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Mutual funds and climate news*

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Abstract

In the context of rising public awareness of climate change, the proliferation of green mutual funds reflects expectations of their contribution to a sustainable economic transition. This paper investigates the effect of climate news on mutual funds' flows, and on their portfolio allocation decisions. Using detailed flow- and holdings- level data, we observe that heightening climate news results in significantly larger capital inflows into green funds versus their non-green counterparts. Furthermore, we show that, in reaction to climate news, green funds decrease their exposure to high-polluting firms relative to low-polluting firms more than non-green funds do. These results suggest that increasing public awareness boosts capital re-allocation towards green funds and this, in turn, potentially fosters investment relocation towards more environmentally-friendly companies.

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1 Introduction

Climate change is emerging as one of the most critical global issues of our time. Leading supranational institutions such as the United Nations and the European Commission have recently introduced legally binding global climate accords to slow global warming and achieve climate neutrality.[1] The escalation of extreme climate events worldwide and the consequent policy discussions are mirrored in widespread media attention on climate change, a process that is increasing public awareness and is exerting pressure on various stakeholders, including investors, citizens and politicians.

Efforts by policymakers to foster a sustainable society have intensified across all sectors of the economy, spotlighting the role of the financial sector in managing and spurring the green transition.[2] Meanwhile, especially in the aftermath of the global financial crisis (GFC), as banking regulations have become more stringent, non-bank financial intermediaries have become increasingly prominent (Aramonte et al., 2022, Gopal and Schnabl, 2022). Thus, within the financial sector, non-bank financial institutions, including mutual funds, can play a substantial role to effectively achieve a greener economy.

In this paper, we focus on mutual funds because of their significant role in funding firms,[3] and because preferences of mutual funds' investors and managers may differ from other financial intermediaries, thus shaping their investment choices in reaction to climate-related shocks. For instance, Krueger et al. (2020) utilize a survey of fund managers and find that long-term, larger, and ESG-oriented investors prefer risk management rather than direct divestment in brown sectors to hedge climate risks. Consistently, Couvert (2020) examine the impact of institutional investors' shareholding on firms' ESG performance, finding that investors from countries with strong community belief in E&S issues positively affect firm E&S performance. In addition, Ilhan et al. (2023) highlight that institutional investors

[1] The 2019 European Green Deal and the 2021 Glasgow Climate Pact are notable examples of recent cooperation initiatives.

[2] For instance, recognizing its significant role, regulators and policymakers have established the Network for Greening the Financial System (NGFS), addressing climate-related challenges and risks within the financial industry.

[3] U.S. mutual funds hold 22% of the total market value of U.S. corporate equity. See, for example, ICI (2023).

actively promote climate-related initiatives in investing companies. With specific reference to the mutual funds industry, Dikolli et al. (2022) and Curtis et al. (2021) report that socially responsible funds are more likely than other funds to vote in support of shareholders' proposals improving companies' ESG scores.

We contribute to the debate on the sensitivity of mutual funds' investors to climate change and the extent to which it may ultimately impact the direct exposure of mutual funds towards greener companies. Specifically, we use a sample of US active equity mutual funds and identify green funds using their names in line with the literature.[4] After identifying green mutual funds, we investigate their role in relocating capital towards environmentally conscious investments in times of increasing attention to climate issues. We find that a higher coverage of climate issues, in terms of more news on the topic, results in significantly larger capital inflows into green funds relative to non-green counterparts. The effect of such a rise in public attention to climate change on mutual funds flow remains significant up to four months after the news shock, and is thus persistent.

In the second part of the paper, we analyse the effect of climate news on mutual funds' portfolios by exploiting the granularity of mutual funds holdings. We study the influence of increased attention to climate news on mutual fund flows, investigating whether mutual fund investors react to climate-related news and adjust their portfolios accordingly. In detail, we aim to understand mutual fund managers' responses to climate news, especially if an increased allocation to green funds in response to climate risk-related news leads funds to shift their allocation towards more environmentally friendly companies and away from browner ones. Our results suggest that increasing public attention to climate is associated to a larger increase in mutual funds' holdings of firms emitting lower levels of greenhouse gas, especially by green funds. In particular, green funds persistently reduce their investments in high emitters relative to low emitters in response to climate news. Our evidence is consistent with green funds gradually increasing over time their investments in low emitters by more than non-green funds.

[4] This strategy has been adopted by He et al. (2023), Michaely et al. (2021), Nofsinger and Varma (2014), among others. Notice that, The SEC rule 35d-1 prescribes the "Names Rule," which prohibits the use of misleading mutual fund names.

The analysis of fund reallocation is key to understand how these flows could effectively contribute to a greener transition of the aggregate economy.[5] There is an established debate about *greenwashing* practices in financial markets, that is the practice where a company misrepresents the environmental impacts of its products or services to benefit from cheaper funding or better investors' perceptions. We find that green mutual funds respond to climate news by allocating more to environmentally friendly companies, supporting sustainable practices against the *greenwashing* hypothesis.

We also disentangle the component of realized physical risk embedded into climate news from the transition risk, which pertains to regulatory and future predictable but unrealized physical risk. Our results suggest that public interest in transition risk factors represent the driving force for capital inflows into green funds. Conversely, climate news related to physical risk represent the main driver for the portfolio reaction by green funds.

Overall, our results confirm that public attention on climate issues has a significant impact on financial markets, driving capital flows to greener actors, and have a potential real effect in increasing the exposure towards environmentally-friendly investments, thus ultimately favoring the ongoing green transition process.

Our paper contributes to different strands of the literature. The first pertains to the analysis of the effect of mutual funds' exposure to climate risks and investment inflows. Hartzmark and Sussman (2019), Ammann et al. (2019), Gantchev et al. (2024) document the presence of large fund inflows following the release of environmental/sustainability ratings issued by third-parties, such as Morningstar's ESG scores for mutual funds, that increase the salience of investors to climate-related issues. Similarly, Kim and Yoon (2023) document inflows towards active US mutual funds after their managers signed the Principles for Responsible Investment (PRI) developed by the United Nations in 2006. These results are consistent with the presence of investors' preference for climate issues that generate a relocation of investments when new initiatives regarding climate sustainability becomes available to them. Differently from these studies, we focus on the effect of climate news on flows,

[5] Other ways for mutual funds to contribute to the green economy include active engagement with invested firms and voting in favor of environmentally friendly policies as stockholders, a dimension that is not fully exploited in the current paper.

highlighting a differential impact on green mutual funds. In particular, we provide insights into the role of green labeling for the reaction of mutual fund investors when the intensity of public attention to climate news increases. Furthermore, we also analyze the reaction of mutual fund managers to the inflows following changes in climate news in terms of holdings. Documenting a relative re-location of mutual funds' holdings towards low-emitting firms points to the presence of real effects of increasing public attention to climate. This last result is in line with findings in Ceccarelli et al. (2024) who uses a different definition of green funds based on labeling by Morningstar (LCD label). While obtaining the LCD label can be a target for mutual funds through their trading decisions, our definition of green funds represents a characteristic of the fund that cannot be changed because of climate news. This feature of our empirical setting allows us to estimate the reaction of funds' flows and holdings to the salience of aggregate climate issues, keeping the underlying business and scope of the funds unchanged. Furthermore, differently from the above studies, we exploit a new time variation in climate-related information, which provides evidence on the impact of changes in public news that are not linked to specific aspects of firms' operations and business models such as the release of ESG (or related) ratings. This novel feature of our empirical setting allows us to separately identify related to physical and transition risk, that is novel with respect to the literature (Giglio et al., 2021).

