of the disaster, followed by a partial recovery in subsequent months, particularly in equity markets. These return dynamics are consistent with risk-premium effects (Braun et al., 2023; Blanco et al., 2024; Kruttli et al., 2025), behavioral overreaction (Alok et al., 2020; Huynh and Xia, 2023), or a mix of the two. Second, we also find a significant decline in firms' sales revenue in the four months after the event, supporting the view that repricing is driven by a deterioration in

underlying fundamentals.

We summarize our main findings on stock and bond trading in the months after the events as follows: First, on aggregate, institutional investors in both Italy and the Netherlands adjust their holdings of US equities in response to extreme weather events, primarily by reducing their exposure to the affected assets. However, this pattern does not extend to bond portfolios. Specifically, Italian institutional investors do not show significant trading activity in bonds, while there is some evidence that Dutch institutional investors increase their holdings of unaffected bonds.⁹

Second, disaggregating by investor type identifies heterogeneity, particularly among pension and investment funds. Dutch pension funds appear to drive the aggregate effects: they reduce holdings of hurricane-exposed equities and reallocate toward unaffected bonds. This response deviates from standard rebalancing behavior, which typically entails increasing exposure to underperforming assets, and instead suggests a reassessment of the exposed equities' fundamental value in light of the shocks.¹⁰ In contrast, Dutch investment funds reduce positions in affected equities, but less than unaffected ones, consistent with active trading behavior (i.e., selectively adjusting positions to exploit short-term mispricing rather than broadly reducing exposure). This pattern contrasts with parts of the institutional ownership literature which argue that long-term investors such as pension funds stabilize prices in distressed markets, while short-term investors like investment funds may amplify price pressures (Hotchkiss and Strickland, 2003; Gaspar et al., 2005; Derrien et al., 2013; Huynh and Xia, 2023). However, our findings align more closely with recent evidence suggesting that, on aggregate, institutional investors can exacerbate financial market stress in the presence of shocks (Glossner et al., 2025).

Our findings contribute to several strands of the literature. First, we advance the empirical understanding of how institutional investors respond to climate-related disasters in foreign markets, building on research that links these disasters to asset pricing and firm-level outcomes (Ding et al., 2021; Blanco et al., 2024; Glossner et al., 2025). Second, we extend the literature on

⁹See Table 11.

¹⁰Italian pension funds are excluded from this analysis because the data are available only in aggregated form for the entire sector, without institution-level granularity. This lack of disaggregation prevents a meaningful comparison with Italian investment funds.

market segmentation and information frictions by providing evidence that geographic distance from the disaster zone shapes the timing and direction of trading responses, with institutional and regulatory differences across jurisdictions likely contributing as well (Ferreira and Matos, 2008; De Haas and Van Horen, 2013; Kacperczyk et al., 2020; Matos, 2020). Third, we contribute to the literature on investment horizons and ESG-related behavior by documenting heterogeneous responses across asset classes among long-term investors. Dutch pension funds reduce their hurricane-exposed equity holdings — contributing to price pressures in equity markets — while simultaneously increasing their holdings of unaffected bonds, suggesting greater patience in fixed-income markets. This asset-class asymmetry is absent among shorter-horizon investors such as investment funds, and highlights that the stabilizing role typically attributed to long-term investors (Starks et al., 2017) may be asset-class specific rather than uniform.

This study could also have important implications for policymakers, prudential supervisors, and market conduct authorities. Despite the significant exposure of European investors to climate risks outside the EU, the current regulatory framework does not systematically incorporate cross-border physical hazard metrics into the monitoring of systemic risk (ECB, 2023; ECB, 2024). Our findings indicate that both long- and short-term investors may exacerbate price pressures during climate-related events.

The remainder of the paper is structured as follows: In Section 2, we formulate the testable hypotheses based on the theoretical and empirical literature. In Section 3, we outline the empirical strategy used to assess the effects of hurricane exposure on firm outcomes and investor behavior. We describe the data sources and the construction of our key variables in Section 4. Section 5 presents our main findings on asset performance and trading activity. In Section 6, we discuss the robustness checks and explore heterogeneity across investor types. Section 7 concludes with a discussion of the policy implications and directions for future research.

2 Theory and hypotheses development

In this section, we develop the key hypotheses that guide our empirical analysis. We build on the literature on financial economics, climate finance, and institutional investment behavior to frame

testable predictions about how extreme weather events affect asset prices, firm fundamentals, and investor decisions. Specifically, we explore (i) how financial markets respond to these events in terms of the returns and performance of firms, and (ii) how institutional investors in Europe adjust their portfolios in response to such events. We also investigate the heterogeneity of investors, focusing on differences in investment horizons and regulatory environments. In Appendix A, we present theoretical considerations regarding asset trading in the context of portfolio rebalancing.

H1: A large body of literature has shown that the expected returns of the securities of firms that are affected by extreme weather events tend to increase following their occurrence.¹¹ Two not necessarily mutually exclusive explanations have been proposed for this phenomenon. The first explanation argues that higher returns reflect a larger risk premium demanded by investors for bearing increased exposure to climate risks (Blanco et al., 2024; Kruttli et al., 2025). Braun et al. (2023) further show that a climate risk premium exists for historically exposed firms and that this premium is primarily demanded by institutional investors to justify their holdings. The second explanation attributes the pattern to investors' overreaction: in the aftermath of an extreme weather event, prices temporarily fall below fundamental values and subsequently revert as the mispricing is corrected (Huynh and Xia, 2023). Given the novelty of our data, we begin by testing the extent to which our results are consistent with this literature:

- *H_{1a}: Extreme weather events are associated with an increase in expected returns in the months following the disaster.*

An increase in expected returns, as highlighted in H_{1a} , can be interpreted either as a rational response reflecting heightened uncertainty about a firm's cash flows or as evidence of behavioral biases, such as overreactions of investors. To distinguish between these explanations, the literature contains examinations of whether firms' fundamentals, such as firms' sales revenue, deteriorate

¹¹A simple reference point to understand the effect on risk premia is the Gordon constant growth model for a stock price: $P = \frac{d}{\mathbb{E}(r) - g}$, where d is next year's dividend, $\mathbb{E}(r)$ the expected return, and g the constant dividend growth rate. Assuming $\mathbb{E}(r) = r_f + \lambda$, the risk premium can be expressed as $\lambda = \frac{d}{P} + g - r_f$. Following an extreme weather event, if prices fall while dividends and growth expectations remain unchanged, the risk premium increases due to a lower P . If prices later recover, the risk premium decreases again. However, if the extreme weather event lowers expected dividends or growth, the risk premium may decline even if prices do not change.

significantly following the event. This line of inquiry helps assess whether behavioral factors influence asset managers' investment decisions. In particular, if firms' revenues remain unaffected following the event, this would support the investor-overreaction explanation (Dessaint and Matray, 2017; Alok et al., 2020; Huynh and Xia, 2023). Huynh and Xia (2023) find that firms' sales revenue declines in affected regions following extreme weather events, both at the production facility and firm level. The authors argue that declining sales after events prove that firms are financially affected by their occurrence. Other studies also show significant drops in sales. For instance, Dessaint and Matray (2017) find a significant decrease in year-over-year sales revenue by 2.4% for firms located in affected regions. In contrast, Alok et al. (2020) find no significant difference between affected and partially affected regions, as both experience comparable sales declines, with estimated drops ranging between 2.3% and 2.8%. Given the current inconclusive state of the literature, we examine the effect of extreme weather events on sales revenue for firms headquartered in affected regions.

- *H_{1b}: Firms' sales revenue declines in the months following an extreme weather event for firms affected by it.*

H2: We now turn to the active trading responses of institutional investors to exposed assets. According to the theory, investors react to extreme weather events for several reasons. Among these, we highlight those particularly relevant for foreign investors (Braun et al., 2023): (i) investors may engage in fire sales of securities with salient downside risks; (ii) investors may fear cascading losses caused by extreme weather events within production networks which can transform idiosyncratic shocks into systematic ones; (iii) investors may assess risk-sharing mechanisms that distribute climate risks among economic agents to be limited. These theoretical motivations offer a foundation for understanding why institutional investors adjust their portfolios in response to extreme weather events. The empirical literature supports these views. For instance, Blanco et al. (2024) show that US institutional investors reduce their holdings in securities affected by extreme weather events while increasing their investments in unaffected stocks. Similarly, Huynh and Xia (2023) find that assets with higher institutional ownership experience stronger selling pressure during extreme weather events. Alok et al. (2020) also

find that fund managers decrease their holdings in affected securities after such events, with geographically closer funds reducing their exposure more significantly than distant ones. In our analysis, we use a unique dataset on Italian and Dutch institutional investors to examine whether their trading behavior mirrors that of their US counterparts:

- *H_{2a}: Institutional investors in Italy and the Netherlands adjust their holdings of US assets exposed to extreme weather events.*

Although the research shows that total institutional ownership contributes to selling pressure on securities affected by extreme weather events, recent evidence suggests that the investment horizon of institutional owners plays a crucial role in moderating this effect. Using ECB Securities Holdings Statistics, Alessi et al. (2024) examine how European institutional investors adjusted their portfolios after the introduction of the Paris Agreement. They find that highly regulated institutional investors reduced their exposure to carbon-intensive assets more significantly than others. Huynh and Xia (2023) show that stocks with high long-term institutional ownership experience less selling pressure and smaller excess return declines during the months of extreme weather events, indicating that long-term investors have a stabilizing effect. Similarly, Starks et al. (2017) investigate the effect of investment horizon on institutional decision-making related to ESG assets. They argue that long-term investors are better positioned to assess the profitability of long-term projects and thus tend to allocate more capital to high-ESG assets. Taken together, this literature points to meaningful heterogeneity in the behaviors of European institutional investors, particularly regarding their investment horizons. Given the more patient and stabilizing role long-term investors appear to play during extreme weather events, we formulate the following hypothesis:

- *H_{2b}: Institutional investors that are typically characterized in the literature as having longer investment horizons – such as pension funds – may display greater portfolio stability during hurricanes, reducing selling pressure on affected assets relative to shorter-horizon investors such as investment funds.*¹²

¹²Investment horizons are not observed in our data. Any reference to horizon differences relies on investor type as an indirect, widely used proxy in the institutional investment literature.

These four hypotheses serve as the foundation for our empirical analysis. They are grounded in theoretical insights and supported by recent findings in climate finance and institutional investment behavior.

3 Methodology

To test hypotheses H_{1a} and H_{1b} , we estimate the following multivariate regression model:

$$\mathbb{E}(Y_{j,t}) = \alpha + \beta TC_{j,t-1} + \delta'' X_{j,t-1} + \theta_j + \phi_t + y_t + \varepsilon_{j,t} \quad (1)$$

In Equation 1, the subscript j indexes an issuer or its securities, and t indexes lead time in months. The dependent variable $Y_{j,t}$ is either the excess return $R_{j,t}$ or the decline in firms' sales revenue $\Delta\text{Sales}_{j,t}$, depending on whether we test H_{1a} or H_{1b} . The indicator variable $TC_{j,t-1}$ equals one if the headquarters of issuer j is located in a region affected by a category 2 hurricane in month $t-1$, and zero otherwise. We focus on headquarters' locations, as this information is readily available and consistently observable across firms. While this choice abstracts from firms' potentially dispersed operations, prior studies show that headquarters' location provides a relevant and informative proxy for firms' economic and risk exposure (Alok et al., 2020; Pankratz et al., 2023). The vector $X_{j,t-1}$ contains lagged firm- or security-specific control variables, with the exact composition varying by specification. The definitions of all control variables in $X_{j,t-1}$ are provided in Table 8. Both returns and firms' sales revenue are scaled by a factor of 100 for ease of interpreting the results in percentage points. We include security fixed effects θ_j , year fixed effects ϕ_t , and month fixed effects y_t to account for unobserved heterogeneity. Standard errors are clustered at both the security and year levels.

To test explanations $H_{2.a}$ and $H_{2.b}$ we use a multivariate regression framework, based on a measure of institutional investors' exposure to extreme weather events. Following the method outlined by Blanco et al. (2024), we define the exposure as follows:

$$IOExposure_{i,t} = \sum_{j \in P_{i,t-1}} w_{i,j,t-1} \cdot TC_{j,t} \quad (2)$$

The measure reflects the investor's portfolio weight of affected issuers. $P_{i,t-1}$ denotes the equity or bond portfolio of institutional investor i at the end of month $t-1$. The term $w_{i,j,t-1}$ represents the weight of issuer j in investor i 's portfolio at that time. The variable $TC_{j,t}$ is a binary indicator equal to one if, in month t , the headquarters of issuer j is located in a region affected by an extreme weather event, and zero otherwise. We use this exposure measure in a multivariate regression analysis to examine the influence of institutional holders affected by extreme weather events on securities. The key regression is as follows:

$$Trading_{i,j,t} = \alpha + \beta_1 IOExposure_{i,t} + \beta_2 IOExposure_{i,t} \cdot TC_{j,t} + \delta'' X_{i,t-1} + \theta_{j,t} + \phi_{i,j} + \varepsilon_{i,j,t} \quad (3)$$

$Trading_{i,j,t}$ captures the trading activity of investor i in security (issuer) j during period t . We analyse this activity along two dimensions: the **intensive margin**, which reflects the volume or magnitude of trading per institutional investor, and the **extensive margin**, defined strictly through three binary indicators, which captures whether a distinct trading action occurred¹³ (Kempf et al., 2017; Blanco et al., 2024). We replicate the analysis of Blanco et al. (2024) except for our definition of institutional ownership.

First, we define $\Delta Hold_{i,j,t}$ as the percentage change in institutional ownership of security j by investor i between the end of periods $t-1$ and t . Institutional ownership is measured as the absolute holdings of security j in euros relative to its total market value in euros. This reflects a share-based measure of institutional ownership, defined as the ratio of the number of shares held by institutional investors to the total number of shares outstanding for security j . The sum of coefficients, $\beta_1 + \beta_2$, captures the direction of trading activity by highly exposed institutional investors in affected firms, relative to those with less exposure. Since $TC_{j,t}$ is a dummy variable indicating whether firm j is affected by a hurricane in period t , its interaction with exposure isolates holding changes specific to affected securities. A negative value of $\beta_1 + \beta_2$ indicates that highly exposed investors are reducing their positions in the affected securities.

¹³The extensive margin is entirely captured by three indicator variables: a trade dummy equal to one when $|\Delta Hold_{i,j,t}| > 0.4\%$, a buy dummy equal to one when $\Delta Hold_{i,j,t} > 0.4\%$, and a sell dummy equal to one when $\Delta Hold_{i,j,t} < -0.4\%$. We do not use any count of trades or number of securities held in defining the extensive margin.

The individual coefficients provide further insight. β_1 captures the difference in trading directions of highly exposed investors of unaffected securities, relative to less exposed investors. Given a negative $\beta_1 + \beta_2$, a positive β_1 reflects reallocation away from affected securities toward unaffected ones. Conversely, a negative β_1 means that highly exposed investors are reducing their overall holdings, potentially as a risk-management response.¹⁴ The coefficient β_2 captures the differential trading behavior for affected securities. Together with β_1 , it helps determine whether investors are trading in the same or opposite direction across affected and unaffected issuers. Table 1 provides a summary of the interpretation of the coefficients.

Second, we consider $|\Delta\text{Hold}_{i,j,t}|$, the absolute change in ownership, which captures the intensity of trading by institutional investors. This measure reflects the degree of attention or information processing by high- versus low-exposure investors. Since both purchases and sales require attention and resources, larger absolute changes indicate greater trading activity in response to extreme weather events that is consistent with the concept that attention is a limited resource (Kempf et al., 2017).

Coefficient	Trading - Sign of Coefficient	
	< 0	> 0
β_1	Reduce unaffected securities	Increase unaffected securities
β_2	Deepens the decrease or dampens/reverses the increase	Amplifies the increase or attenuates/reverses the decrease
$\beta_1 + \beta_2$	Reduce affected securities	Increase affected securities

Table 1. Regression Coefficients: This table presents the regression coefficients used to interpret trading activity of affected and unaffected securities. The sign of $\beta_1 + \beta_2$ determines the direction of trading in affected securities. The coefficient β_2 should be read as a correction to β_1 : it captures how the trading direction for affected securities differs from that for unaffected ones, and its description in the table therefore refers to its effect relative to the direction established by β_1 . The coefficient β_1 captures trading in unaffected securities, while $\beta_1 + \beta_2$ captures trading in affected securities.

We analyze the extensive margin using three binary indicators: $\text{Trades}_{i,j,t}$, $\text{Buys}_{i,j,t}$, and $\text{Sells}_{i,j,t}$ (Schmidt, 2019). We define $\Delta\text{Hold}_{i,j,t}$ as the change in the ownership share of investor i in security j at time t . To distinguish significant changes from minor adjustments, we define¹⁵:

¹⁴A value of $\beta_1 = 0$ would mean that investors are reallocating capital to other asset classes. We address this possibility by presenting results separately for equities and bonds.

¹⁵We set the 0.4% threshold based on the empirical distribution of changes in holdings across our sample. Specifically,

- $Trades_{i,j,t}$ is equal to one if $|\Delta Hold_{i,j,t}| > 0.4\%$, and zero otherwise,
- $Buys_{i,j,t}$ is equal to one if $\Delta Hold_{i,j,t} > 0.4\%$, and zero otherwise,
- $Sells_{i,j,t}$ is equal to one if $\Delta Hold_{i,j,t} < -0.4\%$, and zero otherwise.

We control for additional heterogeneity in funds through the vector $X_{i,t-1}$ that comprises lagged fund characteristics as proposed in Blanco et al. (2024) and detailed in Table 8. Furthermore, we add two-way fixed effects: ϕ_{ij} for *investor* $\times$ *security*, and θ_{jt} for *security* $\times$ *year-month* interactions. These fixed effects ensure that variation is identified only from within-investor changes in trading behavior, net of confounding effects such as institutional investor networks or supply chain linkages associated with the affected firms. Specifically, *investor* $\times$ *security* fixed effects are relevant to absorb time-invariant investor-security relationships such as long-run preferences for a security, strategic holdings based on internal mandates, and historical engagement. Additionally, *security* $\times$ *year-month* fixed effects absorb all time-varying security-level factors, thus controlling for specific shocks in a given month such as analyst downgrades or macro shocks, characteristics of that security in a specific month, and overall demand and sentiment of investors toward security (firm) j . Standard errors are clustered at the investor-month level, which is the level at which $IO\ Exposure_{it}$ is measured (Kempf et al., 2017; Blanco et al., 2024). Figure 1 provides an overview of the different dimensions of trading behavior analyzed in this study.

4 Data

In this section, we provide summary statistics for the datasets used to test hypotheses H_{1a} through H_{2b} , as well as for the underlying data from which these variables are derived.

this value is approximately the median of the $\Delta Hold_{i,j,t}$ distribution. Minor fluctuations near zero are common and likely reflect mechanical or passive adjustments rather than deliberate trading. The threshold is therefore intended to filter out noise and isolate economically meaningful, active trading decisions.

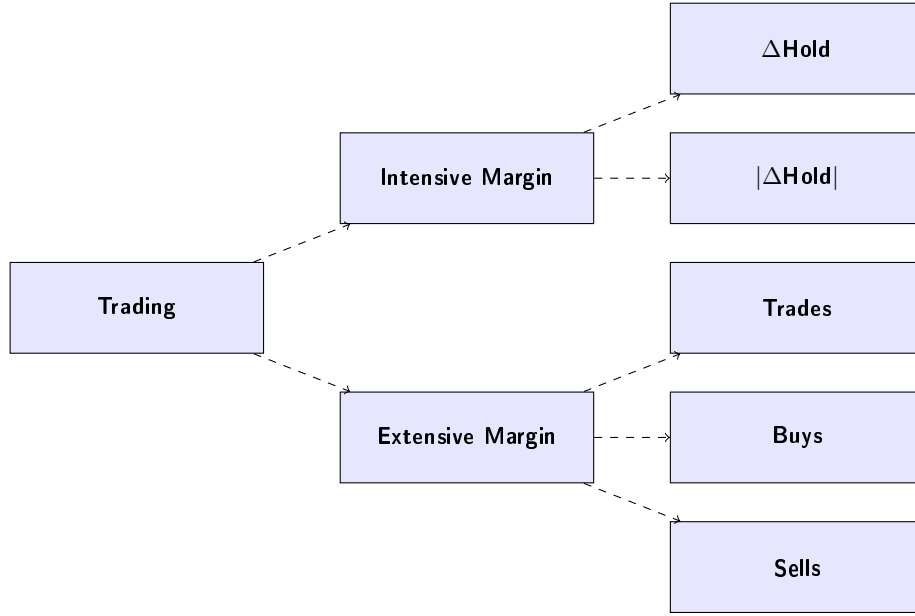


Figure 1. Hierarchy of Trading Activity Measures

4.1 Sample of US Securities in Italian and Dutch Holdings

The sample comprises publicly listed equities and bonds issued by US non-financial firms held by Italian and Dutch institutional investors, covering the period from January 2020 through December 2023. The time series starts in 2020, as this marks the start of mandatory reporting on holdings of securities at a security identifier level for Dutch institutional investors. The series ends in 2023 to ensure the availability of sufficient accounting data on the affected firms to pair it with the holdings information. The number of security-month observations differs between Italy and the Netherlands because we analyze securities held by institutional investors in each country separately. As a result, the two samples vary in size.

Due to confidentiality constraints, we cannot merge holder-level data from Italy and the Netherlands. Instead of using the aggregated SHSS data from the European Central Bank (ECB), we rely on granular (input) holder-security level data provided by the national central banks. As these datasets cannot be combined without breaching confidentiality, we present summary statistics and results separately for each country and discuss potential differences in the results.

In Table 2, we introduce the summary statistics on the variables used to test hypothesis H_{1a} , where we investigate the effect of TC on securities' performances. For Italy, the sample consists of 55,113 equity-month and 107,821 bond-month observations, covering 1,997 unique

equities and 5,407 unique bonds, respectively. For the Netherlands, the sample comprises 92,256 equity-month and 113,525 bond-month observations, covering 2,841 unique equities and 3,932 unique bonds. All variables are defined in detail in Table 8 and winsorized at the 1st and 99th percentiles to mitigate the influence of outliers.

In the sample of US securities held by Italian institutional investors, both asset classes have negative average monthly excess returns, across securities and time. Equities average -0.56% with a standard deviation of 25.48% , while bonds average -0.22% with a standard deviation of 4.29% . On average, over all months, 1.94% of equities and 1.43% of bonds are affected by extreme weather events. The average log market capitalization of equity is 21.34, the profitability is 0.26, the investment rate is 1.00% , the past one-year return is 1.61% , and the log book-to-market ratio is -1.40 . The average bond has a maturity of 8 and a half years, a log outstanding amount of 20.35, a median credit rating of 8.6 (BBB), downside risk of 5.38% , and near-zero illiquidity. The average values of beta, default spread, term spread, and bond market return are 2.28, -0.02 , and 0.88 , respectively.

By contrast, US securities held by Dutch institutional owners show positive average returns. Equities have an average excess return of 0.65% (standard deviation: 15.20%), and bonds average 0.25% (standard deviation: 2.99%). Some 1.76% for the equity sample and 2.11% for the bond sample are affected by *TC* events. The average log market capitalization of equity is 21.53, profitability of 0.25, investment rate of 1.00% , past one-year return of 0.10% , and a log book-to-market ratio of -1.17 . The average bond has a maturity of almost 8 years, an average log outstanding amount of 20.29, median rating of 8.62 (BBB), downside risk of 5.35% , and nearly zero illiquidity. The average values for beta, default spread, term spread, and bond market return are 715.22, 6.85, and -2.95 , respectively.

The overall differences in return performance between Italian and Dutch holdings are largely driven by differences in investors' exposure and investment focus across the two countries. Beyond data availability, the two countries provide a meaningful basis for comparison: both have substantial and well-documented exposure to US markets, yet they differ markedly in institutional structure, sectoral composition, and investor type. These differences allow us to explore how heterogeneity in investor characteristics shapes responses to the same external shocks, rather than

Asset	Variable	N	μ	1st	Median	99th	σ
Italy	Equities	<i>Stock Excess Return</i>	53,761	-0.56	-92.58	0.08	25.48
		TC_t	55,113	1.94	0.0	0.0	13.8
		$Ln(ME)$	54,734	21.34	8.6	22.36	3.42
		<i>Profitability</i>	41,271	0.26	-0.04	0.23	0.18
		<i>Investment</i>	40,868	0.01	-0.13	0.0	0.04
		<i>Momentum</i>	42,662	1.61	-309.18	6.29	206.86
		$Ln(BM)$	38,401	-1.4	-4.65	-1.29	1.05
	Bonds	<i>Bond Excess Return</i>	94,484	-0.22	-16.47	-0.25	18.72
		TC_t	107,821	1.43	0.0	0.0	11.88
		$Ln(Maturity)$	107,821	2.14	0.15	2.07	0.88
		$Ln(Amount\ Out.)$	107,821	20.35	18.91	20.3	0.6
		<i>Reversal Month</i>	105,480	-0.05	-15.67	-0.15	16.29
		<i>Med. Rating</i>	105,933	8.6	1.0	9.0	2.79
		<i>Downside Risk</i>	45,167	5.38	2.03	4.45	20.4
		<i>Roll</i>	51,438	0.0	-0.0	0.0	0.0
		<i>Past Bond Returns</i>	94,484	0.05	-16.39	-0.08	18.15
		$\beta^{default\ spread}$	40,576	2.28	-44.67	0.85	80.06
		$\beta^{term\ spread}$	40,576	-0.02	-6.29	-0.11	14.37
		β^{market}	40,576	0.88	-5.24	0.94	6.0
Netherlands	Equities	<i>Stock Excess Return</i>	90,333	0.65	-41.61	-0.07	54.79
		TC_t	92,256	1.76	0.0	0.0	13.15
		$Ln(ME)$	92,238	21.53	17.53	21.44	1.78
		<i>Profitability</i>	89,561	0.25	-0.04	0.22	0.2
		<i>Investment</i>	91,646	0.01	-0.14	0.0	0.06
		<i>Momentum</i>	88,438	0.09	-172.46	2.99	149.96
		$Ln(BM)$	85,995	-1.17	-4.34	-1.06	1.01
	Bonds	<i>Bond Excess Return</i>	112,311	0.25	-8.9	0.06	10.31
		TC_t	113,525	2.11	0.0	0.0	14.38
		$Ln(Maturity)$	113,525	2.04	0.73	2.0	0.56
		$Ln(Amount\ Out.)$	87,914	20.29	18.51	20.24	0.6
		<i>Reversal Month</i>	111,364	-0.28	-9.68	-0.38	9.79
		<i>Med. Rating</i>	112,327	8.62	1.0	9.0	3.01
		<i>Downside Risk</i>	84,164	5.35	2.12	4.25	21.47
		<i>Roll</i>	100,055	0.0	-0.0	0.0	0.0
		<i>Past Bond Returns</i>	107,032	0.29	-9.02	0.11	10.57
		$\beta^{default\ spread}$	77,655	715.22	-971.26	529.09	4877.42
		$\beta^{term\ spread}$	77,655	6.85	-658.18	20.88	559.85
		β^{market}	77,655	-2.95	-19.86	-2.27	7.45

Table 2. Summary Statistics for US Securities Held by Institutional Investors from Italy and the Netherlands. This table presents the summary statistics for equity-month and bond-month observations from January 2020 to December 2023. For each variable, we report the number of non-missing observations (N), sample mean (μ), 1st percentile, median, 99th percentile, and standard deviation (σ). All variables are winsorized at the 1st and 99th percentiles. $Ln(ME)$ denotes log market capitalization, and $Ln(BM)$ denotes log book-to-market ratio. TC_t is scaled by 100 to reflect the percentage of unique affected securities. Variables are sourced from FactSet (Equities: *Profitability*, *Investment*, *Momentum*, $Ln(BM)$); Bonds: *Downside Risk*, *Roll*) and central bank statistics from Italy and the Netherlands (Equities: *Stock Excess Return*, $Ln(ME)$); Bonds: *Bond Excess Return*, $Ln(Maturity)$, $Ln(Amount\ Out.)$, *Reversal Month*, *Med. Rating*). We follow Huynh and Xia (2023) for the construction of $\beta^{spreads}$. See Table 8 for the definitions of the variables.

simply pooling two observationally similar countries. First, there are substantial differences in the sectoral composition of holdings, which motivates the inclusion of both countries in the analysis. For example, Dutch holdings are predominantly held by pension funds, whereas Italian holdings are mainly held by investment funds and insurance companies. Second, these differences in investor sectors translate into marked variations in holding-sector exposures, which help explain the observed cross-country differences in returns.

	Asset	Variable	N	μ	1st	Median	99th	σ
Italy	Equities	$\Delta Sales$	39,386	0.92	-13.52	0.58	22.06	4.49
		ROA	13,493	1.75	-98.57	5.04	35.31	18.95
		$Leverage$	13,249	0.53	0.06	0.5	1.68	0.26
		σ_m	43,596	97.12	4.75	11.15	3968.12	513.53
		$Ln(ME)$	54,734	21.34	8.6	22.36	26.53	3.42
	Bonds	$\Delta Sales$	78,163	0.8	-39.81	0.0	41.88	9.62
		ROA	16,610	6.35	-13.0	5.43	28.06	6.74
		$Leverage$	16,032	57.52	23.58	54.84	109.38	17.96
		σ_m	43,961	8.9	4.14	7.76	25.45	4.1
		PB	39,308	9.3	0.61	3.58	188.66	22.93
Netherlands	Equities	$\Delta Sales$	86,139	1.16	-16.72	0.58	30.29	5.61
		ROA	30,333	-1.89	-75.58	2.64	35.27	18.49
		$Leverage$	29,879	0.49	0.04	0.48	1.4	0.26
		σ_m	91,587	15.29	5.06	13.15	55.23	8.61
		$Ln(ME)$	92,238	21.53	17.53	21.44	26.03	1.78
	Bonds	$\Delta Sales$	100,423	0.77	-11.5	0.58	17.3	3.75
		ROA	34,219	6.39	-15.22	5.38	28.81	7.21
		$Leverage$	33,565	57.45	23.32	54.93	127.52	19.41
		σ_m	90,976	9.65	4.32	8.31	27.03	4.59
		PB	83,343	9.85	0.58	3.65	192.88	24.0

Table 3. Summary Statistics for US Firms Held by Institutional Investors from Italy and the Netherlands. This table presents the summary statistics for equity-month and bond-month observations over the sample period from January 2020 to December 2023. For each variable, we report the number of non-missing observations (N), sample mean (μ), 1st percentile, median, 99th percentile, and standard deviation (σ). All variables are winsorized at the 1st and 99th percentiles. Variables are sourced from FactSet (for the Dutch Central Bank: $\Delta Sales$, Return on Assets (ROA), $Leverage$, $Ln(ME)$, σ_m , and Price-to-Book ratio (PB)), and Orbis (for the Italian Central Bank: $\Delta Sales$, ROA , $Leverage$, $Ln(ME)$, σ_m , and PB). See Table 8 for detailed definitions of the variables.

Firms in the sample have, on average, positive sales revenue, moderate to low leverage, and large market capitalizations. These characteristics are consistent across both the Italian and Dutch subsamples. Summary statistics for these variables are reported in Table 3. On average, firms in both the equity and bond samples show sales revenue ($\Delta Sales$) of approximately 1%. Leverage is substantially lower for equity-issuing firms (around 0.5%) compared to bond issuers (approximately 60%) in both countries. Return on assets (ROA) is generally positive, ranging

from 1.75% to 6.39%, except for equity issuers in the Dutch sample that report an average ROA of -1.89% . Market capitalizations are high across all samples, reflecting the large size of firms held by institutional investors in both Italy and the Netherlands.

4.2 Sample of Italian and Dutch Institutional Owners

In the previous subsections, we presented the sample of US equities and bonds and the sample of US issuing firms. In this subsection, we collect holdings data for institutional investors based in Italy and the Netherlands. Again, the summary statistics are presented separately as we cannot integrate the datasets. The Italian dataset comprises 57 equity and 58 bond unique holders reporting investments in US issuers, yielding 327,064 equity-investor-month and 275,280 bond-investor-month observations. The Dutch dataset contains 217 equity and 112 bond unique holders reporting investments in US issuers, resulting in 1,507,968 equity-investor-month and 446,854 bond-investor-month observations.¹⁶ **Panel A** of Table 4 presents the ownership and transaction statistics for Italian institutional investors. **Panel B** presents descriptive statistics for the control and independent variables used in Model 3.

Italian institutional investors have limited exposure to US equities and bonds. For equities, the average ownership ($\%_{000}Ownership_{i,j,t}$) is $1.04\%_{000}$, measured as a fraction of the firm's total market capitalization.¹⁷ The mean monthly change in holdings ($\Delta Hold_{i,j,t}$) is 10.73% , indicating that equity positions increase by approximately 11% on average. The mean absolute change ($|\Delta Hold_{i,j,t}|$) is 28.41% , reflecting substantial trading. At the extensive margin, trades are relatively balanced: 51% of the observations are purchases, and 46% are sales. Direct exposure to an extreme weather event is defined as the location of the firm's headquarters that affects only 0.05% of holder-security-month observations.

For bonds, the average per-10,000 ownership is $0.35\%_{000}$ and is measured relative to the total amount outstanding. The mean monthly change in holdings is 0.02% , with an average absolute

¹⁶See Table 6 for reference.

¹⁷We express ownership as per-10,000 units ($\%_{000}$), where $1\%_{000}$ equals 0.01% or 0.0001. This choice improves readability, as ownership stakes in US firms held by individual institutional investors are often very small relative to the firms' total market capitalization. However, average $\%_{000}$ ownership for Italian investors is around 28 times smaller than the one of American investors (0.014% compared to 0.4%) and two times smaller for Dutch ones (0.17% compared to 0.4%) compared to Table A.2 in Blanco et al. (2024).

Security	Variable	N	μ	1st	Median	99th	σ
Panel A: Investor-Security Outcomes							
Equities	$\%_{000} Ownership_{i,j,t}$	327,064	1.04	0.00	0.14	16.27	2.51
	$\Delta Hold_{i,j,t}$	327,064	10.73	-80.37	0.73	381.29	58.51
	$ \Delta Hold_{i,j,t} $	327,064	28.41	0.13	10.55	381.29	52.46
	$Trades_{i,j,t}$	327,064	0.97	0.00	1.00	1.00	0.16
	$Buys_{i,j,t}$	327,064	0.51	0.00	1.00	1.00	0.49
	$Sells_{i,j,t}$	327,064	0.46	0.00	0.00	1.00	0.49
	TC_t	327,064	0.05	0.00	0.00	0.00	2.26
Bonds	$\%_{000} Ownership_{i,j,t}$	275,280	0.35	0.0	0.11	4.20	0.67
	$\Delta Hold_{i,j,t}$	275,280	0.02	-50.36	-0.15	90.08	14.60
	$ \Delta Hold_{i,j,t} $	275,280	6.37	0.02	2.07	92.01	13.89
	$Trades_{i,j,t}$	275,280	0.84	0.00	1.00	1.00	0.36
	$Buys_{i,j,t}$	275,280	0.39	0.00	0.00	1.00	0.48
	$Sells_{i,j,t}$	275,280	0.45	0.00	0.00	1.00	0.49
	TC_t	275,280	0.03	0.00	0.00	0.00	1.76
Panel B: Investor Variables							
Equities	$IO Exposure_t$	327,064	0.04	0.00	0.00	1.34	0.45
	$\%_{000} IO Exposure_t TC_t$	327,064	0.08	0.00	0.00	0.00	12.31
	$\ln(IO Size U.S.)_{t-1}$	326,983	19.27	11.74	19.62	23.6	2.74
	$\ln(N industries_{t-1})$	326,983	3.34	2.71	3.37	3.43	0.13
	$\ln(N states_{t-1})$	326,983	3.55	2.2	3.64	3.99	0.36
	$\ln(N equities_{t-1})$	326,983	5.19	2.48	5.33	6.67	0.96
	$Portfolio concentration_{t-1}$	326,983	0.04	0.01	0.02	0.52	0.08
	$Portfolio industry concentration_{t-1}$	326,983	0.15	0.10	0.14	0.60	0.07
Bonds	$Portfolio state concentration_{t-1}$	326,983	0.13	0.02	0.13	0.40	0.05
	$IO Exposure_t$	275,280	0.02	0.00	0.00	0.55	0.12
	$\%_{000} IO Exposure_t TC_t$	275,280	0.02	0.00	0.00	0.00	1.51
	$\ln(N industries_{t-1})$	275,210	3.27	2.40	3.37	3.43	0.24
	$\ln(N states_{t-1})$	275,210	3.47	1.95	3.66	3.89	0.47
	$\ln(N bonds_{t-1})$	275,210	5.76	2.94	5.96	7.03	1.16
	$Portfolio concentration_{t-1}$	275,210	0.02	0.00	0.01	0.22	0.03
	$Portfolio industry concentration_{t-1}$	275,210	0.12	0.06	0.10	0.36	0.05
	$Portfolio state concentration_{t-1}$	274,813	0.06	0.01	0.05	0.25	0.04

Table 4. Summary Statistics for Institutional Investors from Italy: This table presents the summary statistics for Italian institutional investors. Panel A presents the investor-security level variables at a monthly frequency from January 2020 to December 2023. Panel B presents the investor-level variables, lagged by one month. For each variable, we report the number of non-missing observations (N), sample mean (μ), 1st percentile, median, 99th percentile, and standard deviation (σ). All variables are winsorized at the 1st and 99th percentiles. $\%_{000} Ownership_{i,j,t}$ and $\%_{000} IO Exposure_t | TC_t$ are expressed in per 10,000 units. TC_t is scaled by 100 to reflect percentages and is measured at the holder-security-month level. The definitions of the variables are provided in Table 8. Most variables are derived from central bank statistics, except those matched with Orbis: $N industries_{t-1}$, $N states_{t-1}$, $Portfolio industry concentration_{t-1}$, and $Portfolio state concentration_{t-1}$.

change of 6.37%. Buy and sell transactions account for 39% and 45% of holder-security-month observations, respectively. Only 0.03% of bond-level observations are directly exposed to an extreme weather event, based on the issuer's headquarter location.