On this respect, we contribute also to an emerging literature on the role of climate attention in determining investors' reaction in various financial markets. In equity markets, there is evidence that firms with higher carbon emissions are valued at a discount especially after an increase in public awareness to climate issues related to the 2015 Paris Agreement (Bolton and Kacperczyk, 2023). Engle et al. (2020) show that firms with high environmental scores have higher returns at times of negative news about future climate change. In option markets, the cost of hedging downside risks is larger for more carbon-intensive firms when the public's attention to climate change spikes (Ilhan et al., 2020), while in the fixed income market, investors buy at higher prices corporate bonds issued by firms with better environmental performance when they are more concerned about climate risk (Huynh and Xia, 2021). Our paper complements these findings by adding evidence on the role of climate news in the mutual funds market.

Third our paper contributes to the recent climate and finance literature on the impact of the engagement of private companies towards green investments on their cost of equity and debt (Bolton and Kacperczyk, 2021, Chava, 2014, Fatica et al., 2021), and their external financing conditions by banks and non-bank financial intermediaries (Altavilla et al., 2023, Degryse et al., 2023, Delis et al., Ehlers et al., 2022, Gallo and Park, 2023, Oliviero et al., 2024, Reghezza et al., 2022). These studies confirm a positive role of finance to enhance the green transition, especially following the 2015 Paris Agreement. Our findings highlight the central role of increasing public awareness about climate for favoring the transition to a sustainable economy. In particular, we contribute to this debate by documenting that mutual funds relocate capital towards greener companies following an increase in public interest on climate issues.

The rest of the paper is organised as follows: Section 2 describes the data and the empirical specifications, Section 3 presents our findings on fund flows, Section 4 shows results on funds' portfolios, and Section 5 concludes.

2 Data and econometric model

In this section, we elaborate on the data used in our analysis and we subsequently describe the econometric models employed for deriving the results on fund flows and investment allocation.

2.1 Data

In our analysis we combine granular data at the fund-, fund-holding, and target-firm level. Our data on monthly mutual fund flows are from Lipper and cover the period from December 2006 to June 2022. We construct a dataset of active equity mutual funds using the following procedure. First, we exclude passively managed funds, such as index funds, and assemble a sample of mutual funds that primarily invest in equities globally and are denominated in

USD (ETFs are excluded). Our sample comprises 6,385 primary funds and 22,635 share classes. We then identify (primary) green funds following an established practice in the literature that uses funds' names (He et al. (2023), Michaely et al. (2021), Nofsinger and Varma (2014), among others).[6]

Specifically, we identify funds whose names include at least one of the following keywords: alternative energy, clean, climate, ecolog-, energy solution, environ-, green, low carbon, renewable, solar, sustainab-, or wind.[7] Using the sector exposure of each fund provided by Lipper, we exclude from the green funds those that have an average investment over the sample period larger than 10% in the sectors of oil and gas production and of oil equipment services and distribution.[8] We apply this filtering to account for the potential green-washing practice by high-polluting funds. After this additional filter, we reclassify 8 mutual funds, initially included among the sub-group of green, as non-green funds. At the end of the classification procedure, we identify a total of 119 green funds during the full sample period. On a yearly basis, the number of green funds ranges from 39 (in 2007) to 94 (in 2022).

Lipper provides equity holdings for primary funds and, using the companies' ISIN codes we merge the fund holding-level dataset with the firms' financial statements (source: S&P Capital IQ). Furthermore, for each firm, we add data on its greenhouse gas (GHG) emissions (level 1 and 2) obtained from S&P Trucost.[9]

Insert Table 1 here

Table 1 presents the summary statistics for the constructed dataset. *Flow* corresponds to ratio of the fund's monthly net flow to the lagged value of its assets under management, multiplied by 100. The average flow for green funds is 1.36%, slightly larger than the corresponding figure for non-green funds (1.03%). This is consistent with increasing importance

[6]The SEC rule 35d-1 prescribes the "Names Rule," which prohibits the use of misleading mutual fund names.

[7]For instance names of identified green funds are: "TIAA-CREF Social Choice Low Carbon Equity Fd;Rtl", "DWS Clean Technology Fund;A" and "Brookfield Global Renewables & Sustain Infra Fd;I".

[8]Around 17% of all mutual funds in our entire sample display a such a share of investment larger than 10%.

[9]Holdings data are available for a subgroup of mutual funds (2,381 funds, and 77 green funds) and, although available in principle at monthly frequency, in the empirical analysis will be aggregated at quarterly frequency due to the small variation of the holdings at monthly frequency.

over time of climate-related news and the increased inflows of investments towards green funds. The fund size (logarithm of fund total value) for green funds is relatively smaller compared to non-green funds. The performance of green funds, a measure of return from investment provided by Lipper, is close to that of non-green funds, with a slightly larger value for the latter (0.54 vs 0.56). The weighted average of the price-to-book ratio (PBR) of stocks in the funds' portfolios is higher for green funds than for non-green funds, possibly reflecting a larger presence of growing firms in the portfolio of green funds, and is well above one for both fund types. We winsorize all fund-level variables at the 0.5% level to take care of outliers.

We also provide information on the exposure of funds towards high/low polluting firms. Green funds invest more heavily in firms with lower GHG emissions (thousands of tonnes) scaled by total revenues (in millions of US dollars). The difference between green and non-green funds in scope 1 emissions over total revenues is about 0.02 against an average value of 0.2 in the entire sample; the difference is constant once considering scope 1 plus scope 2 emissions.[10] Using emissions scaled by revenues removes the distortion arising from the fact that the absolute amount of emissions is naturally related to the size of the firms. The average difference of 0.02 between green and non-green funds is not quantitatively tiny: a decrease by 0.01 of this variable implies an average yearly reduction in emissions of about 300 thousands of tonnes of emissions (computed at the average value of firms' total revenues in our sample).[11]

The middle rows of Table 1 present the summary statistics for the holding level data of mutual funds. Specifically, the table reports the descriptive statistics for the natural

[10]The United States Environmental Protection Agency classifies firms' emissions of CO2 (and CO2 equivalents) in three categories: scope 1 (directly produced by a firm of its controlled companies), scope 2 (emissions associated to the consumption of purchased energy) and scope 3 (emissions associated to the a firm's production, including those that occur along the value chain of a firm, excluding scope 2 ones). In the analysis, we consider either scope 1 or scope 1 plus scope 2 emissions because scope 3 emissions are less reliable. For further details, please refer to Scope 1 and Scope 2 Inventory Guidance.