Panel A of Table 5 presents ownership and transaction statistics for Dutch institutional investors. **Panel B** presents the descriptive statistics for the control and independent variables used in Model 3.

Security	Variable	N	μ	1st	Median	99th	σ
Panel A: Investor-Security Outcomes							
<i>Equities</i>	$\%_{000} Ownership_{i,j,t}$	1,507,968	17.50	0.00	0.45	31.55	4.46
	$\Delta Hold_{i,j,t}$	1,507,968	2.97	-100.00	-0.13	134.57	42.19
	$ \Delta Hold_{i,j,t} $	1,507,968	22.62	0.09	8.25	134.57	35.73
	$Trades_{i,j,t}$	1,507,968	0.96	0.00	1.00	1.00	0.17
	$Buys_{i,j,t}$	1,507,968	0.47	0.00	0.00	1.00	0.49
	$Sells_{i,j,t}$	1,507,968	0.49	0.00	0.00	1.00	0.49
	TC_t	1,507,968	0.06	0.00	0.00	0.00	2.49
<i>Bonds</i>	$\%_{000} Ownership_{i,j,t}$	446,981	0.29	0.00	0.10	3.38	0.54
	$\Delta Hold_{i,j,t}$	446,981	-1.41	-100.0	-0.28	59.71	28.97
	$ \Delta Hold_{i,j,t} $	446,981	13.17	0.03	2.21	100.0	26.73
	$Trades_{i,j,t}$	446,981	0.89	0.00	1.00	1.00	0.30
	$Buys_{i,j,t}$	446,981	0.41	0.00	0.00	1.00	0.49
	$Sells_{i,j,t}$	446,981	0.48	0.00	0.00	1.00	0.49
	TC_t	446,981	0.07	0.00	0.00	0.00	2.64
Panel B: Investor Variables							
<i>Equities</i>	$IO Exposure_t$	1,507,968	0.03	0.00	0.00	0.93	0.19
	$\%_{000} IO Exposure_t TC_t$	1,507,968	0.04	0.00	0.00	0.00	2.88
	$\ln(IO Size U.S.)_{t-1}$	1,507,724	20.79	16.67	20.94	25.05	1.53
	$\ln(N industries_{t-1})$	1,507,724	3.24	2.20	3.30	3.40	0.20
	$\ln(N states_{t-1})$	1,507,724	3.77	2.40	3.76	4.13	0.29
	$\ln(N equities_{t-1})$	1,507,724	6.02	2.77	6.02	7.44	0.98
	$Portfolio concentration_{t-1}$	1,507,724	0.01	0.00	0.01	0.05	0.01
	$Portfolio industry concentration_{t-1}$	1,507,722	0.04	0.00	0.04	0.11	0.02
<i>Bonds</i>	$Portfolio state concentration_{t-1}$	1,507,716	0.04	0.00	0.03	0.11	0.02
	$IO Exposure_t$	446,981	0.07	0.00	0.00	1.54	0.33
	$\%_{000} IO Exposure_t TC_t$	446,981	0.09	0.00	0.00	0.00	4.89
	$\ln(IO Size U.S.)_{t-1}$	446,854	20.91	18.56	20.8	24.49	1.42
	$\ln(N bonds_{t-1})$	446,854	7.68	5.83	7.71	8.91	0.69
	$\ln(N industries_{t-1})$	446,854	3.19	2.48	3.26	3.33	0.15
	$\ln(N states_{t-1})$	446,854	3.59	2.71	3.66	3.74	0.18
	$Portfolio concentration_{t-1}$	446,854	0.01	0.00	0.00	0.07	0.01
	$Portfolio industry concentration_{t-1}$	446,854	0.01	0.00	0.00	0.06	0.01
	$Portfolio state concentration_{t-1}$	446,854	0.00	0.00	0.00	0.02	0.00

Table 5. Summary Statistics for Institutional Investors from the Netherlands: This table presents the summary statistics for Dutch institutional investors. Panel A presents investor-security level variables at a monthly frequency from January 2020 to December 2023. Panel B presents investor-level variables, lagged by one month. For each variable, we report the number of non-missing observations (N), sample mean (μ), 1st percentile, median, 99th percentile, and standard deviation (σ). All variables are winsorized at the 1st and 99th percentiles. $\%_{000} Ownership_{i,j,t}$ and $\%_{000} IO Exposure_t | TC_t$ are expressed in per 10,000 units. TC_t is scaled by 100 to reflect percentages and is measured at the holder-security-month level. The definitions of the variables are provided in Table 8. Most variables are derived from central bank data, except those matched with FactSet: $N industries_{t-1}$, $N states_{t-1}$, $Portfolio industry concentration_{t-1}$, and $Portfolio state concentration_{t-1}$.

Dutch institutional investors have substantial exposure to US equities, with average per-10,000 ownership ($\%_{00}Ownership_{i,j,t}$) of 17.50 that is measured relative to total market capitalization (Table 5). The mean monthly change in holdings ($\Delta Hold_{i,j,t}$) is 2.97%, and the average absolute change ($|\Delta Hold_{i,j,t}|$) is 22.62%. Transactions are relatively balanced: 47% of holder-security-month observations are classified as purchases and 49% as sales. Only 0.06% of equity-level observations are directly affected by an extreme weather event. However, a larger share of observations are indirectly treated, as TC_t remains equal to one after the initial effect.

Dutch institutional ownership averages 0.29‰ of the total amount outstanding, which is comparable to the level observed for Italian investors. The mean change in exposure is -1.41% , with an average absolute change of 13.17%. Purchases and sales account for 41% and 48% of bond-level transactions, respectively. Only 0.07% of bond-level observations are directly exposed to an extreme weather event via the headquarters location.

4.3 Sample Construction

Building on the previous subsection, we construct a sample of US securities held by Italian and Dutch institutional investors by integrating three primary data sources: (i) security-level holdings from the respective national central banks, (ii) firm-level financial and geographic characteristics from Orbis and FactSet, and (iii) hurricane exposure data based on wind-speed metrics from NOAA's IBTrACS archive. This data integration allows us to trace institutional exposure to hurricanes over time, across asset classes, and at a highly granular level. The subsections that follow describe the securities holdings dataset, the financial and accounting data, and the construction of the hurricane exposure measures.

4.3.1 Securities holdings dataset

The core of our dataset consists of the granular input data underlying the Securities Holdings Statistics by Sector, collected by the national central banks of the European System of Central Banks (ESCB) which provide disaggregated, security-level holdings (IMF, 2015). For this study, we use confidential data from BdI and DNB that report detailed holdings by institutional investors

in their respective jurisdictions.¹⁸ The dataset comprises key attributes such as the security identifier (ISIN), the institutional sector of the holder (e.g., pension funds, investment funds, insurance companies), the identifier of the specific holding institution, issuer country, and the value of holdings.

The Italian data have various reporting frequencies across institutional sectors. Investment funds report monthly at the individual institution and asset manager levels, while pension funds and insurance companies report quarterly. To ensure consistency, we interpolate quarterly observations to a monthly frequency by averaging between the end-of-quarter values provided that the data for both adjacent quarters are available and non-missing.¹⁹ In contrast, all Dutch institutions in the sample have reported monthly since 2020, following the implementation of mandatory disclosure requirements.²⁰ Our sample period covers January 2020 through December 2023.

Country	Asset	Sector	Holders	ISIN	$TC_{exp,\mu}$	$Size_{\mu}$	$Size_{U.S.,\mu}$
Italy	Equities	Pension funds	1	1,222	0.041	338.15	13.64
		Investment funds	29	1,092	0.032	44.79	1.55
		Insurances	27	580	0.044	13.48	0.37
	Bonds	Pension funds	1	4,042	0.024	4.93	2.57
		Investment funds	17	2,753	0.03	1.3	0.24
		Insurances	40	1,334	0.001	1.67	0.64
Netherlands	Equities	Pension funds	41	2,663	0.037	6.03	3.14
		Investment funds	162	2,198	0.033	9.05	5.59
		Insurances	14	924	0.024	0.71	0.19
	Bonds	Pension funds	42	3,614	0.071	22.17	4.03
		Investment funds	48	2,939	0.064	6.49	3.27
		Insurances	22	1,015	0.05	10.85	1.35

Table 6. US Securities Holdings by Institutional Investors: This table presents a breakdown of US securities held by institutional investors from Italy and the Netherlands, disaggregated by institutional category. Reported metrics comprise the number of unique holders and ISINs, the hurricane exposure dummy ($TC_{exp,\mu}$), and the average size of total holdings ($Size_{\mu}$) and US holdings ($Size_{U.S.,\mu}$), both expressed in billion euros. Institutional categories correspond to ESA sectors: pension funds (S.129), investment funds (S.124), and insurance companies (S.128). For further details, see IMF (2015), Table 4.1, p. 27. For Italy, investment fund data are aggregated at the asset management level, while pension fund data cover the entire sector.

¹⁸We do not include banks in this analysis as their holdings in US corporates are negligible.

¹⁹Overall, this procedure affects approximately 13% of equity holdings and 46% of bond holdings by Italian institutional investors.

²⁰For further details, see DNB (2020).

Table 6 presents a breakdown of holdings by investor sector. Italian pension funds hold the largest number of unique bonds in the sample (4,042 securities), followed by Dutch pension funds (3,614). However, the Italian pension funds are aggregated at a sector level and will therefore not be analyzed further. Dutch pension funds have the highest exposure to hurricanes during the sample period, with 7.1% of their US observed holdings affected, reflecting both a broader investment mandate and heightened sensitivity to market-wide events. Dutch institutional investors also manage significantly larger average portfolios, with an average Dutch investment funds holding approximately € 5.6 billion in US equities and Dutch pension funds € 4 billion in US corporate bonds. This average reflects a broader market footprint relative to their Italian counterparts; a pattern further corroborated by portfolio size metrics, both overall ($Size_{\mu}$) and US-specific ($Size_{U.S.,\mu}$).

4.3.2 Financial and Accounting Data

To complement the holdings data, we incorporate firm-level financial and geographic information from Orbis and FactSet. These databases provide key firm characteristics, such as profitability, investment rates, and market capitalization, and allow us to identify headquarters zipcodes necessary to assign hurricane exposure. Italian holdings are primarily matched using Orbis, accessed via BdI, while Dutch holdings are supplemented with FactSet data available at Maastricht University. Missing Orbis data are completed using corresponding information from FactSet.

We process the Orbis data following Kalemli-Ozcan et al. (2022) by prioritizing unconsolidated accounts when available and interpolating quarterly observations to a monthly frequency. Firm identifiers, such as the Legal Entity Identifier (LEI) or, for equities, the ISIN, are used to merge accounting data with security-level holdings.

Despite differences in investor types and portfolio scale across countries, the sectoral allocation of US holdings is broadly comparable between Italian and Dutch institutional investors, with a few notable exceptions. Figure 2 illustrates these cross-country differences, where exposures are computed as sector-level holdings relative to total market capitalization for equities or total amount outstanding for bonds that are weighted by overall market capitalization (or amount outstanding). The largest divergence appears in the *Chemical Products* sector, where Italian

institutional investors hold approximately six percentage points less in equities than their Dutch counterparts. For bonds, Italian holdings in the *Electric Services*, *Electronic Components*, and *Oil and Gas* sectors are lower by about two percentage points. Conversely, Italian investors allocate roughly two percentage points more to the *Communications* sector.

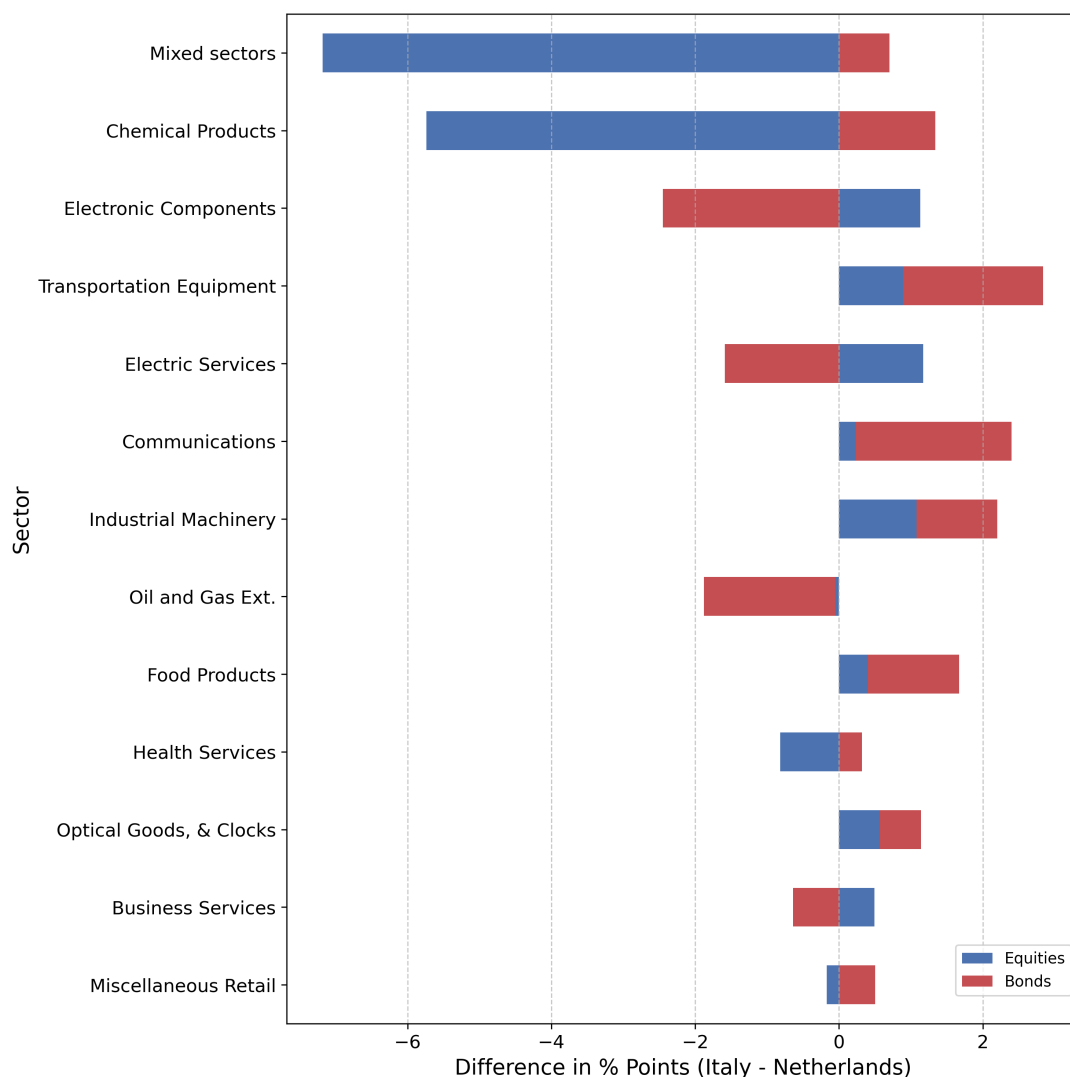


Figure 2. Sectoral Differences in US Holdings Between Italian and Dutch Institutional Investors: Figure 2 illustrates the differences in sectoral allocations between Italian and Dutch institutional investors, measured in percentage points by SIC2 sector. The comparison is based on the share of market capitalization or amount outstanding of securities in each SIC2 sector relative to the full sample of US securities. SIC2 refers to the two-digit Standard Industrial Classification system, which categorizes firms by primary industry. Security-level holdings are sourced from the input of SHSS dataset; firm-level sector classifications are obtained from Orbis (for Italian holdings) and FactSet (for Dutch holdings). Blue bars represent differences in equity holdings, while red bars correspond to bond holdings.

4.3.3 Hurricanes Exposure

To finish the data section, we identify hurricane exposure using wind speed data from NOAA's International Best Track Archive for Climate Stewardship (IBTrACS) (Knapp et al., 2010; Gahtan et al., 2024).²¹ IBTrACS provides three-hourly wind-speed records by zipcode for all major Tropical Cyclones (*TC*) events in the US. We define six intensity categories based on wind speed thresholds: below 64 knots (non-event), and categories 1 through 5 for increasing storm intensities, as defined in the Saffir-Simpson hurricane wind scale (SSHWS) that classifies hurricanes into five categories distinguished by the intensities of their sustained winds. Category 2 of the scale is the event that is "*Extremely dangerous winds that will cause extensive damage*".

Our exposure-matching procedure proceeds in three steps. First, we identify zipcodes directly affected by hurricanes that reached at least category 2 from the Saffir Simpson scale. Second, we assign each publicly listed, non-financial US issuer to a zipcode using data from Orbis or FactSet. Third, we classify a security as exposed to a hurricane event if the issuer's headquarters is located within 100 km of a storm-affected zipcode at the time of the event. This approach aligns with the literature on localized disaster exposure and enables high spatial resolution in identifying firm-level effects (Alok et al., 2020).

We then aggregate this information to construct investor-level exposure to hurricane events by linking affected securities to the institutions holding them. Zipcode areas are first mapped, followed by an overlay of hurricane trajectories. Figure 3 provides an illustrative map of all hurricane events in our sample of category 2 intensity and higher, highlighting the overlap between storm paths and firm headquarters using zipcode-level data.

Our procedure yields seven hurricane events between 2020 and 2023 that meet the exposure criteria and are linked to US holdings of Italian and Dutch institutional owners. Table 7 has a summary for each event that contains the number of observations as well as the median, maximum, and standard deviation of recorded wind speeds. These events constitute the exogenous shocks analyzed in the rest of this paper. In sum, our dataset is an integration of detailed security holdings, firm-level fundamentals, and geospatial hurricane exposure, enabling a detailed analysis of institutional portfolio responses to physical climate shocks.

²¹Data available at NOAA IBTrACS archive.

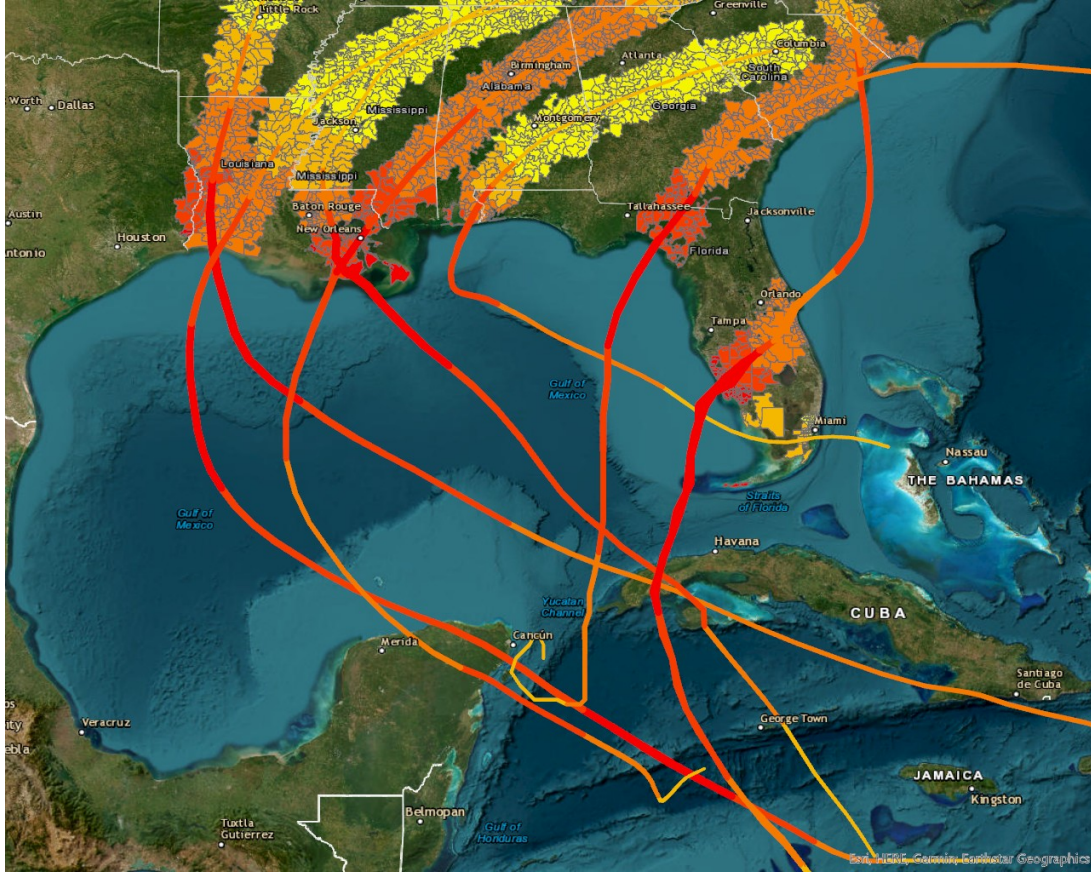


Figure 3. Visualization of Category 2 and Higher Hurricanes Affecting the US (January 2020 to December 2023): Figure 3 illustrates the methodology used to link hurricane events to US zipcodes in order to identify firms exposed to hurricanes. Zipcode areas are first mapped, followed by an overlay of hurricane trajectories. Firms are classified as affected if their headquarters are located within zipcodes that fall within a 100 km radius of the center of a hurricane with an intensity of category 2 or higher.

Year	Name	WindSpeed(kn)				Category	
		Min.	Max.	μ	σ	Min.	Max.
2020	DELTA	85	100	91	5.63	2	3
2020	LAURA	85	130	116	18.06	2	4
2020	SALLY	85	95	94	3.51	2	2
2020	ZETA	85	100	94	7.38	2	3
2021	IDA	85	130	120	14.17	2	4
2022	IAN	100	135	127	11.91	3	4
2023	IDALIA	100	115	108	7.50	3	4

Table 7. Summary Statistics of Hurricanes Affecting the US (January 2020 to December 2023): This table presents the summary statistics for hurricanes that made landfall in the US and were category 2 or higher during the sample period. Column 1 lists the hurricane name. Columns 2 to 5 present the minimum (*Min.*), maximum (*Max.*), mean (μ), and standard deviation (σ) of wind speeds (in knots). Columns 6 and 7 give the minimum and maximum recorded storm categories for each event. The final column indicates the year in which the hurricane occurred. Hurricane categories are based on the Saffir-Simpson scale, which classifies storms by sustained wind speed: Category 1 (64-82 knots), Category 2 (83-95), Category 3 (96-112), Category 4 (113-136), and Category 5 (above 137).

5 Results

The results are presented in three parts. First, we examine how financial markets and firms respond to extreme weather events, focusing on asset returns and firm-level performance up to four months after the events. Second, we analyze how European institutional investors rebalance their portfolios in response to such events the month after. Third, we investigate the role of investor heterogeneity, with particular emphasis on differences in investment horizons and regulatory environments.

5.1 Financial Market Responses

In the following, we test hypotheses H_{1a} and H_{1b} using the model defined in Equation 1. For Hypothesis H_{1a} , we test whether “*extreme weather events are associated with an increase in expected returns in the months afterward*”. This hypothesis proposes that following an initial decline in returns due to the immediate effect of the event and elevated uncertainty, returns may subsequently increase. This rebound could reflect either a risk-based mechanism in which investors demand higher compensation for bearing climate risk or a behavioral mechanism, whereby initial overreaction leads to a subsequent upward correction in prices.

Using Equation 1, and following (Huynh and Xia, 2023), we run regressions on the expected returns $\mathbb{E}(R_{j,t+l})$, where j is the security and $l = [1, \dots, 4]$ indicates the time as measured in months. The dummy variable $TC_{j,t}$ indicates whether a firm is affected by a hurricane and a set of equity and bond-specific control variables together with security specific and time fixed effects, as explained in Section 3. We provide the results of this exercise for equities and bonds held by Italian and Dutch investors in Figure 4.

For Italian investors, we find diverging patterns between equities and bonds. Equities show a decline in value of approximately 11.55% in the second month following the hurricane, followed by a rebound of 19.10% in the third month. Both estimates are statistically significant at the 5% level. In contrast, bonds experience an initial increase of about 3.89% in the month after the hurricane, followed by a decline of 3.27% in the second month after the event. These results are visualized in a coefficient plot in subfigure 4a and are reported in the Appendix (Panel A of

Table 9).

Equities and bonds held by Dutch institutional investors have similar dynamics following hurricane events. For equities, we observe negative and statistically significant excess returns of -6.36% in period $t + 3$, followed by a positive excess return of 5.72% in $t + 4$. Bonds held by Dutch investors show a weakly significant decline of 0.79% in $t + 2$, followed by a positive and significant rebound of 1.44% in $t + 4$, significant at the 5% level. These results are visualized in subfigure 4b and are reported in the Appendix (Panel B of Table 9).

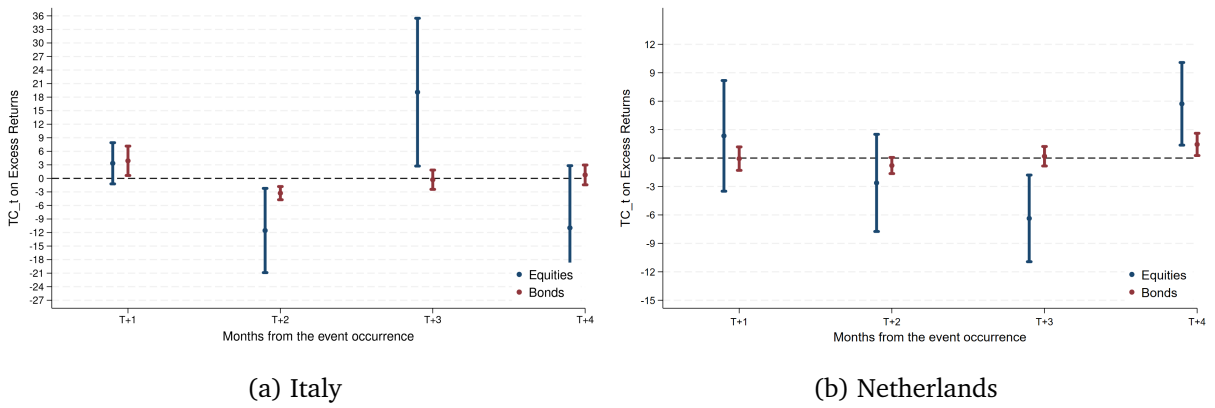


Figure 4. The Effects of Hurricanes on Excess Returns of Equities and Bonds: This figure presents monthly data from January 2020 to December 2023. Subfigure 4a shows the results for US securities held by institutional investors from Italy, while subfigure 4b displays the results for those from the Netherlands. The regressions follow model 1 and show the effect of $TC_{j,t}$, a dummy indicating whether the headquarters of issuer j 's excess returns $\mathbb{E}(R_{j,t+l})$ were affected by a hurricane where $l = 1, \dots, 4$. Security-level controls are defined monthly (see Table 2) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are detailed in Section 3. Confidence intervals are shown at the 90% level and reflect two-sided significance. Blue dots and intervals represent coefficients for equities; red dots and intervals represent those for bonds.

The results presented in Figure 4 are partially consistent with the literature. In particular, our findings differ from those of Huynh and Xia (2023) that find negative excess returns one month after and positive excess returns up to four months following the occurrence of an extreme weather event. In our analysis, we observe negative excess returns two months after a hurricane and positive excess returns in the fourth month. These findings provide weak support for hypothesis H_{1a} .

5.2 Responses of Firms

We next examine whether firms located in regions affected by hurricanes experience changes in their fundamentals. Specifically, we test the hypothesis that “firms’ sales revenue declines in the months following a hurricane for firms affected by it.” To do so, we modify the dependent variable in Equation 1 to $\Delta\text{Sales}_{j,t+l}$, where $l = 1, \dots, 4$ denotes the lead time and j indexes the firm. We regress this variable on the treatment indicator $TC_{j,t}$, along with a set of firm-specific control variables and saturated fixed effects, as described in Section 3. The results of this analysis are presented in Figure 5.

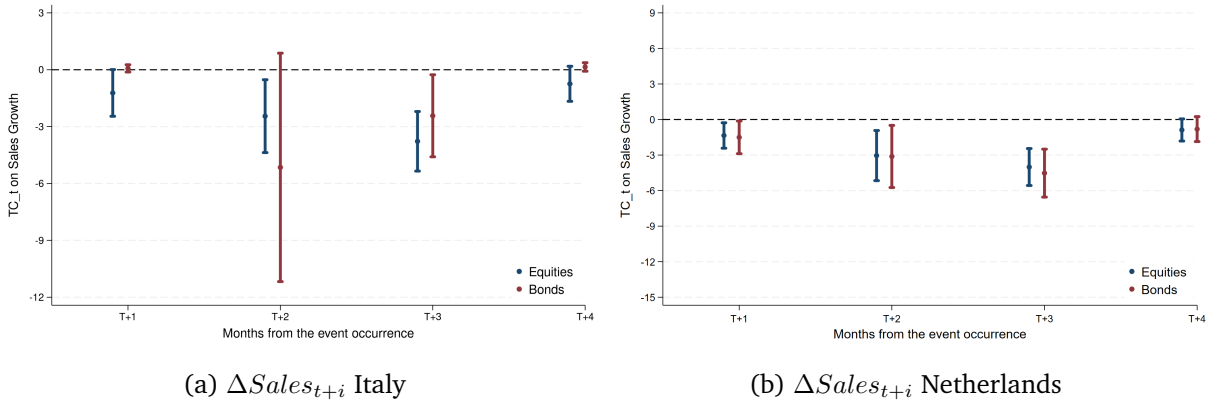


Figure 5. The Effects of Hurricanes on Sales Revenue of Firms Issuing Equities and Bonds: This figure presents monthly data from January 2020 to December 2023. Subfigure 5a shows results for US issuers issuing securities held by institutional investors from Italy, while subfigure 5b displays the results for those held by institutional investors from the Netherlands. The regressions are based on model 1 and show the effect of $TC_{j,t}$ that is a dummy variable indicating whether a hurricane affected the firms’ sales revenue $\Delta\text{Sales}_{j,t+l}$ of the headquarters of issuer j where $l = \{1, \dots, 4\}$. Firm-level control variables are defined at the monthly level and are described in Table 8. All control variables are lagged by one month. Fixed effects and clustering are specified in Section 3. Confidence intervals are shown at the 90% level and reflect two-sided significance. Blue dots and confidence intervals represent coefficient estimates for firms issuing equities; red dots correspond to firms issuing bonds.

We find evidence that hurricane events negatively affect $\Delta\text{Sales}_{j,t+l}$ of US firms whose equities or bonds are in the portfolios of Italian institutional investors. The US firms in the equity portfolio experience an average and statistically significant decline in sales of approximately 2.45% two months after the event, followed by a further decline of 3.77% in $t + 3$. There is no evidence of continued negative firms’ sales revenue in subsequent months. Similarly, US firms in the bond portfolio have an average and weakly significant decline in sales of 2.43% three months after the hurricane event. These results are presented visually in subfigure 5a and are reported in the Appendix (Panel A of Table 10).

In addition, we find similar evidence for US firms whose securities are held in the portfolios of Dutch institutional investors. For equities, we observe significant evidence of negative firms' sales revenue from one to three months after the event. The decline starts with 1.35% in $t + 1$ and increases to 4.01% in $t + 3$ to become non-significant in $t + 4$. Similarly, for US bonds, there is evidence of a statistically significant decline in firms' sales revenue of 1.50% in $t + 1$ which becomes 4.52% in $t + 3$, thus indicating negative sales revenue by those firms as a response to hurricanes. These results are presented visually in subfigure 5b and reported in the Appendix (Panel B of Table 10).

These findings are consistent with the results of Huynh and Xia (2023) who find adverse effects from severe weather events on firm fundamentals. Since many stocks and bonds of US issuers are held by both Italian and Dutch institutional investors, our results support Hypothesis H_{1b} .

Under the first set of hypotheses, we posit that the repricing of securities held by Italian and Dutch investors is driven by a deterioration in firm fundamentals. The results related to H_{1a} show that investors demand higher compensation for increased risk exposure. The findings under H_{1b} further confirm that this repricing is mechanically linked to deteriorating fundamentals, supporting the information hypothesis: investors adjust their required returns in response to perceived increases in firm-specific risk.

5.3 Portfolio Trading

Next, we examine whether Italian and Dutch institutional investors actively respond to the repricing of US assets by adjusting their portfolios in the month following the hurricane. To this end, we test Hypothesis H_{2a} , which states: *Institutional investors from Italy and the Netherlands adjust their holdings of US assets exposed to extreme weather events*, using the model specified in Equation 3. The results are presented in Figure 6 and in Appendix D (Table 11).

Figure 6 presents the results for Hypothesis H_{2a} in a structured and interpretable format.

We first focus on the estimates for securities held by Italian institutional investors. For equities, we find statistically significant negative results for $\beta_1 + \beta_2$. These results indicate that at the intensive margin, Italian institutional investors reduce their equities affected by hurricanes.