[11]Green funds achieve a different CO2 footprint than other funds in our sample by allocating their assets to different sectors. Looking at the average allocation share to 45 ICB sectors over our sample period, we find that green funds display significant larger exposures (around 3 percentage points) to Alternative Energy and Electricity, and, partially by construction, lower exposures to Oil & Gas Producers, and Oil Equipment Services & Distribution sectors. For the majority of the 45 ICB sectors which the funds in our sample invest in, the difference between green funds and non-green funds in the average allocation share is not statistically different from zero.

logarithm of the value of funds' holdings and the corresponding weight in the asset allocation, as well as observables of the companies where the funds invest in, such as average stock return and stock market capitalization over a quarter. As highlighted above, these variables are available for a sub-group of mutual funds on a quarterly basis; the total number of observations of equity holdings is approximately 15 million.

To measure the prominence of climate news, we use the Media and Climate Change Observatory (MeCCO) index. This index is compiled by accessing archives through the Lexis Nexis, Proquest, and Factiva databases via the University of Colorado libraries. It encompasses prominent US media (newspapers, television and radio) and measures the number of articles on issues related to climate change or global warming at monthly frequency. In Figure 1 we report the MeCCO index after rescaling the number of news by 100.[12] Notice that, the MeCCO index is highly correlated with other climate news attention indexes, such as the one proposed by Engle et al. (2020), with a correlation coefficient of 0.58. In our study, we use the MeCCO because it is frequently updated, whereas Engle et al. (2020)'s index is only available up to 2017.

In the bottom rows of Table 1 we report the average number of Mecco index which is of about 500 news per month with a significant standard deviation; we also report the logged version of the index as this will be used in the regression analysis. Figure 1 shows that index peaked in December 2009 during the COP15 conference in Copenhagen. Subsequently, MeCCO declined and remained at a low level for long period. Starting in 2015, it began to increase again, reaching a peak in October 2021 during COP 21 when public attention to climate change intensified. Furthermore, extreme climate events such as hurricanes Dorian (in September 2019) or Sally (in September 2020) generated a spike in media attention. Therefore, the monthly changes in the index naturally reflect the attention of the media to both physical and transition risks. Even though some recent studies have developed different climate news and attention indices to capture specific aspects of climate risks, we intentionally employ the simple MeCCO index because it captures a broad spectrum of public interests in the baseline analysis. In a subsequent analysis, we exploit the Actuaries

[12]For more detailed information, the reader may refer to http://mecco.colorado.edu.

Climate Index (ACI) to disentangle the physical- and transition- risk component of climate news.

Insert Figure 1 here

2.2 Econometric model

We leverage the temporal and cross-sectional variation of fund flows for mutual fund i at time t through the following panel regression model at the fund-month-year level:

$$Flow_{i,t} = \beta Mecco_t \times \mathit{Green\ Fund}_i + \alpha_i + \gamma_t + X_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

In this equation, $Flow_{i,t}$ represents the net flow of mutual fund i at time t scaled by the fund value at time $t-1$, $Mecco$ corresponds to the log of the climate news index normalized by its standard deviation, and *Green Fund* is an indicator variable for green funds as defined in the previous section. α_i and γ_t denote fund- and time fixed effects, respectively. Note that time fixed effects naturally absorb all the variation in $Mecco_t$ meaning we fully control for the average response of investors to climate news. Furthermore, fund fixed effects control for unobservable characteristics at the fund level and absorb the *Green Fund* dummy. Our coefficient of interest is β. Under the assumption that an increase in public awareness about climate influences the investment behavior of mutual fund investors towards green funds, we expect the coefficient of interest to be positive. Standard errors are clustered at fund level.[13]

Following previous literature, we include as control variables the lagged values of the logarithm of the total fund size, flows, fund performance, total expense ratio, and PBR. Since each fund share class may have a different fee structure, fund flows within different share classes of the same fund are expected to exhibit varying responses to climate news shocks. Therefore, we analyze fund flows at the fund-share class level.

Next we investigate the effect of climate news on funds' portfolio allocation to examine if green mutual funds allocate funds more to greener firms, relatively to browner ones, in

[13]As robustness, we replicate the baseline results by clustering at primary fund level; results are confirmed after this check and are available upon request.

reaction to increasing climate news to a greater extent than non-green funds. We run a panel regression at the target firm-fund-quarter-year level where the main dependent variable is the natural logarithm of the number of equity shares of firm j held by fund i at quarter t as follows:

$$
\begin{aligned}
y_{i,j,t} = \beta Mecco_t \times \textit{Green Fund}_i \times \textit{Lagged FirmEmission}_j \\
+\alpha_{i,t} + \gamma_{j,t} + X_{i,j,t-1} + \varepsilon_{i,j,t}
\end{aligned}
\tag{2}
$$

Differently from specification in equation (1), the i unit of observation refers to each primary fund, and not to a single share class. Furthermore, j refers to each company in the sample and t denotes quarters in the period 2016q4-2022q4. Given that the analysis is at quarterly frequency, the variable $Mecco$ is measured by the average climate news index (MeCCO) in each quarter t.[14] Notice that our specification includes the one-quarter lagged value of the outcome variable, and thus delivers the same estimates of parameter of interests of a similar specification where the outcome variable is expressed in quarterly changes. $\alpha_{i,t}$ and $\gamma_{j,t}$ denote time-varying fund- and firm- level fixed effects, and capture unobservable time-varying characteristics at the fund- and firm- level, respectively. Importantly, firm-quarter fixed effects account for all company-level changes that occur in each quarter and are contemporaneous to the climate news, including stock price changes that could be impacted by the reaction of green investors (Gong et al., 2023). $LaggedFirmEmission_j$ corresponds to the greenness or brownness indicator for firm j, lagged by one year.[15] In the baseline model, we use the green house gas (GHG) emissions for scope 1 plus 2 over total revenues as an indicator of brownness of firms (ie, emission intensity).

The coefficient of interest is again β, which measures the response of holdings by green funds i (relative to non-green funds) in relatively higher GHG emitting firm j, in response to an increase in one standard deviation of the climate news index. If green funds are indeed

[14]As a robustness we have replicated the holding-level analysis using the maximum value of the Mecco index within each quarter rather than its quarterly average. Results are confirmed under this alternative construction of the explanatory variable and are available upon request.

[15]The reason why the variable is lagged by one year and not by one quarter is that emissions are measured at yearly frequency.

highly sensitive to higher coverage of climate news, the triple interaction coefficient will be negative, meaning that green funds react more to increases in public attention to climate risks by reducing exposure to relatively higher emitters. In these analyses, standard errors are clustered at fund and firm level.

3 Analysis of funds' flows

First, we present the estimation results for the analysis at the fund level documenting the effect of climate news on mutual fund flows. Next, we present our findings from the fund-holding level analysis shedding light on the relationship between public attention to climate risks and mutual fund portfolio allocation.