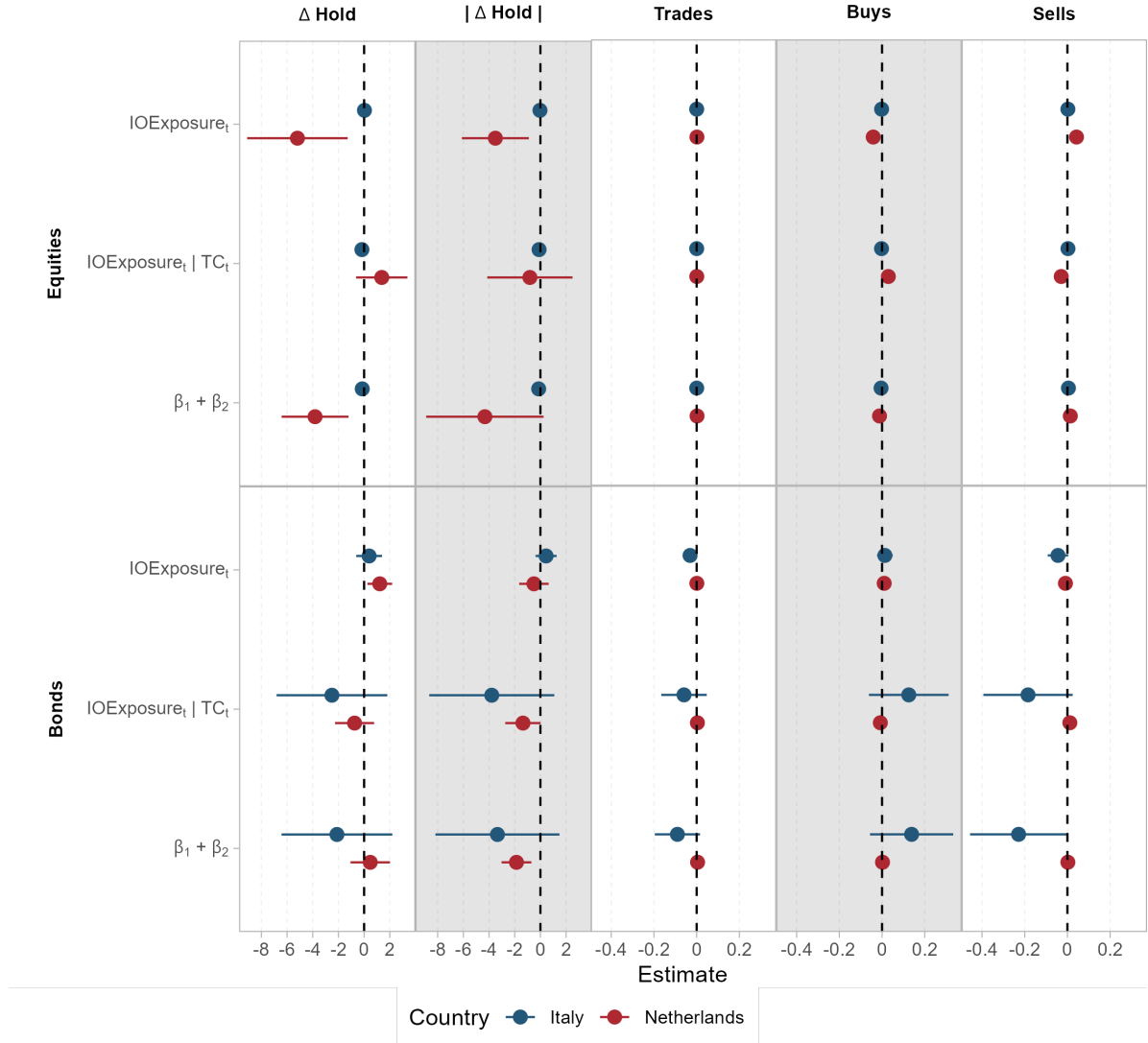


Figure 6. The Effects of Institutional Investors' Exposure to Hurricanes on Trading Behavior. Evidence from Italy and the Netherlands: This figure presents monthly data from January 2020 to December 2023. The top panel (Equities) shows the trading behavior among equity investors from Italy and the Netherlands with varying exposure to hurricanes. The bottom panel (Bonds) presents analogous results for bond investors. Columns 1 and 2 present the intensive margin outcomes ($\Delta Hold_{i,j,t}$, $|\Delta Hold_{i,j,t}|$), while Columns 3 to 5 present the extensive margin outcomes ($Trades_{i,j,t}$, $Buys_{i,j,t}$, $Sells_{i,j,t}$), based on model 3. The regressions show the effect of investors' exposure to hurricanes ($IO Exposure_t$, $IO Exposure_t | TC_t$) on trading behavior. Investor-security level controls are defined monthly (see Tables 4 and 5) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are specified in Section 3. Confidence intervals are shown at the 90% level and reflect two-sided significance. The sample comprises all institutional investors located in Italy and the Netherlands. The variable $\beta_1 + \beta_2$ on the left side of the figure represents a joint test of the sum of coefficients β_1 and β_2 from $IO Exposure_{i,j,t}$ and $IO Exposure_t | TC_t$ in model 3.

Specifically, they show a significant reduction in holdings, with an estimate of -0.15 for $\beta_1 + \beta_2$ in the regression on $\Delta\text{Hold}_{i,j,t}$. Similarly, they reduce their trading intensity, as shown by the estimate of -0.14 for $\beta_1 + \beta_2$ in the regression on $|\Delta\text{Hold}_{i,j,t}|$. We find no statistically significant evidence of active trading in bonds held by Italian institutional investors.

We then analyze the estimates for securities held by Dutch institutional investors. Consistent with our earlier findings, we find a statistically significant negative effect for the sum of coefficients $\beta_1 + \beta_2$ in the equity sample. This effect indicates that at the intensive margin, Dutch institutional investors reduce their equities affected by hurricanes. Notably, the magnitude of the estimated coefficients is substantially larger than those observed for Italian institutional investors, suggesting a stronger behavioral response among Dutch institutions.

Moreover, the significantly negative coefficient for $IO\ Exposure_{i,j,t}$ further shows that Dutch institutional investors disengage not only from the affected assets but also from the unaffected ones. At the extensive margin, we observe that the probability of purchasing unaffected equities declines, while the probability of selling them increases. This is reflected in the coefficients for $IO\ Exposure_{i,j,t}$ in the regressions for $Buys_{i,j,t}$ and $Sells_{i,j,t}$, which are -0.04 and 0.04 , respectively. For equities directly affected by hurricanes, we find a similar pattern, though the magnitude is smaller and the coefficients are non-significant. We find again no statistically significant evidence of active trading in bonds held by Dutch institutional investors. There is some weak evidence that investors increase their holdings in unaffected assets, as shown by the positive and weakly significant estimate of 1.22 for $IO\ Exposure_{i,j,t}$ on the regression for $\Delta\text{Hold}_{i,j,t}$. This result is also supported in the extensive margin of the regression on $Buys_{i,j,t}$.

Although we find weak evidence that Italian and Dutch institutional investors reduce their equity holdings and trading activity in response to hurricanes, it is not enough to claim that this is directly affected by hurricanes. Italian investors show a significant decline in both the level and intensity of equity trading in affected equities, but no meaningful changes are observed in their bond portfolios. Dutch institutional investors demonstrate a similar but more pronounced reaction in equities, however they reduce engagement in both affected equities, and unaffected assets. Given that results across several holders' sectors do not yield a clear picture, we further investigate the heterogeneity of responses across holding sectors, thus leveraging

the heterogeneity of investment horizons to investigate investors' responses to extreme weather events.

5.4 Trading and Type of Investor

In the following analysis, we examine how different types of financial institutions in Italy and the Netherlands respond to a common type of event occurring in the US. The literature finds that some investor types have greater patience than others in the face of shocks. In the context of hypothesis H_{2b} , we test whether *Institutional investors that are typically characterized in the literature as having longer investment horizons—such as pension funds—may display greater portfolio stability during hurricanes, reducing selling pressure on affected assets relative to shorter-horizon investors such as investment funds*. To this end, we estimate the model described in Section 3 separately for each type of investor. Specifically, we analyze pension funds, investment funds, and insurance companies. The results are presented in Figures 7, 8, and 9, with detailed regression outputs provided in Tables 12, 13, and 14 in the Appendix. For the analysis of pension fund behavior, we restrict our attention to Dutch institutional investors, as disaggregated holdings data for Italian pension funds are not available for BdI.

Dutch pension funds appear to be the primary drivers of the aggregate portfolio adjustments found in the preceding subsection. Specifically, these institutional investors significantly reduce their holdings in affected equities and reallocate capital toward unaffected bonds. We find robust evidence of this behavior: the sum of coefficients $\beta_1 + \beta_2$ in the equity sample yields statistically significant estimates of -5.182 and -4.95 for $\Delta\text{Hold}_{i,j,t}$ and $|\Delta\text{Hold}_{i,j,t}|$, respectively. In contrast, the coefficient for $IO\text{ Exposure}_{i,j,t}$ in the bond sample is positive and statistically significant at 1.70 , indicating a shift toward safer assets. This reallocation pattern diverges from conventional rebalancing strategies that typically involve increasing exposure to underperforming assets. Instead, the observed behavior indicates a reassessment of the fundamental value of hurricane-exposed equities in response to the shock that is consistent with a belief that the event conveys new information about the risk of long-term assets.

We next turn to the analysis of investment funds, with results presented in Figure 8 for both Italian and Dutch institutions. We begin by examining the behavior of Italian investment funds,

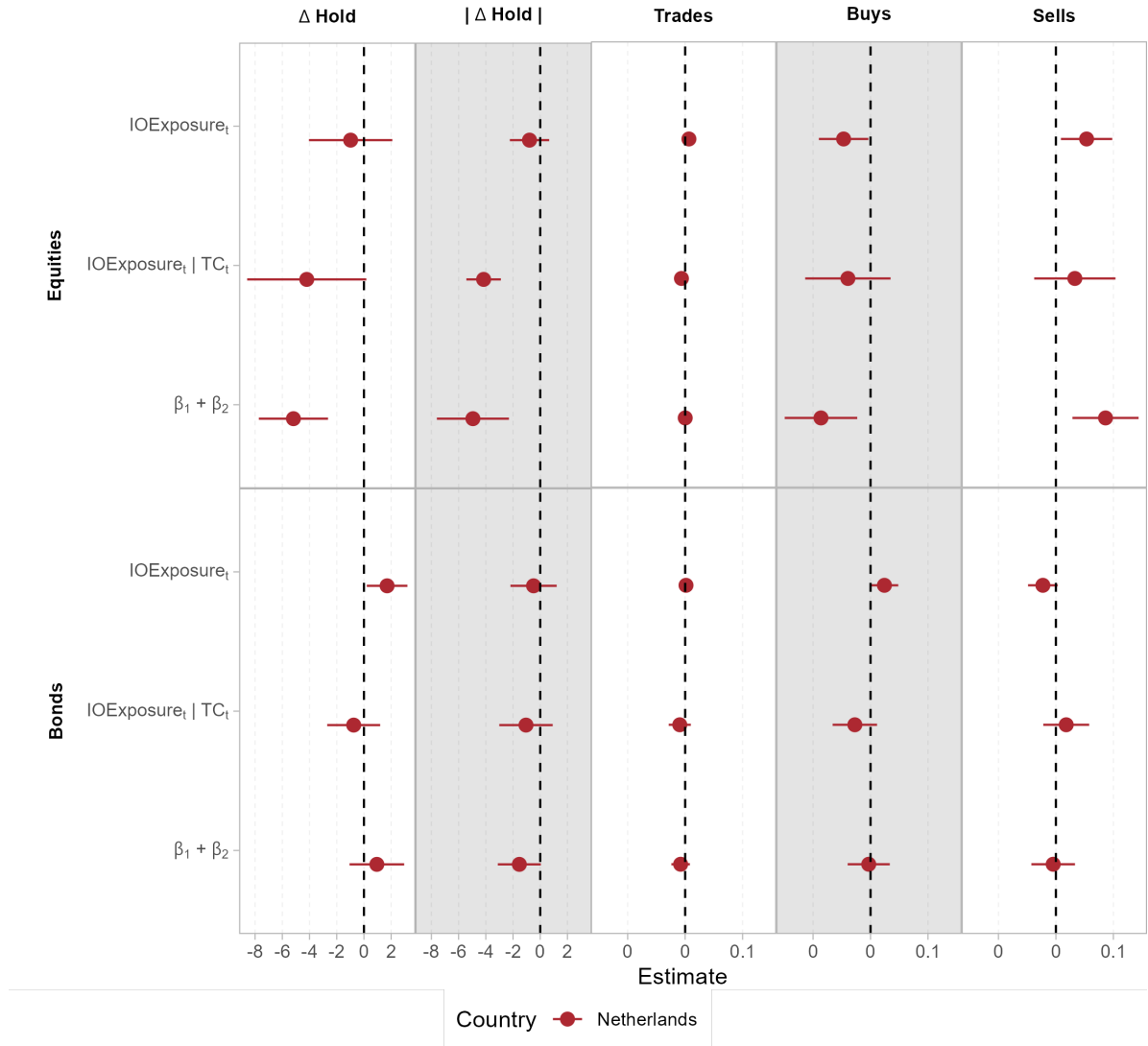


Figure 7. The Effects of Pension Funds' Exposure to Hurricanes on Trading Behavior: Evidence from the Netherlands: This figure presents monthly data from January 2020 to December 2023. The top panel (Equities) shows the trading behavior among Dutch pension funds holding equities with varying exposure to hurricanes. The bottom panel (Bonds) presents analogous results for bond holdings. Columns 1 and 2 present intensive margin outcomes ($\Delta \text{Hold}_{i,j,t}$, $|\Delta \text{Hold}_{i,j,t}|$), while Columns 3 to 5 present extensive margin outcomes ($\text{Trades}_{i,j,t}$, $\text{Buys}_{i,j,t}$, $\text{Sells}_{i,j,t}$), based on model 3. The regressions show the effect of investors' exposure to hurricanes (IO Exposure_t , $\text{IO Exposure}_t | \text{TC}_t$) on trading behavior. Investor-security level controls are defined monthly (see Tables 4 and 5) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are specified in Section 3. Confidence intervals are shown at the 90% level and reflect two-sided significance. The variable $\beta_1 + \beta_2$ on the left side of the figure represents a joint test of the sum of coefficients β_1 and β_2 from IO Exposure_t and $\text{IO Exposure}_t | \text{TC}_t$ in model 3.

highlighted in blue in Figure 8. In the Equity section, we find statistically significant results for $\beta_1 + \beta_2$. At the intensive margin, the regression for $\Delta Hold_{i,j,t}$ yields an estimate of -4.38 , indicating that Italian investment funds reduce their holdings in the affected equities. This behavior is further supported at the extensive margin, where the estimates for $\beta_1 + \beta_2$ in the regressions for $Buys_{i,j,t}$ and $Sells_{i,j,t}$ are -0.09 and 0.09 , respectively. These results show that highly exposed Italian investment funds are less likely to buy and more likely to sell the affected equities compared to less exposed funds. In contrast, we do not find economically or statistically significant effects for bond holdings among Italian investment funds.

We then analyze the behavior of Dutch investment funds, shown in red in Figure 8. In contrast to Dutch pension funds, Dutch investment funds reduce their positions in both unaffected and affected equities, although affected ones are sold less and bought more. In the Equity section, we observe that the coefficients for $IO Exposure_{i,j,t}$ and $IO Exposure_t | TC_t$ are negative and positive respectively, in the regression for $\Delta Hold_{i,j,t}$. These coefficients indicate that highly exposed Dutch investment funds reduce their holdings in unaffected equities more than affected ones, as $\beta_1 + \beta_2$ remains negative, though not significant. The corresponding estimate for β_1 is economically meaningful: a one percentage point increase in $IO Exposure_{i,j,t}$ is associated with a 2.77% decrease in unaffected equity holdings relative to the average percentage ownership.²² This directional pattern is confirmed at the extensive margin.

Regarding bond holdings, we find evidence that Dutch investment funds reduce their exposure to affected assets. This is evident from the coefficients on $IO Exposure_{i,j,t} \times TC_t$ and $\beta_1 + \beta_2$ in the intensive margin regressions for $\Delta Hold_{i,j,t}$ and $|\Delta Hold_{i,j,t}|$. Specifically, the regression for $\Delta Hold_{i,j,t}$ yields negative and highly significant coefficients of -2.18% for $IO Exposure_{i,j,t} \times TC_t$ and -1.67% for $\beta_1 + \beta_2$. Similarly, for $|\Delta Hold_{i,j,t}|$, the corresponding coefficients are -2.04% and -2.82% , respectively. These results indicate a disengagement from affected bonds, both in terms of actual holdings and trading intensity.

Taken together, the divergent responses of Dutch pension funds and Dutch investment funds stand in contrast to segments of the institutional ownership literature, which posit that long-term

²²These numbers are obtained by dividing the percentage changes estimated by the model (Table 12) with the percentage ownership from the descriptive statistics (Table 5)

investors such as pension funds act as stabilizing forces in distressed markets, while short-term investors like mutual funds may amplify price dislocations (Hotchkiss and Strickland, 2003; Gaspar et al., 2005; Derrien et al., 2013; Huynh and Xia, 2023). Our findings, however, are more consistent with a growing body of evidence suggesting that institutional investors, regardless of their investment horizon, can contribute to market instability in the presence of large, salient shocks (Glossner et al., 2025). This evidence suggests that the conventional dichotomy between stabilizing and destabilizing institutional behavior may not be as straightforward in the context of climate-related or disaster-induced financial stress.

Finally, when analyzing Italian and Dutch insurers we only find evidence that highly exposed Dutch insurers have a lower likelihood of buying and higher likelihood of selling their equity holdings. The findings for Italian and Dutch insurers are presented in Figure 9 and in the Appendix (**Panel A** and **Panel B** in Table 14). For Dutch insurers, we see that the estimate of $\beta_1 + \beta_2$ in the regressions on $Buys_{i,j,t}$ and $Sells_{i,j,t}$ are -0.096 and 0.141 respectively. These results indicate that highly exposed insurers have a lower probability of buying and a higher probability of selling affected equities compared to less exposed ones.

Based on the findings for investment funds, insurance companies, and pension funds, we find partial support for hypothesis H_{2b} . Specifically, Dutch pension funds show greater patience in their bond holdings, consistent with the hypothesis. However, this behavior does not extend to equity holdings. In contrast, we do not observe similar patterns of patience among investment funds or insurance companies. On the contrary, Dutch investment funds display evidence of speculative behavior, reallocating from unaffected equities and affected bonds toward affected equities in the aftermath of hurricanes.