3.1 Green fund flows and climate news

Table 2 illustrates the estimation results for equation 1 with various specifications. In Column (1) of Table 2, the interaction term between the climate news index and the green fund dummy is positive and statistically significant. This finding indicates that green funds experience larger inflows than non-green funds when the climate news index increases. In other words, this result suggests that the rise in public attention to climate risks has an impact on the behavior of mutual fund investors. Furthermore, the impact is economically significant, with a one standard deviation increase in the log of MeCCO leading to about a 1.3 percent inflows for green funds relative to non-green funds; this is a size-able effect given that the median flow is around -0.5%.

The two control variables, namely lagged fund size and lagged fund flow, have significantly negative and positive coefficients, respectively. This implies that smaller funds experience, on average, lower inflows, while funds that experience larger inflows in the previous month attract more inflows.

Columns (2) to (4) report the estimation results with additional control variables, including the lagged fund return and total expense ratio. These results consistently demonstrate that the interaction effect between MeCCO and the green fund dummy remains significantly positive across all specifications. It is worth noting that the inclusion of the weighted average of the price-to-book ratio for firms in the mutual fund portfolio leads to a reduction in the sample size; in these specifications, the coefficient of interest becomes smaller in absolute value but remains consistent and statistically significant. In column (4), we display the results including the interaction terms between MeCCO and the fund-level control variables. Importantly, the coefficient of interest –the interaction term between the climate news index and the green fund dummy –remains significantly positive and of similar magnitude when compared with column (3).

In summary, green mutual funds experience larger inflows in response to an increase in climate news compared to non-green funds. This evidence suggests that the heightened public attention to climate risks does have an impact on the behavior of mutual fund investors.

Insert Table 2 here

3.1.1 Persistence of the impact on mutual fund flows

In the previous section, we studied the contemporary response of fund flows in period t to the climate news index in month t as an independent variable. In this section, we use the fund flow in period $t+h$, with $h = 0, .., 5$ as a dependent variable to investigate how gradually and persistently investors respond to changes in the climate news index. We include the same set of control variables as the one used in column (5) of Table 2, even though we do not report all the estimated coefficients for conciseness. Table 3 reports the estimation results. To ease the comparison across estimates, in column (1) we report the baseline estimate from Table 2, column (4). The coefficient associated to the interaction term $MeCCO \times GreenFund$ in column (2) indicates that the flow in the following month is still affected by the change in the climate news index, even though to a lower extent as suggested by its smaller size. Consistently, columns (3) to (5) show that higher flows into green funds following an increase in the climate news index persist over a quarter from the climate news.[16]

[16]This persistent effect supports the subsequent holding-level analysis which is based on data observed at quarterly frequency.

These results suggest that the effect of higher public attention to climate persistently impacts the inflows into green funds, although at decreasing rate, as expected.

Insert Table 3 here

3.1.2 Physical and transition risks

In the previous section, we demonstrated the significant and persistent effect of climate news shocks on mutual fund flows. However, it is important to note that climate news reflects various factors in the economy. For instance, the climate news index may increase in response to events like droughts or floods, indicating an increase in physical risk. Conversely, discussions by governments about the introduction of carbon taxes can also lead to an increase in the index, however the latter are associated with transition risk rather than physical risk.

To disentangle factors related to physical risk from the MeCCO index, we exploit the Actuaries Climate Index (ACI). The ACI captures the intensity of abnormal climate events and reflects observed changes in extreme weather and sea levels, including phenomena such as droughts, heavy rain, and extreme temperatures in the United States and Canada.[17] When we plot MeCCO alongside ACI in Figure 2, it is evident that they exhibit a moderate correlation.

Insert Figure 2 here

Specifically, to control for the influence of extreme weather events, we regress the MeCCo index on the ACI and use the predicted component as a measure of climate news related to physical risk, while the residual component as a measure of public attention related to transition risk.[18]

To enhance the comparability between coefficient estimates, we normalize the predicted and the residual component by their estimated standard deviations. We then replicate the

[17] Additional information about the index can be found at https://actuariesclimateindex.org/home/.
[18] Estimation details are presented in the Appendix 5.

baseline analysis in Table 2 by using the two estimated variables instead of the standardized logarithm of MeCCO.

Table 4 reports the results of the regressions featuring the measure of climate news related to physical and transition risk. Although not reported in the table, these specifications include the same set of controls used in column (4) of Table 2. Results in Table 4 highlight a positive interaction effect of climate news related to both physical and transition risk and the green fund dummy, with a larger coefficient attached to the transition-risk component of the MeCCO index in columns (1) and (2).

The coefficient of the interaction term with the component related to physical risk of MeCCO is, instead, not statistically significant in specifications that include all control variables (columns (3) and (4)). Notice that, also in this case, the variables are scaled by their standard deviation to enhance their comparisons. The estimates suggest that both public interest in realized physical risks (e.g., due to abnormal weather events) and attention to transition risks (not directly associated with past realized events, e.g., changes in regulation) may be a driving force behind the impact of the climate news index on larger inflows into green funds, with the latter having stronger impact.

Insert Table 4 here

3.1.3 Robustness checks

In this section, we report results from additional analyses and robustness checks regarding to the baseline fund-level analysis in Table 2.

Primary funds only. We replicate the baseline analysis by considering only primary funds. Selecting primary funds allows to give equal weights to all mutual funds, irrespective of their number of share classes. Results in Table 5 confirm baseline findings.

Insert Table 5 here

Funds with holdings' information. Holding level data, which will be used in the next section to analyze the relation between climate news and portfolio reallocation by mutual funds, are available only for a subgroup of primary funds. Thus, as a further robustness, we replicate the baseline estimates by considering only this sub-group of funds. Results in Table 6 confirm the findings in Table 2.

Insert Table 6 here

Controlling for funds' benchmark index. Our analysis is based on active equity US mutual funds that do not passively track indexes. However, each funds may be characterized by investment style factors that could be systematically different between green and non-green funds. In order to control for this potential difference, we retrieve information from Lipper on the fund manager benchmark indexes of each fund. In our sample of about 400 different indexes, 41 are related to green funds. As a robustness test, we repeat the baseline analysis after including benchmark-month fixed effects. Results in Table 7 are consistent with the baseline. Notice that this test is not necessary in the holding analysis as it is based on primary funds only and all specifications include funds-time fixed effects, which naturally account for differences among funds in investment style strategies.

Insert Table 7 here

Sample split between pre and post 2016 As shown in Figure 1 there is, over the past decades, an increasing attention to climate by the general public. In particular, starting from 2016, there is a clear increase in news coverage about climate. This period coincides with the 2015 Paris Agreement and the release of fund-level ESG information, including the ESG Globes and the Low Carbon Designation (LCD). In this section we investigate if, and to which extent, our results are driven by observations in more recent years. To this purpose, we split our sample between two sub-periods (pre- and post- 2016) and repeat our estimates from Table 2, columns (3) and (4). Results in Table 8 show that coefficient estimates are consistent with the baseline results in both sub-periods, but are larger and precisely estimated in the post-2016 period. The reason is possibly because after 2016 there has been a growing attention to climate issues, and increasing demand for green funds, as well as supply of green funds in the financial industry as documented in the literature.

Insert Table 8 here

4 Analysis of funds' portfolios

4.1 Green funds and portfolio allocation

In this section, we investigate the effect of climate news on mutual funds' portfolios using data on holdings (at quarterly level) and estimating the model in equation (2). In Table 9 we present the estimates for the specification in equation (2), where the dependent variable is the logarithm of the weight by firm j in a fund's portfolio i in quarter t.[19]

Insert Table 9

Column (1) displays the estimation results in a specification that, in line with the above strategy, only includes the lag of the dependent variable, and the lagged value of each fund's total value as controls, besides the presence of fund-quarter and firm-quarter fixed effects. Given the presence of such granular fixed effects, in order to control for time-varying characteristics at the fund level, we include variables constructed by the triple interaction between the $Mecco$, the $LaggedFirmEmission$ and the control variable (e.g., each fund total value). The estimated coefficient associated with the triple interaction term involving the climate news index, the green fund dummy, and the emission intensity (GHG emissions under scope 1 and 2 over total revenues) is negative and statistically different from zero. It indicates that in response to a one standard deviation increase in the logarithm of the climate news index, green funds are likely to reduce their investments in relatively higher emitters when

[19] As specified above, the emission intensity of each firm is measured by the yearly lagged value of emissions under scope 1 plus scope 2 classification over total revenues. However, we repeat the entire subsequent analysis by using emissions under scope 1 only and the results, available upon request, are substantially confirmed.

compared to non-green funds. In words, we find that green funds take into consideration the emission intensity of their investments more than non-green funds, following increases in public attention to climate.

This result complements the previous findings on fund flows and highlight that not only investors, but also fund managers react to climate news. We show that they reallocate their funds' portfolios away from browner companies, a reaction that is larger for green funds relative to other funds. The estimates is also sizeable: comparing a high-emitting vs a low-emitting company (a difference in emissions over total revenues equal to a standard deviation, about 0.30) a standard deviation increase in MeCCO generates a reduction in weights that is about 0.001% larger for green funds relative to non-green funds. This has a substantial influence, particularly given that the median quarterly change in the log of weights is around 0% (the average quarterly change is -0.004%).

In column (2) we add as further controls at fund-level, measured by the triple interactions between $Log(Mecco)$, $LaggedFirmEmission$, and the control variables used in the previous analysis lagged by one quarter (i.e. Total expense ratio, PBR and performance). Results are robust to the inclusion of these further controls. In addition, in column (3), we add further controls at the firm level: the one-year lagged value of firms' market capitalization and the one-quarter lagged value of firms' average stock returns. In this case, the additional regressors are constructed by the triple interaction term between $Mecco$, the $Greenfund$ dummy and the firms' controls. The estimate of our main coefficient of interest is robust also in this case.[20]

While the coefficient attached to the triple interaction between climate news, the green fund dummy and the lagged emission intensity has a negative coefficient, we cannot conclude whether the effect is driven by a declining exposure towards browner companies or an increasing exposure towards greener companies. To distinguish the impact on green firms from that on brown firms, we estimate a specification that includes two triple interaction terms: $Mecco$ times the $Greenfund$ dummy, times two (alternative) dummy variables at firm level,

[20]In unreported regressions, splitting the regression analysis between green and non-green funds, we highlight that the increase in holdings towards low emitting firms by the first ones relative to the others, is due to a significant increase in exposure by the green funds.

one identifying relatively low emitting companies, the other for high emitting companies. These two dummies are measured using the lowest and highest terciles of the distribution of one-year lagged emission intensity; in this case, the baseline group is represented by firms at the center of the emission distribution. In details, *Low Emission Intensity* indicates firms with GHG emission over revenues in the lowest tercile in the previous year distribution, while *High Emission Intensity* indicates firms in the highest tercile. The estimation results are presented in Table 10. The coefficient of the triple interaction term for the low emitters (ie $MeCCO \times GreenFund \times LowEmissionIntensity$) is positive, quantitatively indicating that, following a standard deviation increase in climate news, the portfolio weights to low emitting companies by green funds increases by about 0.003% more than non-green funds. Importantly, this increase in allocation towards greener firms, occurs with a contemporaneous declining exposure towards browner companies. That is, the coefficient of the triple interaction term for the high intensity indicator ($MeCCO \times GreenFund \times HighEmissionIntensity$) is significantly negative in all specifications, suggesting that the investment in high emitting firms by green funds tend to be relatively lower when compared to the investment by non-green funds for a given increase in the climate news index.

Insert Table 10 here

4.1.1 Additional results and robustness checks

Persistence of the impact on holdings. In line with the previous analysis, we test how persistent is the impact of climate news on funds' portfolio allocations. In column (1) of Table 11 we report the estimated coefficient of interest from column (3) of Table 9, that is the specification including fund-time and firm-time fixed effects as well as all controls at fund- and firm- level . In columns (2) to (5) in Table 11 we report the estimates of the β coefficient where the dependent variable is the logarithm of the weight from quarter $t + 1$ to $t + 4$, respectively.

Insert Table 11 here

Results show that the impact of the climate news index is persistent over time. The coefficient of interest is increasing in magnitude (in absolute value) over quarters, indicating that the exposure of green funds with respect to non-green funds towards relatively high-emitters is persistently declining over time following climate news.

Physical and transitory risk. We replicate the analysis in Table 9, by distinguishing between climate news on physical and transitory risk, in line with the strategy adopted in Table 4. The results in Table 12 show that the estimated (negative) impact of climate news on portfolio weights of green funds towards relatively high-emitting firms is larger and significant when climate news refer to physical risks.

Insert Table 12 here

Sample split between pre- and post- 2016 Consistently with the flow analysis, we replicate the baseline holding-level analysis by sample splitting our period between pre- and post- 2016. Results are reported in Table 13. They show that, in line with the above results, coefficient estimates are larger and more precisely estimated in the more recent years after 2016, confirming the growing importance of green finance for both investors and funds' managers, especially following climate news' hikes. Notice, however, that the sample is highly under-represented in the pre-2016 period, due to the lack of data.

Insert Table 13 here

Robustness tests. In the previous section, we have used the portfolio weights rather than the value of shares held in funds' portfolios as our main dependent variable to overcome the concern that estimation results could be driven by differential changes in stock valuations of low/high emitting companies held by green/non-green funds in response to climate news. In this section, we show that our results are confirmed when using the logarithm of the value of shares held, rather than the weights, as dependent variable. In the Appendix B, Tables B1, B2, B3, B4 and B5, we replicate entirely the analysis contained in the previous section using the value of holdings as dependent variable. The results align with the previous ones, and are consistent with the idea that in response to climate-related news, green funds adjust their portfolio exposures depending on firms' emission intensity.

5 Conclusions

In this paper, we investigate the effect of changes in public attention to climate on mutual fund flows, and analyze the reaction of mutual funds' investment portfolios to such events.

Using fund-level data, we find that green funds attract more inflows than non-green funds when attention to climate news increases. This impact is both economically significant and persistent. Furthermore, using the information on funds' stock holding, we demonstrate that, compared to non-green funds, green funds are more likely to increase their investments in green firms and reduce their exposure to brown firms in response to changes in climate news.