6 Discussion

In this section, we critically interpret our findings in the context of the literature and outline implications for future research and policy. First, we assess the divergence between our results and those of other studies, particularly Huynh and Xia (2023) and Blanco et al. (2024). Second, we explore cross-country differences between the Italian and Dutch samples, highlighting

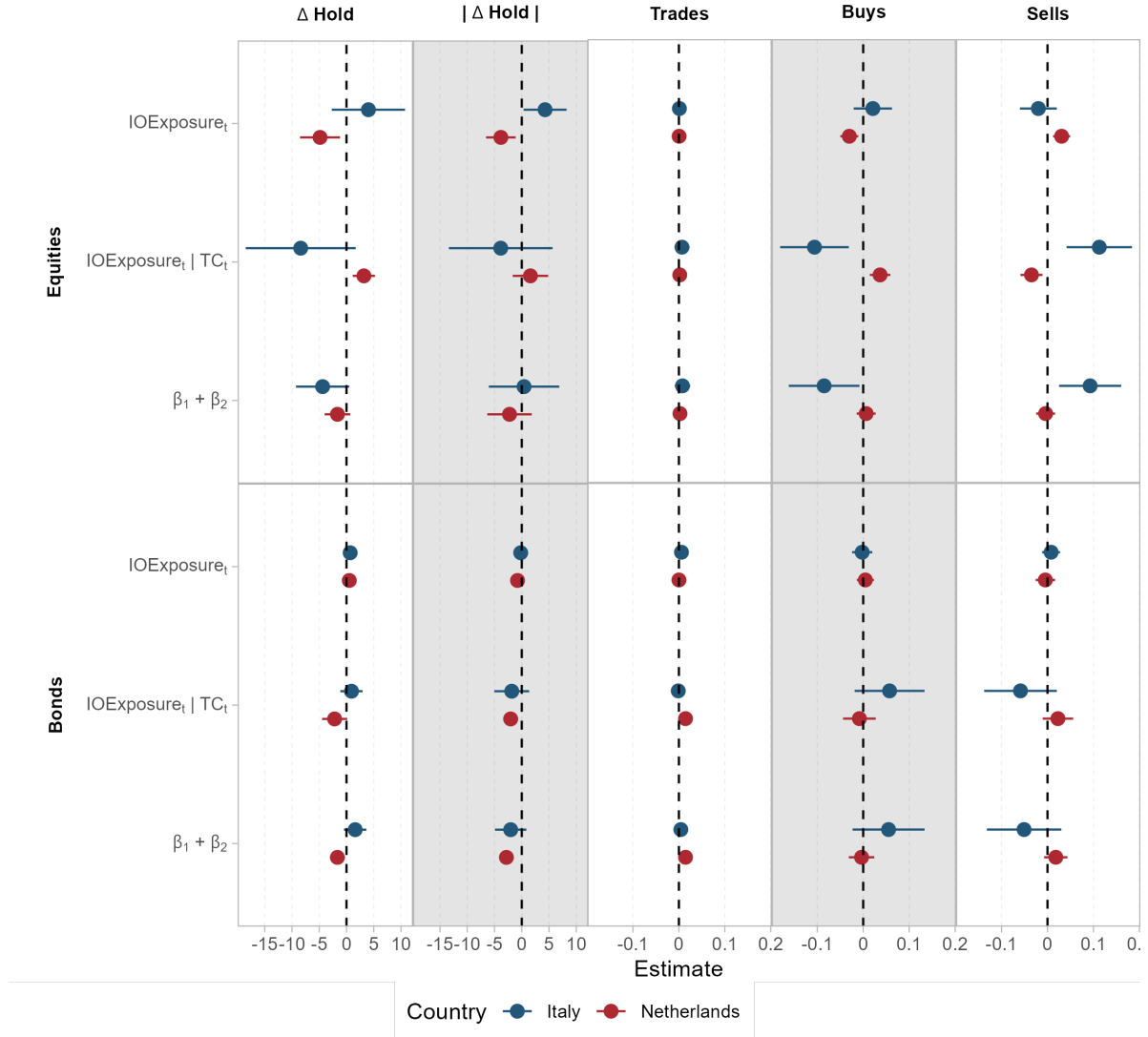


Figure 8. The Effects of Investment Funds' Exposure to Hurricanes on Trading Behavior: Evidence from Italy and the Netherlands: This figure presents monthly data from January 2020 to December 2023. The top panel (Equities) shows the trading behavior among equity investment funds from Italy and the Netherlands with varying exposure to hurricanes. The bottom panel (Bonds) presents analogous results for bond investment funds. Columns 1 and 2 present intensive margin outcomes ($\Delta Hold_{i,j,t}$, $|\Delta Hold_{i,j,t}|$), while Columns 3 to 5 give the extensive margin outcomes ($Trades_{i,j,t}$, $Buys_{i,j,t}$, $Sells_{i,j,t}$), based on model 3. The regressions show the effect of investment funds' exposure to hurricanes ($IO Exposure_t$, $IO Exposure_t | TC_t$) on trading behavior. Investor-security level controls are defined monthly (see Tables 4 and 5) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are specified in Section 3. Confidence intervals are shown at the 90% level and reflect two-sided significance. The variable $\beta_1 + \beta_2$ on the left side of the figure represents a joint test of the sum of coefficients β_1 and β_2 from $IO Exposure_t$ and $IO Exposure_t | TC_t$ in model 3.

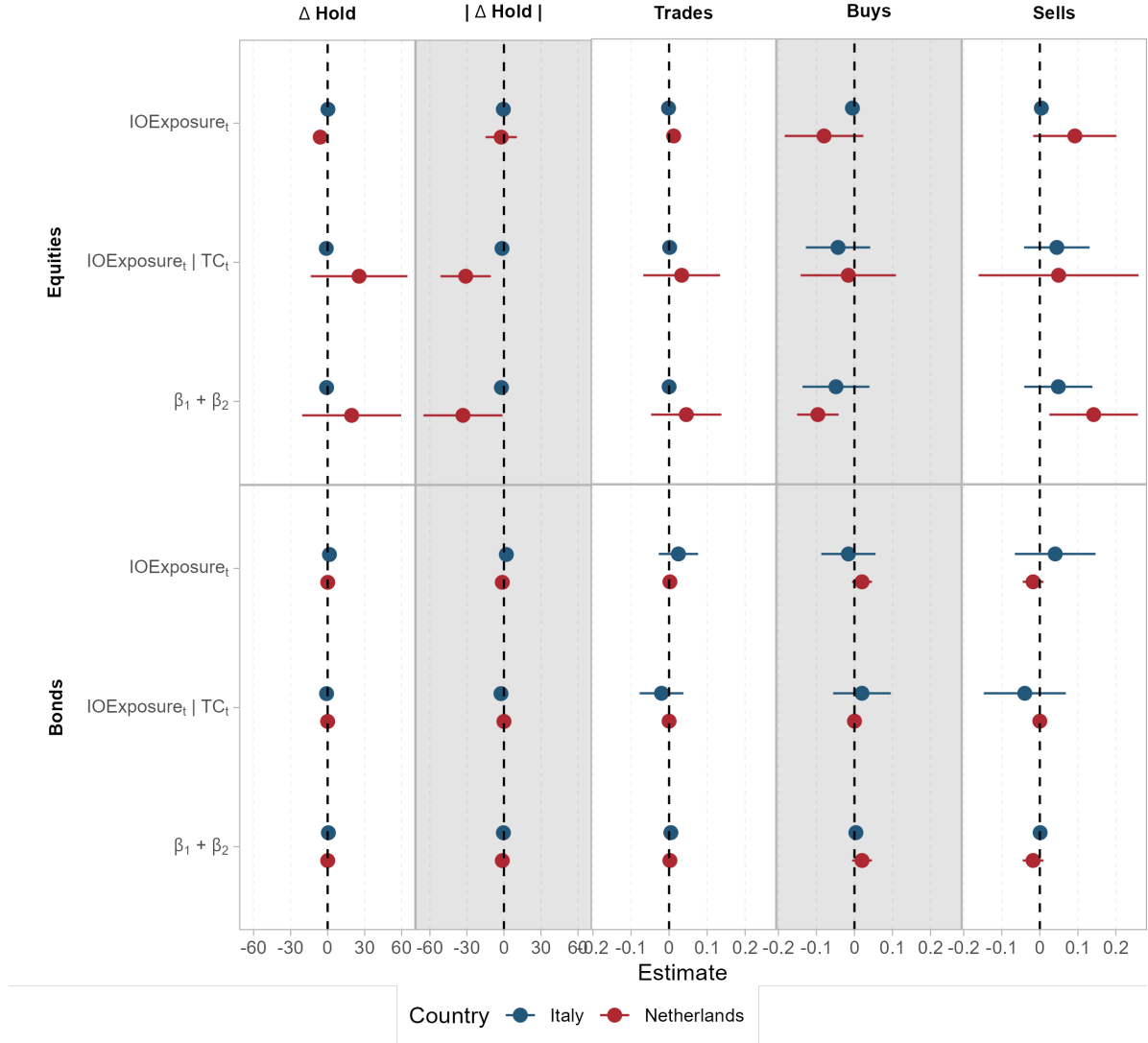


Figure 9. The Effects of Insurance Companies' Exposure to Hurricanes on Trading Behavior - An Analysis on Italy and the Netherlands: The information is provided at monthly frequency from January 2020 to December 2023. Panel Equities shows the trading outcomes across equity investors from Italy and the Netherlands with differential exposure to hurricanes. Panel Bonds shows the same across bond investors. Columns 1 and 2 present the dependent trading variables in the intensive ($\Delta \text{Hold}_{i,j,t}$, $|\Delta \text{Hold}_{i,j,t}|$) while Columns 3, 4, and 5 present those in the extensive margin ($\text{Trades}_{i,j,t}$, $\text{Buys}_{i,j,t}$, $\text{Sells}_{i,j,t}$) from model 3. The regression has an analysis of the effect of the exposure of investors' holdings to hurricanes (IO Exposure_t , $\text{IO Exposure}_t | \text{TC}_t$) on the trading variables. Investors $\times$ security controls are defined on a monthly level and are presented in Tables 4 and 5 and described in Table 8. All investor control variables are lagged one month and the fixed effects as well as clustering are defined in Section 3. Presented confidence intervals are at the 90% significance levels and denote (two-sided) significance. The variable $\beta_1 + \beta_2$ on the left side of the figure is the joint test on the sum of the coefficients β_1 and β_2 from the variables IO Exposure_t , $\text{IO Exposure}_t | \text{TC}_t$ of model 3.

institutional and behavioral heterogeneity that warrants further investigation. Third, we offer recommendations for data harmonization within the Eurosystem to facilitate more consistent and comparable analyses across member states, to ensure better supervision and financial stability mandates.

First, we address differences in baseline asset characteristics. Compared to Huynh and Xia (2023), the securities held by Italian and Dutch institutional investors have markedly different descriptive statistics, which may help explain the relatively weaker results observed for hypothesis H_{1a} . The Italian sample displays greater dispersion and more extreme outliers in excess returns, while the Dutch sample more closely resembles the return distributions presented in Huynh and Xia (2023). Specifically, the average excess returns for equities and bonds in Italian portfolios are -0.56 and -0.22 , respectively, while the corresponding values for Dutch-held securities are 0.65 and 0.25 . These latter figures are closer to the benchmark values of 1.075 and 0.522 presented in Huynh and Xia (2023), who present a similar analysis in the US. However, both equity samples in our data have substantially higher market capitalizations (log values around 20) than the average of 5.8 presented in Huynh and Xia (2023), likely contributing to the lower levels of *Investment*, *Momentum*, and $\ln(BM)$ observed in our sample. Firms with a higher level of capitalization are less prone to strong repricing after extreme weather events. In contrast, our bond holdings are more closely aligned with those in Huynh and Xia (2023), as the distributions of $\ln(Amount, Out)$ and *Rating* are comparable, although the average maturity in our sample is shorter (six years versus nine). This indicates that the investors characterizing the Dutch and Italian sample invest in assets with a higher liquidity compared to the US ones.

Second, we observe notable behavioral heterogeneity between Italian and Dutch institutional investors. Although investors in both countries adjust their holdings of US equities in the aftermath of hurricanes by reducing exposure to affected assets, this pattern does not extend to bond portfolios. Specifically, Italian institutional investors do not show significant trading activity in bonds, while there is some evidence that Dutch institutional investors increase their holdings of unaffected bonds (see Figure 6). We provide below two possible interpretations of the different findings over Italian and Dutch investors.

Disaggregating by investor type, we find that Dutch pension funds reduce their exposure to

affected equities, consistent with Panel A of Table 3 in Blanco et al. (2024). However, rather than reallocating into unaffected equities, they shift capital into unaffected bonds, an asset-class reallocation not examined in Blanco et al. (2024). Similarly, Italian investment funds appear to disengage from affected equities, in line with prior findings, although the extent to which they increase exposure to unaffected equities remains unclear. These shifts between bonds and equities could be interpreted as a flight to safety by Dutch pension funds, however other channels might explain the results despite the fixed effects regressions. For instance, the Fed increased interest rates by about 5 p.p. between 2020 and 2023, an effect that increases the attractiveness of bonds with respect to equity, justifying the increase in unaffected bond holdings.

In contrast, Dutch investment funds reduce positions in unaffected equities more than affected ones, consistent with active trading behavior. This behavior may be driven by short-term mispricing opportunities in equity markets. With respect to bonds, these funds tend to liquidate positions in response to hurricane exposure, likely reflecting reduced liquidity in bond markets during periods of stress. Alternatively, investment funds may dispose of previously issued bonds in their portfolios that have declined in value and weigh on overall performance.

Third, we propose two potential mechanisms underlying the observed cross-country variation in trading behavior: differences in sectoral portfolio composition and in familiarity with hurricane risk. As shown in Figure 2, Italian institutional investors maintain systematically lower exposure to sectors highly susceptible to hurricane-related physical risks, such as Chemical Products and Oil & Gas, relative to their Dutch counterparts. Specifically, Italian portfolios allocate six percentage points less to these sectors in equities and two percentage points less in bonds. These sectors are characterized by high asset immobility, which amplifies their vulnerability to extreme weather events.²³ Conversely, Italian portfolios are more concentrated in sectors with lower physical risk exposure, such as Communications, which are less dependent on fixed-location infrastructure. On average, Italian investors hold approximately two percentage points more in these sectors across both asset classes.

In addition, deeper engagement with US markets, particularly among Dutch pension funds,

²³ Sectoral exposure to physical climate risks is documented by MSCI in their article Which Sectors Are Most Affected by Climate Risks?, published May 15, 2023.

may foster greater sensitivity to events and their risk transmission mechanisms. Geographic proximity to storm surges, as in the case of the Netherlands, which experienced a major storm in 1953, may also contribute to enhanced institutional familiarity with storm-related events triggering a stronger reaction when facing uncertainty with respect to hurricanes (Wolf and Flather, 2005; Bauer et al., 2025).

Our analysis is not without limitations. The sample covers only the 2020–2023 period because of the regulatory timing of granular disclosure in the Netherlands. This relatively short time series limits our ability to identify long-run trading patterns and precludes stronger causal inference. Moreover, disaggregated pension fund data are available only for Dutch institutional investors; in Italy, pension fund data are aggregated at the sector level. This asymmetry prevents a direct cross-country comparison of long-term investor behavior and represents an important avenue for future research.

Expanding the geographic and temporal scope of analysis would be valuable. While our focus on the US is justified by its portfolio relevance to both countries, the framework could be extended to climate-vulnerable emerging markets (e.g., the Philippines, Mexico, or Caribbean nations), where price dynamics may differ under conditions of lower liquidity and weaker institutions. Another promising extension would be to compare the behavior of European and US-based institutional investors exposed to the same hurricane events, allowing for a direct test of geographic information asymmetries and investor attention biases.

The findings of this paper also point to potential benefits from extending the Securities Holdings Statistics (SHS) dataset to include security-level holdings at the entity-month level across all EU jurisdictions. Such an enhancement could support more integrated risk monitoring and enable Eurosystem-wide assessments of cross-border climate risk exposures. As this paper illustrates, coordinating analyses across national firewalls is time-consuming and technically complex. Greater harmonization of the underlying SHSS data could facilitate both academic research and evidence-based policy design, and may represent a valuable avenue for future institutional development.

7 Conclusion

In this paper, we investigate how institutional investors from Italy and the Netherlands adjust their US equity and bond portfolios in the aftermath of hurricanes between 2020 and 2023. Leveraging a unique dataset that combines granular securities holdings from Banca d'Italia and De Nederlandsche Bank with firm-level financials and hurricane exposure data from NOAA, we examine the extent to which information frictions shape cross-border trading responses to localized climate shocks.

We show that institutional investors do respond to hurricanes affecting US firms, but their trading behavior varies across countries, asset classes, and investor types. Although the results from this analysis provide preliminary evidence that Dutch institutional investors reallocate from equities to bonds, particularly among pension funds, we believe that further investigation is needed to draw stronger conclusions. Italian institutional investors have weaker overall responses. Importantly, we find that Dutch pension funds contribute to price pressures in equity markets but tend to hold affected bonds more patiently than more reactive investors, such as investment funds. These results need further investigation to ensure the possibility to draw stronger conclusions on the channels acting for the effects we found.

These findings contribute to three strands of the literature. First, we extend the growing body of work on climate finance by identifying the international transmission of physical climate risk to European portfolios. Second, we contribute to the literature on market segmentation and information frictions by showing that foreign investors adjust their positions with varying sensitivity based on geographic proximity, regulatory environment, and investment horizon. Third, we enrich the discussion on institutional heterogeneity by demonstrating that cross-asset reallocations and investment patience vary systematically by investor type.

From a policy perspective, our results are particularly relevant. Despite their substantial holdings of non-EU assets, European institutional investors operate in a regulatory environment that does not fully take into account cross-border physical climate risks. The presence of information frictions and segmented reactions suggests potential blind spots in the Eurosystem's monitoring of the financial impact of climate risk. Moreover, the differentiated behavior of long-

and short-term investors underscores the importance of investor composition in financial stability assessments under climate stress.

We acknowledge several limitations. Our sample period is constrained by the availability of granular holdings data, particularly for Dutch institutions, which limits the historical scope of the analysis. In addition, the lack of disaggregated data for Italian pension funds prevents a full cross-country comparison. Future research could benefit from longer time series, broader coverage of euro area countries, and comparisons with US institutional investors to more directly test for geographic information asymmetries. Extending the analysis to emerging markets highly exposed to hurricane risks could further illuminate how institutional investors respond under varying market conditions and risk intensities. Additionally, we do not find significant differences between insurances and investment funds, mostly due to the lack of information on investments of Dutch insurance companies in the US. As a result, we are unable to draw conclusions on whether insurance companies behave differently from investment funds, the investor type most comparable to them in terms of portfolio characteristics.

Overall, this study underscores the importance of integrating physical climate risk metrics into international portfolio supervision and highlights the need for enhanced data sharing across jurisdictions to better assess global climate-related financial vulnerabilities.