While previous literature has primarily examined the impact of green labeling on fund flows and performance, we emphasize the role of public attention to climate issues, as reflected in prominent news outlets. Our results indicate that the rise in news media coverage influences both the investment behavior of mutual fund investors and managers and suggest that, in such context, green funds may play an important role in promoting a sustainable economic transformation.

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Tables

Table 1: Summary statistics for green and non-green funds

	Mean	St Dev	P10	Median	P90	Observations
Green funds						
Fund-level data						
Flow	1.36	15.89	-4.48	-0.41	6.16	29,170
Log(Total value)	2.86	2.69	-0.69	2.84	6.05	29,394
Total expense ratio	1.31	0.53	0.70	1.24	2.02	27,037
Price-to-book	5.11	2.31	2.69	4.55	8.55	22,915
Performance	0.54	5.16	-6.29	1.01	6.38	25,451
Emissions (scope 1) over revenues	0.18	0.29	0.04	0.11	0.35	23,999
Emissions (scope 1 plus 2) over revenues	0.22	0.32	0.06	0.15	0.39	23,999
Holding-level data						
Log(Weight)	-2.73	2.31	-5.78	-2.82	0.40	428,347
Log(Shares held)	9.53	2.28	6.90	9.31	12.58	428,480
Companies' average stock return	0.01	0.16	-0.17	0.01	0.17	445,670
Companies' Log(market cap.)	8.44	1.98	5.79	8.43	11.04	327,353
Non-green funds						
Fund-level data						
Flow	1.03	15.96	-4.80	-0.48	5.53	2,007,905
Log(Total value)	3.21	2.86	-0.92	3.43	6.75	2,015,472
Total expense ratio	1.33	0.53	0.74	1.24	2.09	1,909,666
Price-to-book	4.74	2.53	2.29	4.07	8.16	1,542,508
Performance	0.56	5.25	-6.19	1.03	6.38	1,643,118
Emissions (scope 1) over revenues	0.20	0.32	0.02	0.11	0.40	1,347,689
Emissions (scope 1 plus 2) over revenues	0.24	0.35	0.05	0.15	0.46	1,347,689
Holding-level data						
Log(Weight)	-1.71	2.06	-4.66	-1.31	0.62	13,773,312
Log(Shares held)	10.84	2.45	7.70	10.87	13.95	13,777,267
Companies' average stock return	0.01	0.17	-0.16	0.02	0.18	14,397,592
Companies' Log(market cap.)	8.84	1.82	6.41	8.83	11.21	10,242,740
Mecco index						
Mecco index (over 100)	5.24	2.82	2.40	4.57	8.69	189
Log (Mecco index)	1.53	0.50	0.88	1.52	2.16	189

NOTE: The table reports the descriptive statistics. The fund-level data for the period December 2006 to June 2022 is at monthly frequency. The holding-level data for the period December 2006 to June 2022 is at quarterly frequency. The Mecco index is recorded each month over the sample period. Sources: Refinitiv Lipper; S&P Capital IQ; Media and Climate Change Observatory; authors' calculations.

Table 2: Fund-flow analysis

	Dependent variable: Flow			
	(1)	(2)	(3)	(4)
Mecco × Green fund	0.726***	0.597***	0.426***	0.441***
	(0.15)	(0.13)	(0.15)	(0.14)
L.Log(Total value)	-2.226***	-1.691***	-1.717***	-1.782***
	(0.03)	(0.03)	(0.04)	(0.05)
L.Flow	0.120***	0.090***	0.078***	0.078***
	(0.00)	(0.00)	(0.01)	(0.01)
L.Total expense ratio		-1.210***	-1.286***	-0.232
		(0.18)	(0.23)	(0.25)
L.PBR			0.354***	0.422***
			(0.02)	(0.03)
L.Performance			0.202***	0.260***
			(0.01)	(0.02)
Mecco × L.Log(Total value)				0.019*
				(0.01)
Mecco × L.Total expense ratio				-0.429***
				(0.05)
Mecco × L.PBR				-0.020**
				(0.01)
Mecco × L.Performance				-0.020***
				(0.01)
Observations	2,025,096	1,923,193	1,223,102	1,223,102
Adjusted R-squared	0.091	0.070	0.070	0.070

NOTE: The table reports the coefficients of a panel OLS regression at the fund-month-year level corresponding to equation 1. Monthly data for the period December 2006 to June 2022. Regressions include fund- and time fixed effects. Standard errors clustered at the fund level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table 3: Fund-flow analysis: persistence

Dependent variable:	Flow	F.Flow	F2.Flow	F3.Flow	F4.Flow
	(1)	(2)	(3)	(4)	(5)
Mecco × Green fund	0.441***	0.358**	0.397***	0.333**	0.277**
	(0.14)	(0.15)	(0.14)	(0.13)	(0.13)
Controls	Y	Y	Y	Y	Y
Mecco × Controls	Y	Y	Y	Y	Y
Observations	1,223,102	1,216,793	1,210,104	1,203,477	1,197,056
Adjusted R-squared	0.070	0.069	0.068	0.065	0.064

NOTE: The table reports the coefficients of a panel OLS regression at the fund-month-year level corresponding to column (4) in Table 2. Monthly data for the period December 2006 to June 2022. Regressions include fund- and time fixed effects. Standard errors clustered at the fund level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table 4: Fund-flow analysis: physical vs transition risk

	Dependent variable: Flow			
	(1)	(2)	(3)	(4)
Mecco (physical risk) × Green fund	0.247***	0.186**	0.120	0.125
	(0.09)	(0.08)	(0.10)	(0.10)
Mecco (transition risk) × Green fund	0.626***	0.520***	0.374***	0.386***
	(0.13)	(0.11)	(0.13)	(0.13)
L.Log(Total value)	-2.225***	-1.690***	-1.717***	-1.730***
	(0.03)	(0.03)	(0.04)	(0.04)
L.Flow	0.120***	0.090***	0.078***	0.078***
	(0.00)	(0.00)	(0.01)	(0.01)
L.Total expense ratio		-1.210***	-1.286***	-1.433***
		(0.18)	(0.23)	(0.23)
L.PBR			0.354***	0.368***
			(0.02)	(0.02)
L.Performance			0.202***	0.202***
Mecco (physical risk) × Controls	N	N	N	Y
Mecco (transition risk) × Controls	N	N	N	Y
Observations	2,025,096	1,923,193	1,223,102	1,223,102
Adjusted R-squared	0.091	0.070	0.070	0.070

NOTE: The table reports the coefficients of a panel OLS regression at the fund-month-year level corresponding to equation 1. Monthly data for the period December 2006 to June 2022. Regressions include fund- and time fixed effects. Standard errors clustered at the fund level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table 5: Fund-flow analysis: only primary funds

	Dependent variable: Flow			
	(1)	(2)	(3)	(4)
Mecco × Green fund	0.552**	0.534***	0.390**	0.419**
	(0.22)	(0.16)	(0.19)	(0.19)
L.Log(Total value)	-1.846***	-1.082***	-1.139***	-1.330***
	(0.06)	(0.05)	(0.07)	(0.09)
L.Flow	0.162***	0.125***	0.097***	0.097***
	(0.01)	(0.01)	(0.02)	(0.02)
L.Total expense ratio		-0.492**	-0.615**	-0.784**
		(0.23)	(0.28)	(0.35)
L.PBR			0.276***	0.264***
			(0.02)	(0.05)
L.Performance			0.180***	0.254***
			(0.01)	(0.03)
Mecco × L.Log(Total value)				0.069***
				(0.02)
Mecco × L.Total expense ratio				0.051
				(0.07)
Mecco × L.PBR				0.002
				(0.01)
Mecco × L.Performance				-0.026***
				(0.01)
Observations	612,828	586,311	370,633	370,633
Adjusted R-squared	0.103	0.068	0.066	0.066

NOTE: The table reports the coefficients of a panel OLS regression at the fund-month-year level corresponding to equation 1. Monthly data for the period December 2006 to June 2022. Regressions include fund- and time fixed effects. Standard errors clustered at the fund level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table 6: Fund-flow analysis: only funds with holding's data

	Dependent variable: Flow			
	(1)	(2)	(3)	(4)
Mecco × Green fund	0.592***	0.519***	0.320**	0.315**
	(0.15)	(0.13)	(0.16)	(0.15)
L.Log(Total value)	-2.130***	-1.725***	-1.756***	-1.738***
	(0.03)	(0.03)	(0.04)	(0.06)
L.Flow	0.120***	0.094***	0.080***	0.080***
	(0.00)	(0.00)	(0.01)	(0.01)
L.Total expense ratio		-1.754***	-1.849***	-0.278
		(0.22)	(0.28)	(0.30)
L.PBR			0.328***	0.407***
			(0.02)	(0.04)
L.Performance			0.214***	0.296***
			(0.01)	(0.03)
Mecco × L.Log(Total value)				-0.014
				(0.01)
Mecco × L.Total expense ratio				-0.625***
				(0.05)
Mecco × L.PBR				-0.022***
				(0.01)
Mecco × L.Performance				-0.028***
				(0.01)
Observations	1,435,381	1,382,244	894,431	894,431
Adjusted R-squared	0.097	0.076	0.076	0.076

NOTE: The table reports the coefficients of a panel OLS regression at the fund-month-year level corresponding to equation 1. Monthly data for the period December 2006 to June 2022. Regressions include fund- and time fixed effects. Standard errors clustered at the fund level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table 7: Fund-flow analysis: including benchmark-month fixed effects

	Dependent variable: Flow			
	(1)	(2)	(3)	(4)
Mecco × Green fund	0.712***	0.548***	0.394*	0.410**
	(0.19)	(0.16)	(0.21)	(0.20)
L.Log(Total value)	-2.288***	-1.767***	-1.763***	-1.814***
	(0.04)	(0.04)	(0.05)	(0.06)
L.Flow	0.114***	0.084***	0.072***	0.072***
	(0.00)	(0.01)	(0.01)	(0.01)
L.Total expense ratio		-1.243***	-1.369***	-0.208
		(0.24)	(0.30)	(0.32)
L.PBR			0.305***	0.325***
			(0.03)	(0.06)
L.Performance			0.240***	0.308***
			(0.02)	(0.04)
Mecco × L.Log(Total value)				0.013
				(0.01)
Mecco × L.Total expense ratio				-0.469***
				(0.05)
Mecco × L.PBR				-0.007
				(0.01)
Mecco × L.Performance				-0.024**
				(0.01)
Observations	2,008,962	1,907,724	1,211,302	1,211,302
Adjusted R-squared	0.101	0.078	0.079	0.079

NOTE: The table reports the coefficients of a panel OLS regression at the fund-month-year level corresponding to equation 1. Monthly data for the period December 2006 to June 2022. Regressions include fund- and time fixed effects. Standard errors clustered at the fund level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table 8: Fund-flow analysis: Pre vs Post 2016

	Dependent variable: Flow			
	(1)	(2)	(3)	(4)
	PRE-2016		POST-2016	
Mecco × Green fund	0.216	0.196	0.745***	0.755***
	(0.22)	(0.22)	(0.22)	(0.22)
L.Log(Total value)	-2.351***	-2.319***	-2.565***	-2.661***
	(0.06)	(0.08)	(0.07)	(0.09)
L.Flow	0.063***	0.063***	0.063***	0.064***
	(0.01)	(0.01)	(0.01)	(0.01)
L.Total expense ratio	-0.570*	-0.841**	-1.381***	0.061
	(0.34)	(0.36)	(0.44)	(0.48)
L.PBR	0.493***	0.632***	0.376***	0.313***
	(0.04)	(0.07)	(0.02)	(0.04)
L.Performance	0.224***	0.203***	0.171***	0.191***
	(0.01)	(0.03)	(0.01)	(0.04)
Mecco × L.Log(Total value)		-0.015		0.020
		(0.02)		(0.01)
Mecco × L.Total expense ratio		0.126*		-0.453***
		(0.07)		(0.07)
Mecco × L.PBR		-0.058***		0.014
		(0.02)		(0.01)
Mecco × L.Performance		0.009		-0.006
		(0.01)		(0.01)
Observations	654,500	654,500	568,517	568,517
Adjusted R-squared	0.087	0.087	0.081	0.081

NOTE: The table reports the coefficients of a panel OLS regression at the fund-month-year level corresponding to equation 1. Monthly data for the period December 2006 to June 2022. Regressions include fund- and time fixed effects. Standard errors clustered at the fund level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table 9: Holding analysis: portfolios' weights

	Dependent variable: Log(weight)		
	(1)	(2)	(3)
Mecco × Green fund × L.Emission Intensity	-0.0032***	-0.0038***	-0.0033***
	(0.001)	(0.001)	(0.001)
L.Log(Weight)	0.9131***	0.9118***	0.9120***
	(0.003)	(0.004)	(0.004)
Mecco × L.Log(Total value) × L.Emission Intensity	-0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)
Mecco × L.Total expense ratio × L.Emission Intensity		0.0002	0.0002
		(0.000)	(0.000)
Mecco × L.PBR × L.Emission Intensity		-0.0001	-0.0001*
		(0.000)	(0.000)
Mecco × L.Performance × L.Emission Intensity		-0.0002**	-0.0002**
		(0.000)	(0.000)
Mecco × Green fund × L.Firm size			0.0038***
			(0.001)
Mecco × Green fund × L.Stock Return			0.0270*
			(0.015)
Observations	8,080,151	6,726,776	5,863,059
Adjusted R-squared	0.971	0.973	0.972