References

- ALESSI, L., S. BATTISTON, AND V. KVEDARAS (2024): “Over with carbon? Investors’ reaction to the Paris Agreement and the US withdrawal,” *Journal of Financial Stability*, 71, 101232.
- ALOK, S., N. KUMAR, AND R. WERMERS (2020): “Do fund managers misestimate climatic disaster risk,” *Review of Financial Studies*, 33, 1146–1183.
- BAUER, R., D. BROEDERS, AND F. DE CAROLIS (2025): “Local institutional ownership and price discovery around extreme weather events,” *ECB Working Paper Series*, 3069.
- BIKKER, J. A., D. W. G. A. BROEDERS, J. DE DREU, D. DREU, AND R. BANK (2010): “Stock Market Performance and Pension Fund Investment Policy: Rebalancing, Free Float, or Market Timing?” *International Journal of Central Banking*.
- BLANCO, I., J. M. MARTIN-FLORES, AND A. REMESAL (2024): “Climate shocks, institutional investors, and the information content of stock prices,” *Journal of Corporate Finance*, 86, 102567.
- BRAUN, A., J. BRAUN, AND F. WEIGERT (2023): “Extreme Weather Risk and the Cross-Section of Stock Returns,” *SSRN*.
- DE BANDT, O., L.-C. KUNTZ, N. NORA PANKRATZ, F. PEGORARO, H. SOLHEIM, G. SUTTON, A. TAKEYAMA, AND D. XIA (2023): “The effects of change-related risks on banks: a literature review,” *Basel Committee on Banking Supervision*, 40.
- DE HAAS, R. AND N. VAN HOREN (2013): “Running for the exit? International bank lending during a financial crisis,” *Review of Financial Studies*, 26, 244–285.
- DERRIEN, F., A. KECSKÉS, AND D. THESMAR (2013): “Investor horizons and corporate policies,” *Journal of Financial and Quantitative Analysis*, 48, 1755–1780.
- DESSAINT, O. AND A. MATRAY (2017): “Do managers overreact to salient risks? Evidence from hurricane strikes,” *Journal of Financial Economics*, 126, 97–121.

- DING, W., R. LEVINE, C. LIN, W. XIE, AND H. KONG (2021): “Corporate Immunity to the COVID-19 Pandemic,” *Journal of Financial Economics*, 141, 802–830.
- DNB (2020): “Monthly Securities Reporting (MSR) Manual,” *De Nederlandsche Bank*.
- ECB (2023): “Towards climate-related statistical indicators,” *Statistics Paper Series*.
- ECB (2024): “Climate change-related statistical indicators,” *Statistics Paper Series*, 48.
- FERREIRA, M. A. AND P. MATOS (2008): “The colors of investors’ money: The role of institutional investors around the world,” *Journal of Financial Economics*, 88, 499–533.
- GAHTAN, J., KNAPP K. R., SCHRECK C. J., DIAMOND H. J., KOSSIN J. P., AND KRUK M. C. (2024): “International Best Track Archive for Climate Stewardship (IBTrACS) Project,” *NOAA National Centers for Environmental Information*, 4r01.
- GASPAR, J. M., M. MASSA, AND P. MATOS (2005): “Shareholder investment horizons and the market for corporate control,” *Journal of Financial Economics*, 76, 135–165.
- GLOSSNER, S., P. MATOS, S. RAMELLI, AND A. F. WAGNER (2025): “Do Institutional Investors Stabilize Equity Markets in Crisis Periods? Evidence from COVID-19,” *Management Science*, 0.
- HOTCHKISS, E. S. AND D. STRICKLAND (2003): “Does Shareholder Composition Matter? Evidence from the Market Reaction to Corporate Earnings Announcements,” *Journal of Finance*, 58, 1469–1498.
- HUYNH, T. D. AND Y. XIA (2023): “Panic Selling When Disaster Strikes: Evidence in the Bond and Stock Markets,” *Management Science*, 69.
- IMF (2015): *Handbook on Securities Statistics*, International Monetary Fund.
- KACPERCZYK, M., S. SUNDARESAN, AND T. WANG (2020): “Do Foreign Institutional Investors Improve Price Efficiency?” *The Review of Financial Studies*, 34, 1317–1367.
- KALEMLI-OZCAN, S., B. SORENSEN, C. VILLEGAS-SANCHEZ, V. VOLOSOVYCH, AND S. YESILTAS (2022): “How to Construct Nationally Representative Firm Level Data from The Orbis Global Database: New Facts and Aggregate Implications,” *NBER Working Paper Series*, 21558, 1–96.

- KEMPF, E., A. MANCONI, AND O. SPALT (2017): “Distracted Shareholders and Corporate Actions,” *Review of Financial Studies*, 30, 1660–1695.
- KNAPP, K. R., M. C. KRUK, D. H. LEVINSON, H. J. DIAMOND, AND C. J. NEUMANN (2010): “The international best track archive for climate stewardship (IBTrACS),” *Bulletin of the American Meteorological Society*, 91, 363–376.
- KRICHENE, H., T. VOGT, F. PIONTEK, T. GEIGER, C. SCHÖTZ, AND C. OTTO (2023): “The social costs of tropical cyclones,” *Nature Communications*, 14.
- KRUTTLI, M. S., B. R. TRAN, AND S. W. WATUGALA (2025): “Pricing Poseidon: Extreme Weather Uncertainty and Firm Return Dynamics,” *Journal of Finance*, 80, 651–1329.
- MATOS, P. (2020): “ESG and Responsible Institutional Investing Around the World - A Critical Review,” *CFA*.
- MERTON, R. C. (1987): “A Simple Model of Capital Market Equilibrium with Incomplete Information,” *The Journal of Finance*, 42, 483–510.
- NEWMAN, R. AND I. NOY (2023): “The global costs of extreme weather that are attributable to climate change,” *Nature Communications*, 14.
- PANKRATZ, N., R. BAUER, AND J. DERWALL (2023): “Climate Change, Firm Performance, and Investor Surprises,” *Management Science*, 69, 7352–7398.
- SCHMIDT, D. (2019): “Distracted Institutional Investors,” *Source: The Journal of Financial and Quantitative Analysis*, 54, 2453–2491.
- STARKS, L. T. (2023): “Presidential Address: Sustainable Finance and ESG Issues—Value versus Values,” *Journal of Finance*, 78, 1837–1872.
- STARKS, L. T., P. VENKAT, AND Q. ZHU (2017): “Corporate ESG Profiles and Investor Horizons,” *SSRN Electronic Journal*.

WOLF, J. AND R. A. FLATHER (2005): “Modelling waves and surges during the 1953 storm,”
Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences,
363, 1359–1375.

A Theoretical considerations

We develop a parsimonious model that captures institutional investors' trading behavior, emphasizing portfolio rebalancing as the primary driver. We assume that a representative institutional investor follows a fixed asset allocation policy between stocks and bonds. For illustrative purposes, we focus on the stock portfolio.

At time t , the investor holds n_t^u unaffected stocks, each priced at P_t^u , and n_t^e affected stocks, each priced at P_t^e . The total market value of the investor's assets is denoted by V_t . The weight of the stock portfolio in total assets is given by:

$$w_t^s = \frac{S_t}{V_t} = \frac{n_t^u P_t^u + n_t^e P_t^e}{V_t}, \quad (4)$$

where w_t^s denotes the share of total assets allocated to stocks, and S_t is the market value of the stock portfolio.

We consider a scenario in which only the price of affected stocks changes between periods, such as following a hurricane, while the price of unaffected stocks remains constant, i.e., $P_{t+1}^u = P_t^u$. Assuming the investor rebalances the affected stock holdings to maintain a constant portfolio weight, the following condition must hold:

$$w_{t+1}^s - w_t^s = 0 \quad \Rightarrow \quad \frac{S_{t+1}}{V_{t+1}} = \frac{S_t}{V_t} \quad \Rightarrow \quad S_{t+1} = \frac{V_{t+1}}{V_t} S_t. \quad (5)$$

First, we focus on the left-hand side of Eq. 5. The value of the stock portfolio after rebalancing follows from the return on the existing portfolio and the trading in unaffected and affected stocks:

$$S_{t+1} = (1 + R_{t+1}^S) S_t + \Delta n_{t+1}^u P_{t+1}^u + \Delta n_{t+1}^e P_{t+1}^e \quad (6)$$

Second, we look at the right-hand side of Eq. 5. Using the definition of total return $R_{t+1} = \frac{V_{t+1}}{V_t} - 1$, and knowing that $R_{t+1} = w_t^s R_{t+1}^S$, we can write:

$$\frac{V_{t+1}}{V_t} S_t = (1 + w_t^s R_{t+1}^S) S_t. \quad (7)$$

We can rewrite Eq. 5 as:

$$(1 + R_{t+1}^S) S_t + \Delta n_{t+1}^u P_{t+1}^u + \Delta n_{t+1}^e P_{t+1}^e = (1 + w_t^S R_{t+1}^S) S_t \quad (8)$$

which can be rearranged to

$$\Delta n_{t+1}^u P_{t+1}^u + \Delta n_{t+1}^e P_{t+1}^e = (1 + w_t^S R_{t+1}^S) S_t - (1 + R_{t+1}^S) S_t. \quad (9)$$

This simplifies to:

$$\Delta n_{t+1}^u P_{t+1}^u + \Delta n_{t+1}^e P_{t+1}^e = S_t R_{t+1}^S (w_t^S - 1). \quad (10)$$

If the rebalancing is conducted entirely via unaffected stocks, the investor buys (or sells):

$$\Delta n_{t+1}^u = \frac{S_t R_{t+1}^S (w_t^S - 1)}{P_{t+1}^u}. \quad (11)$$

Similarly, if rebalancing is fully done through affected stocks, the investor buys (or sells):

$$\Delta n_{t+1}^e = \frac{S_t R_{t+1}^S (w_t^S - 1)}{P_{t+1}^e}. \quad (12)$$

Because the stock portfolio weight satisfies $0 \leq w_t^S \leq 1$, it follows that $\frac{\partial \Delta n_{t+1}}{\partial R_{t+1}^S} = \frac{S_t (w_t^S - 1)}{P_{t+1}} < 0$. This equation means that when the stock return increases, the investor needs to sell shares to maintain the target portfolio weight. Conversely, if the return decreases, the investor must purchase additional shares to rebalance. Rebalancing can also be achieved through any combination of unaffected and affected stocks, and the investor may also choose to rebalance only partially. Since we do not observe all four parameters on the right-hand side of Eq. 12, we cannot establish a precise benchmark for the trading volume required to rebalance the portfolio. Nonetheless, if investors, for example, sell stocks following a negative stock return, such behavior is unlikely driven by rebalancing considerations but rather reflects their assessment of the fundamentals of the affected stocks. An analogous rebalancing framework applies to the bond portfolio.

B Descriptions of variables

We construct most variables of interest based on insights from the literature (e.g., Huynh and Xia (2023); Blanco et al. (2024); Alessi et al. (2024)), distinguishing between the equity and bond datasets. The dependent variable in our models is $R_{i,t+1}$ that is defined as the excess return of stock or bond i at time $t + 1$ and is constructed as follows:

1. Calculation of the monthly returns on the 1-month Treasury Bill

As a proxy for the risk-free rate, we obtain returns on 1-month Treasury Bills (Huynh and Xia, 2023).

2. Calculation of the monthly logarithmic returns of stocks

We compute monthly log returns as the natural logarithm of the ratio of the security price in month t to that in month $t - 1$. This measure provides a continuous and time-additive return metric. All returns are computed using prices denominated in euros.

3. Calculation of the excess returns

We merge monthly log returns of individual securities with 1-month Treasury Bill returns using year and month as matching keys. We then compute excess returns as the difference between each security's monthly log return and the corresponding Treasury Bill return.

For bonds, we collect information on ratings and we define *bond beta* variables using the methodology of Huynh and Xia (2023). Specifically, for each bond i in month t , we estimate three coefficients: $\beta_{\text{Bond Market}}$, β_{Term} , and β_{Default} . We obtain these from monthly rolling regressions of bond excess returns on excess market returns, bond market illiquidity, the term spread, and the default spread, respectively, using 18-month windows. These betas measure the sensitivity of bond returns to systematic risk factors, capturing exposure to broad market movements, macroeconomic conditions, and credit risk. For a detailed description of the other key variables, see Table 8 which also indicates the hypothesis tests in which each variable is used.

Table 8. Descriptions of variables

Variable	Units	Description	Hypothesis
Book Value	EUR	Calculated as total assets minus total liabilities, based on balance sheet data. Source: Orbis, FactSet. Asset type: Equities.	H_{1a}
Profitability	Decimal	The ratio of gross profit to total assets as a measure of the firm's ability to generate earnings. This ratio serves as a key indicator of the firm's financial health and operational efficiency. Source: Orbis, FactSet. Asset type: Equities.	H_{1a}
Investment	Decimal	Asset growth is computed as the difference between the natural logarithm of total assets in the current quarter and that of the prior quarter. Source: Orbis, FactSet. Asset type: Equities.	H_{1a}
Market capitalization logarithm	Log(EUR)	The natural logarithm of market capitalization that is calculated as the stock price multiplied by the number of shares outstanding. Source: Input data for SHSS. Asset type: Equities.	H_{1a}
Monthly excess return	Decimal	The difference between the security's monthly return and the monthly risk-free rate, which we approximate using Treasury Bills. Source: Input data for SHSS. Asset type: Equities, Bonds.	H_{1a}
Reversal/short-term reversal	Decimal	Reversal is measured as the excess return in the previous month. Short-term reversal corresponds to the stock's cumulative return over the prior quarter. Source: Input data for SHSS. Asset type: Equities, Bonds.	H_{1a}
Momentum	Decimal	Momentum is defined as the stock's cumulative return over the preceding three quarters. Source: Input data for SHSS. Asset type: Equities, Bonds.	H_{1a}

Continued on next page

Continued from previous page

Variable	Units	Description	Hypothesis
Rating	Ordinal scale	A numerical rating scale ranging from one, which corresponds to an AAA rating, to 22, representing the lowest rating. A value of 23 is assigned when no rating is available. For each security, we use the second-lowest rating among the three sources. Source: Input data for SHSS. Asset type: bonds.	H_{1a}
N Industries (log)	Log count	Natural logarithm of the number of distinct industries (based on SIC codes) represented in an institutional owner's portfolio. Source: Orbis, FactSet. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
N States (log)	Log count	Natural logarithm of the number of distinct US states represented in the institutional owner's portfolio (state determined by the location of firm headquarters). Source: Orbis, FactSet. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
N Securities (log)	Log count	Natural logarithm of the number of distinct stocks held in the institutional owner's portfolio. Source: Orbis, FactSet. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
Portfolio Industry Concentration	Index	Herfindahl index measuring the concentration of holdings across industries (based on SIC codes) in the institutional owner's portfolio. Source: Orbis, FactSet. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
Portfolio State Concentration	Index	Herfindahl index measuring the concentration of holdings across US states in the institutional owner's portfolio (state determined by firm headquarters). Source: Orbis, FactSet. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
Portfolio Concentration	Index	Herfindahl index measuring the overall concentration of holdings in the institutional owner's portfolio. Source: Orbis, FactSet. Asset type: stocks.	H_{2a}, H_{2b}

Continued on next page

Continued from previous page

Variable	Units	Description	Hypothesis
$\Delta Hold$	Percentage points	Month-over-month change in the holdings of a security (stock or bond) by the institutional owner, expressed in percentage points. Can be measured in relative or absolute terms. Source: Input data for SHSS. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
Trades	Decimal	Binary indicator equal to one if $ \Delta Hold > 0.4\%$. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
Buys	Decimal	Binary indicator equal to one if $\Delta Hold > 0.4\%$. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
Sells	Decimal	Binary indicator equal to one if $\Delta Hold < -0.4\%$. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
ESA Holding Sector	Categorical	Classification defined in IMF (2015) under the European System of Accounts (ESA 2010). Source: Input data for SHSS. Asset type: Equities, Bonds.	H_{2a}, H_{2b}
TC	Decimal	A binary indicator equal to one if, in month t , the headquarters of issuer j was located in a region affected by a hurricane, and zero otherwise.	H_{2a}, H_{2b}
$IO Exposure \times TC$	Decimal	Exposure of an institutional holder to a tropical cyclone in the US as defined in Equation 2.	H_{2a}, H_{2b}
$\Delta Sales$	Decimal	Percentage change in sales revenue (in millions), net of cash and trade discounts, earned from goods and services. Source: FactSet. Asset type: Equities, Bonds.	H_{1b}
ROA	Decimal	Return on Assets that is calculated as net income divided by total assets. Based on last 12 months (LTM) net income and average quarterly assets for US firms. Source: FactSet. Asset type: Equities, Bonds.	H_{1b}

Continued on next page

Continued from previous page

Variable	Units	Description	Hypothesis
Leverage	Decimal	Defined as long-term debt minus current liabilities, divided by total assets (Huynh and Xia, 2023). Source: FactSet. Asset type: Equities, Bonds.	H_{1b}
σ_m	Decimal	Monthly return volatility of stocks and bonds, adjusted for splits and spinoffs, calculated over a 3-year period using monthly frequency. Source: FactSet. Asset type: Equities, Bonds.	H_{1b}
PB	Index	Price-to-book ratio, calculated using the stock price as of the last trading day of the specified period. Source: FactSet. Asset type: Equities, Bonds.	H_{1b}

C Results: regression tables for effect of hurricanes on securities returns and firms' sales revenue

Panel A: Excess returns in US holdings						
			$\mathbb{E}(R_{t+1})$	$\mathbb{E}(R_{t+2})$	$\mathbb{E}(R_{t+3})$	$\mathbb{E}(R_{t+4})$
Italy	Equities	TC_t	3.341	-11.548**	19.100**	-10.965
			(2.27)	(4.63)	(8.12)	(6.83)
		R^2	0.153	0.238	0.239	0.247
		N	36259	34416	33173	31938
	Bonds	TC_t	3.892**	-3.274***	-0.294	0.764
			(1.60)	(0.72)	(1.05)	(1.08)
		R^2	0.175	0.196	0.150	0.118
		N	13460	12548	11574	10777

Panel B: Excess returns in US holdings						
			$\mathbb{E}(R_{t+1})$	$\mathbb{E}(R_{t+2})$	$\mathbb{E}(R_{t+3})$	$\mathbb{E}(R_{t+4})$
Netherlands	Equities	TC_t	2.343	-2.620	-6.364***	5.723**
			(2.89)	(2.54)	(2.26)	(2.16)
		R^2	0.135	0.141	0.131	0.135
		N	79411	76468	74103	71734
	Bonds	TC_t	-0.060	-0.786*	0.192	1.440**
			(0.61)	(0.42)	(0.51)	(0.58)
		R^2	0.208	0.176	0.199	0.176
		N	57116	54152	51712	49232

Table 9. The Effects of Hurricanes on Excess Returns of Equities and Bonds: This table presents monthly data from January 2020 to December 2023. **Panel A** presents the results for US securities held by institutional investors from Italy, while **Panel B** presents the results for those held by institutional investors from the Netherlands. The regressions follow model 1 and examine the effect of TC_t , a dummy variable indicating whether a hurricane affected the excess returns $\mathbb{E}(R_{t+l})$, where $l = 1, \dots, 4$ of the headquarters of issuer j . Security-level controls are defined monthly (see Table 2) and described in Table 8. All investor-level control variables are lagged by one month. Fixed effects and clustering are specified in Section 3. $\{^*\}$, $\{^{**}\}$, and $\{^{***}\}$ indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Firms' sales revenue in US holdings						
		$\Delta Sales_{t+1}$	$\Delta Sales_{t+2}$	$\Delta Sales_{t+3}$	$\Delta Sales_{t+4}$	
Italy	Equities	TC_t	-1.222 (0.73)	-2.448** (1.14)	-3.774*** (0.93)	-0.741 (0.55)
		R^2	0.412	0.297	0.399	0.363
		N	11757	11649	11314	10543
	Bonds	TC_t	0.073 (0.11)	-5.150 (3.56)	-2.428* (1.28)	0.148 (0.13)
		R^2	0.265	0.210	0.229	0.345
		N	11450	11255	10965	10033
Panel B: Firms' sales revenue in US holdings						
		$\Delta Sales_{t+1}$	$\Delta Sales_{t+2}$	$\Delta Sales_{t+3}$	$\Delta Sales_{t+4}$	
Netherlands	Equities	TC_t	-1.348** (0.64)	-3.044** (1.26)	-4.010*** (0.93)	-0.882 (0.55)
		R^2	0.395	0.250	0.386	0.326
		N	27988	26192	25948	25598
	Bonds	TC_t	-1.503* (0.82)	-3.118* (1.56)	-4.525*** (1.20)	-0.808 (0.63)
		R^2	0.380	0.248	0.457	0.346
		N	25034	23103	22806	22474

Table 10. The Effects of Hurricanes on Sales Revenue of Firms Issuing Equities and Bonds: This table presents monthly data from January 2020 to December 2023. **Panel A** presents the results for US issuers issuing securities held by institutional investors from Italy, while **Panel B** presents the results for those held by institutional investors from the Netherlands. The regressions follow model 1 and examine the effect of TC_t , a dummy variable indicating whether a hurricane affected the firms' sales revenue $\Delta Sales_{t+l}$ of the headquarters of issuer x , where $l = 1, \dots, 4$. Firm-level controls are defined monthly (see Table 3) and described in Table 8. All control variables are lagged by one month. Fixed effects and clustering are specified in Section 3. $\{^*\}$, $\{^{**}\}$, and $\{^{***}\}$ indicate significance at the 10%, 5%, and 1% levels, respectively.

D Results: regression tables for trading activity following hurricanes

Panel A: Institutional investors from Italy						
		$\Delta Hold_{i,j,t}$	$ \Delta Hold_{i,j,t} $	$Trades_{i,j,t}$	$Buys_{i,j,t}$	$Sells_{i,j,t}$
Equities	$IO Exposure_{i,j,t}$	0.027 (0.25)	-0.033 (0.18)	0.000 (0.00)	-0.002 (0.00)	0.002 (0.00)
	$IO Exposure_{i,j,t} TC_t$	-0.172 (0.27)	-0.103 (0.20)	0.000 (0.00)	-0.002 (0.00)	0.003 (0.00)
	$\beta_1 + \beta_2$	-0.145**	-0.136***	0.000	-0.005***	0.005***
	$p - value$	0.011	0.004	0.573	0.000	0.000
	R^2	0.372	0.344	0.337	0.518	0.518
	N	301,886	301,886	301,886	301,886	301,886
Bonds	$IO Exposure_{i,j,t}$	0.390 (0.51)	0.443 (0.42)	-0.031* (0.02)	0.013 (0.02)	-0.044 (0.02)
	$IO Exposure_{i,j,t} TC_t$	-2.506 (2.20)	-3.787 (2.48)	-0.059 (0.05)	0.125 (0.10)	-0.184 (0.11)
	$\beta_1 + \beta_2$	-2.116	-3.344	-0.090*	0.138	-0.229
	$p - value$	0.337	0.175	0.095	0.164	0.049
	R^2	0.531	0.576	0.791	0.805	0.809
	N	188,481	188,481	188,481	188,481	188,481
Panel B: Institutional investors from the Netherlands						
		$\Delta Hold_{i,j,t}$	$ \Delta Hold_{i,j,t} $	$Trades_{i,j,t}$	$Buys_{i,j,t}$	$Sells_{i,j,t}$
Equities	$IO Exposure_{i,j,t}$	-5.193* (2.00)	-3.506* (1.33)	0.001 (0.00)	-0.041** (0.01)	0.043*** (0.01)
	$IO Exposure_{i,j,t} TC_t$	1.375 (1.02)	-0.817 (1.69)	0.001 (0.00)	0.029*** (0.01)	-0.029*** (0.01)
	$\beta_1 + \beta_2$	-3.819***	-4.323***	0.002	-0.012	0.014
	$p - value$	0.006	0.070	0.214	0.345	0.238
	R^2	0.188	0.491	0.551	0.608	0.607
	N	1,467,279	1,467,279	1,467,279	1,467,279	1,467,279
Bonds	$IO Exposure_{i,j,t}$	1.220* (0.49)	-0.505 (0.59)	0.001 (0.00)	0.010* (0.00)	-0.009 (0.00)
	$IO Exposure_{i,j,t} TC_t$	-0.743 (0.78)	-1.359 (0.70)	0.003 (0.01)	-0.008 (0.01)	0.011 (0.01)
	$\beta_1 + \beta_2$	0.477	-1.864***	0.004	0.002	0.002
	$p - value$	0.544	0.002	0.455	0.772	0.780
	R^2	0.358	0.647	0.868	0.803	0.806
	N	402,608	402,608	402,608	402,608	402,608

Table 11. The Effects of Institutional Investors' Exposures to Hurricanes on Trading Behavior: Evidence from Italy and the Netherlands: This table presents monthly data from January 2020 to December 2023. The top panel (Equities) shows the trading behavior among equity investors from Italy and the Netherlands with varying exposures to hurricanes. The bottom panel (Bonds) presents analogous results for bond investors. Columns 1 and 2 present the intensive margin outcomes ($\Delta Hold_{i,j,t}$, $|\Delta Hold_{i,j,t}|$), while Columns 3 to 5 present the extensive margin outcomes ($Trades_{i,j,t}$, $Buys_{i,j,t}$, $Sells_{i,j,t}$), based on model 3. The regressions show the effect of investors' exposures to hurricanes ($IO Exposure_t$, $IO Exposure_t|TC_t$) on trading behavior. Investor-security level controls are defined monthly (see Tables 4 and 5) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are specified in Section 3. This table presents results for all institutional investors (pension funds, investment funds, and insurance firms) located in Italy and the Netherlands. The variable $\beta_1 + \beta_2$ represents a joint test of the sum of coefficients β_1 and β_2 from $IO Exposure_t$ and $IO Exposure_t|TC_t$ in model 3. $\{ \}^*$, $\{ \}^{**}$, and $\{ \}^{***}$ indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Pension funds from the Netherlands						
		$\Delta Hold_{i,j,t}$	$ \Delta Hold_{i,j,t} $	$Trades_{i,j,t}$	$Buys_{i,j,t}$	$Sells_{i,j,t}$
Equities	$IO Exposure_{i,j,t}$	-0.978 (1.56)	-0.788 (0.74)	0.003 (0.00)	-0.023* (0.01)	0.027* (0.01)
	$IO Exposure_{i,j,t} TC_t$	-4.204* (2.23)	-4.161*** (0.65)	-0.003 (0.00)	-0.020 (0.02)	0.016 (0.02)
	$\beta_1 + \beta_2$	-5.182***	-4.949***	0.000	-0.043**	0.043***
	$p - value$	0.000	0.001	0.847	0.011	0.005
	R^2	0.252	0.538	0.624	0.679	0.678
	N	773,167	773,167	773,167	773,167	773,167
Bonds	$IO Exposure_{i,j,t}$	1.703** (0.76)	-0.490 (0.87)	0.001 (0.00)	0.012** (0.01)	-0.011* (0.01)
	$IO Exposure_{i,j,t} TC_t$	-0.754 (0.99)	-1.046 (1.00)	-0.005 (0.00)	-0.014 (0.01)	0.009 (0.01)
	$\beta_1 + \beta_2$	0.949	-1.536*	-0.004	-0.002	-0.002
	$p - value$	0.355	0.057	0.338	0.867	0.806
	R^2	0.375	0.667	0.900	0.831	0.836
	N	247,038	247,038	247,038	247,038	247,038

Table 12. The Effects of Pension Funds' Exposures to Hurricanes on Trading Behavior: Evidence from the Netherlands: This table presents monthly data from January 2020 to December 2023. The top panel (Equities) shows trading behavior among Dutch pension funds holding equities with varying exposures to hurricanes. The bottom panel (Bonds) presents analogous results for bond holdings. Columns 1 and 2 present the intensive margin outcomes ($\Delta Hold_{i,j,t}$, $|\Delta Hold_{i,j,t}|$), while Columns 3 to 5 present the extensive margin outcomes ($Trades_{i,j,t}$, $Buys_{i,j,t}$, $Sells_{i,j,t}$), based on model 3. The regressions examine the effect of investors' exposures to hurricanes ($IO Exposure_t$, $IO Exposure_t|TC_t$) on trading behavior. Investor-security level controls are defined monthly (see Tables 4 and 5) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are specified in Section 3. This table presents results for all pension funds located in the Netherlands. The variable $\beta_1 + \beta_2$ represents a joint test of the sum of coefficients β_1 and β_2 from $IO Exposure_t$ and $IO Exposure_t|TC_t$ in model 3. { }*, { }**, and { }*** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Investment funds from Italy						
		$\Delta Hold_{i,j,t}$	$ \Delta Hold_{i,j,t} $	$Trades_{i,j,t}$	$Buys_{i,j,t}$	$Sells_{i,j,t}$
Equities	$IO Exposure_{i,j,t}$	4.020 (3.43)	4.278* (2.01)	0.001 (0.00)	0.021 (0.02)	-0.020 (0.02)
	$IO Exposure_{i,j,t} TC_t$	-8.401 (5.15)	-3.859 (4.85)	0.007 (0.01)	-0.106** (0.04)	0.113** (0.04)
	$\beta_1 + \beta_2$	-4.381*	0.419	0.008	-0.085**	0.093**
	$p - value$	0.090	0.900	0.372	0.039	0.012
	R^2	0.386	0.345	0.447	0.617	0.618
	N	142,155	142,155	142,155	142,155	142,155
Bonds	$IO Exposure_{i,j,t}$	0.674 (0.45)	-0.194 (0.41)	0.006 (0.00)	-0.002 (0.01)	0.008 (0.01)
	$IO Exposure_{i,j,t} TC_t$	0.918 (1.05)	-1.837 (1.63)	-0.001 (0.01)	0.057 (0.04)	-0.059 (0.04)
	$\beta_1 + \beta_2$	1.593	-2.032	0.004	0.055	-0.051
	$p - value$	0.136	0.173	0.345	0.174	0.223
	R^2	0.481	0.494	0.931	0.894	0.900
	N	31,077	31,077	31,077	31,077	31,077
Panel B: Investment funds from the Netherlands						
		$\Delta Hold_{i,j,t}$	$ \Delta Hold_{i,j,t} $	$Trades_{i,j,t}$	$Buys_{i,j,t}$	$Sells_{i,j,t}$
Equities	$IO Exposure_{i,j,t}$	-4.853** (1.87)	-3.831*** (1.39)	0.000 (0.00)	-0.030*** (0.01)	0.031*** (0.01)
	$IO Exposure_{i,j,t} TC_t$	3.190*** (1.04)	1.586 (1.66)	0.002 (0.00)	0.037*** (0.01)	-0.035*** (0.01)
	$\beta_1 + \beta_2$	-1.663	-2.245	0.002**	0.006	-0.004
	$p - value$	0.170	0.286	0.016	0.543	0.696
	R^2	0.207	0.516	0.509	0.582	0.581
	N	553,946	553,946	553,946	553,946	553,946
Bonds	$IO Exposure_{i,j,t}$	0.512 (0.59)	-0.777** (0.34)	0.000 (0.00)	0.005 (0.01)	-0.005 (0.01)
	$IO Exposure_{i,j,t} TC_t$	-2.184* (1.17)	-2.039*** (0.67)	0.014*** (0.00)	-0.008 (0.02)	0.023 (0.02)
	$\beta_1 + \beta_2$	-1.671**	-2.816***	0.014***	-0.004	0.018
	$p - value$	0.021	0.000	0.001	0.802	0.172
	R^2	0.412	0.722	0.873	0.802	0.802
	N	101,770	101,770	101,770	101,770	101,770

Table 13. The Effects of Investment Funds' Exposures to Hurricanes on Trading Behavior: Evidence from Italy and the Netherlands: This table presents monthly data from January 2020 to December 2023. The top panel (Equities) shows the trading behavior among equity investment funds from Italy and the Netherlands with varying exposures to hurricanes. The bottom panel (Bonds) presents analogous results for bond investment funds. Columns 1 and 2 present the intensive margin outcomes ($\Delta Hold_{i,j,t}$, $|\Delta Hold_{i,j,t}|$), while Columns 3 to 5 present the extensive margin outcomes ($Trades_{i,j,t}$, $Buys_{i,j,t}$, $Sells_{i,j,t}$), based on model 3. The regressions show the effect of investment funds' exposures to hurricanes ($IO Exposure_t$, $IO Exposure_t|TC_t$) on trading behavior. Investor-security level controls are defined monthly (see Tables 4 and 5) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are specified in Section 3. This table presents results for all investment funds located in Italy and the Netherlands. The variable $\beta_1 + \beta_2$ represents a joint test of the sum of coefficients β_1 and β_2 from $IO Exposure_t$ and $IO Exposure_t|TC_t$ in model 3. { }*, { }**, and { }*** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Insurances from Italy						
		$\Delta Hold_{i,j,t}$	$ \Delta Hold_{i,j,t} $	$Trades_{i,j,t}$	$Buys_{i,j,t}$	$Sells_{i,j,t}$
<i>Equities</i>	$IO Exposure_{i,j,t}$	0.215 (0.23)	-0.474** (0.21)	-0.001* (0.00)	-0.005 (0.00)	0.004 (0.00)
	$IO Exposure_{i,j,t} TC_t$	-1.085 (1.30)	-1.561 (1.08)	0.002** (0.00)	-0.043 (0.04)	0.045 (0.04)
	$\beta_1 + \beta_2$	-0.870	-2.035*	0.000	-0.049	0.049
	$p - value$	0.471	0.060	0.790	0.288	0.297
	R^2	0.558	0.537	0.235	0.550	0.551
	N	78,243	78,243	78,243	78,243	78,243
<i>Bonds</i>	$IO Exposure_{i,j,t}$	1.459 (1.63)	1.959 (1.36)	0.025 (0.03)	-0.016 (0.04)	0.040 (0.05)
	$IO Exposure_{i,j,t} TC_t$	-0.874 (1.63)	-2.394 (1.46)	-0.020 (0.03)	0.020 (0.04)	-0.040 (0.06)
	$\beta_1 + \beta_2$	0.585*	-0.435	0.005	0.004	0.001
	$p - value$	0.092	0.448	0.636	0.693	0.928
	R^2	0.588	0.580	0.897	0.904	0.906
	N	74,252	74,252	74,252	74,252	74,252
Panel B: Insurances from the Netherlands						
		$\Delta Hold_{i,j,t}$	$ \Delta Hold_{i,j,t} $	$Trades_{i,j,t}$	$Buys_{i,j,t}$	$Sells_{i,j,t}$
<i>Equities</i>	$IO Exposure_{i,j,t}$	-6.022* (2.84)	-2.212 (6.47)	0.012 (0.01)	-0.080 (0.05)	0.092 (0.06)
	$IO Exposure_{i,j,t} TC_t$	25.466 (19.98)	-31.006** (10.40)	0.033 (0.05)	-0.016 (0.06)	0.049 (0.11)
	$\beta_1 + \beta_2$	19.444	-33.218	0.045	-0.096***	0.141**
	$p - value$	0.361	0.065	0.356	0.005	0.035
	R^2	0.330	0.673	0.680	0.716	0.715
	N	93,807	93,807	93,807	93,807	93,807
<i>Bonds</i>	$IO Exposure_{i,j,t}$	0.051 (0.81)	-1.333 (0.68)	0.002 (0.01)	0.020 (0.01)	-0.018 (0.01)
	$IO Exposure_{i,j,t} TC_t$	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
	$\beta_1 + \beta_2$	0.051	-1.333*	0.002	0.020	-0.018
	$p - value$	0.950	0.056	0.715	0.144	0.211
	R^2	0.150	0.887	0.906	0.650	0.664
	N	4,752	4,752	4,752	4,752	4,752

Table 14. The Effects of Insurance Firms' Exposures to Hurricanes on Trading Behavior: Evidence from Italy and the Netherlands: This table presents monthly data from January 2020 to December 2023. The top panel (Equities) shows the trading behavior among insurance firms from Italy and the Netherlands with varying exposures to hurricanes. The bottom panel (Bonds) presents analogous results for bond investors. Columns 1 and 2 present the intensive margin outcomes ($\Delta Hold_{i,j,t}$, $|\Delta Hold_{i,j,t}|$), while Columns 3 to 5 present the extensive margin outcomes ($Trades_{i,j,t}$, $Buys_{i,j,t}$, $Sells_{i,j,t}$), based on model 3. The regressions show the effect of investors' exposures to hurricanes ($IO Exposure_t$, $IO Exposure_t|TC_t$) on trading behavior. Investor-security level controls are defined monthly (see Tables 4 and 5) and described in Table 8. All investor-level controls are lagged by one month. Fixed effects and clustering are specified in Section 3. This table presents results for all insurance firms located in Italy and the Netherlands. The variable $\beta_1 + \beta_2$ represents a joint test of the sum of coefficients β_1 and β_2 from $IO Exposure_t$ and $IO Exposure_t|TC_t$ in model 3. { }*, { }**, and { }*** indicate significance at the 10%, 5%, and 1% levels, respectively.