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

Table 10: Holding analysis: high and low emitting companies

	Dependent variable: Log(weight)		
	(1)	(2)	(3)
Mecco × Green fund × Low Emission Intensity	0.0027***	0.0027**	0.0010
	(0.001)	(0.001)	(0.001)
Mecco × Green fund × High Emission Intensity	-0.0013	-0.0026***	-0.0027***
	(0.001)	(0.001)	(0.001)
L.Log(Weight)	0.9131***	0.9117***	0.9120***
	(0.003)	(0.004)	(0.004)
Mecco × L.Log(Total value) × L.Emission Intensity	-0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)
Mecco × L.Emission Intensity × Fund-level controls	N	Y	Y
Mecco × Green fund × Firm-level controls	N	N	Y
Observations	8,080,151	6,726,776	5,863,059
Adjusted R-squared	0.971	0.973	0.972

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

Table 11: Holding analysis: persistence of portfolios' weights

	(1) Log(weight)	(2) F.Log(weight)	(3) F2.Log(weight)	(4) F3.Log(weight)	(5) F4.Log(weight)
Mecco × Green fund × L.Emission Intensity	-0.0033***	-0.0056***	-0.0081***	-0.0101***	-0.0138***
	(0.001)	(0.002)	(0.002)	(0.003)	(0.004)
Mecco × L.Emission Intensity × Fund-level controls	Y	Y	Y	Y	Y
Mecco × Green fund × Firm-level controls	Y	Y	Y	Y	Y
Observations	5,863,059	5,239,484	4,716,007	4,275,491	3,894,013
Adjusted R-squared	0.972	0.953	0.939	0.929	0.921

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

Table 12: Holding analysis: portfolios' weights and physical vs transition risk

	Dependent variable: Log(weight)		
	(1)	(2)	(3)
Mecco (physical risk) × Green fund × L.Emission Intensity	-0.0014***	-0.0015***	-0.0012***
	(0.000)	(0.000)	(0.000)
Mecco (transition risk) × Green fund × L.Emission Intensity	0.0026	0.0016	0.0014
	(0.002)	(0.002)	(0.003)
L.Log(Weight)	0.9131***	0.9118***	0.9120***
	(0.003)	(0.004)	(0.004)
Mecco (physical risk) × Green fund × L.Log(Total value)	-0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)
Mecco (transition risk) × Green fund × L.Log(Total value)	0.0002	-0.0001	-0.0000
	(0.000)	(0.000)	(0.000)
Mecco × L.Emission Intensity × Fund-level controls	N	Y	Y
Mecco × Green fund × Firm-level controls	N	N	Y

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

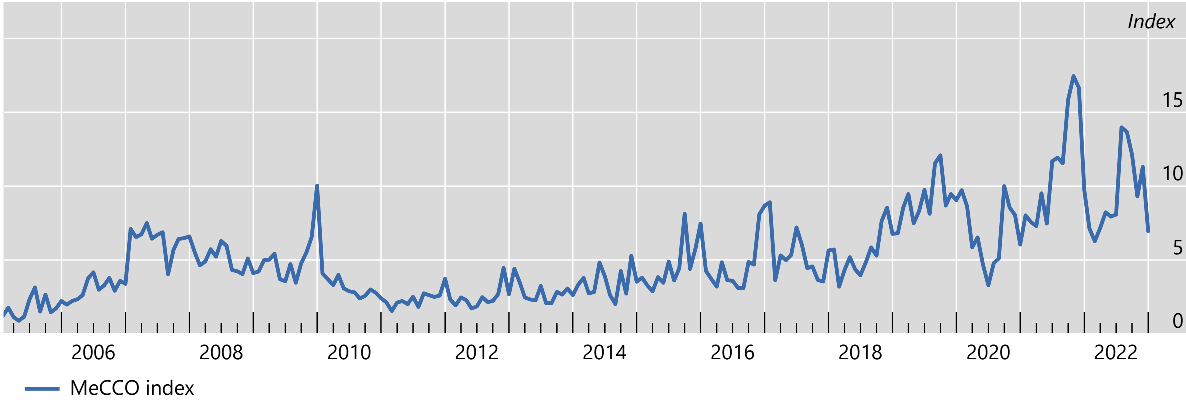
Table 13: Holding analysis: portfolios' weights pre vs post 2016

	Dependent variable: Log(weight)			
	(1)	(2)	(3)	(4)
	PRE-2016		POST-2016	
Mecco × Green fund × L.Emission Intensity	-0.0009	-0.0008	-0.0041***	-0.0036***
	(0.002)	(0.002)	(0.001)	(0.001)
L.Log(Weight)	0.9070***	0.9065***	0.9121***	0.9124***
	(0.005)	(0.005)	(0.004)	(0.004)
Mecco × L.Log(Total value) × L.Emission Intensity	0.0000	-0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)
Mecco × L.Total expense ratio × L.Emission Intensity	0.0013	0.0014	0.0001	0.0001
	(0.001)	(0.001)	(0.000)	(0.000)
Mecco × L.PBR × L.Emission Intensity	-0.0013***	-0.0013***	-0.0001	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Mecco × L.Performance × L.Emission Intensity	-0.0001	-0.0003	-0.0002**	-0.0002*
	(0.000)	(0.000)	(0.000)	(0.000)
Mecco × Green fund × L.Firm size		0.0060***		0.0037**
		(0.002)		(0.001)
Mecco × Green fund × L.Stock Return		0.0385*		0.0265*
		(0.020)		(0.015)
Observations	523,183	452,761	6,203,593	5,410,298
Adjusted R-squared	0.964	0.962	0.973	0.973

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

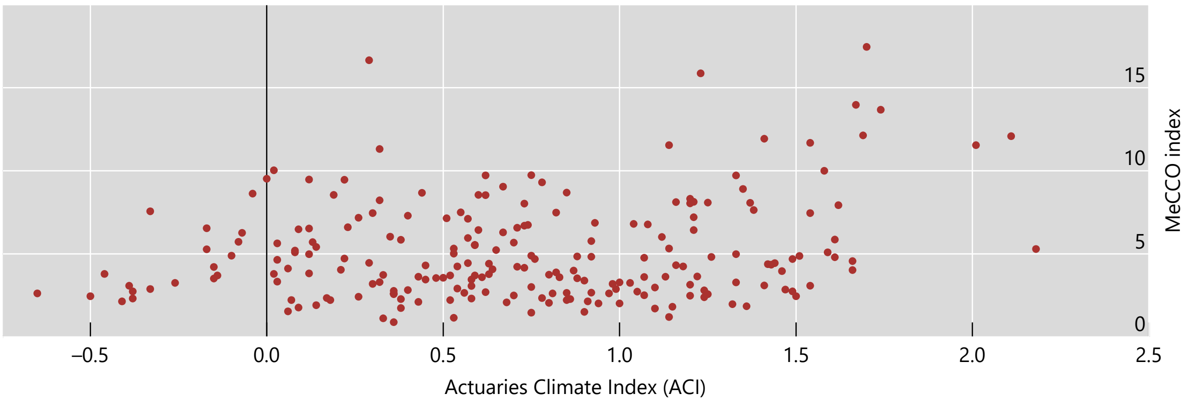
Figures

Figure 1: **Climate news index (MeCCO)**



Note: The graph shows the MeCCO index over the period 2005–2022.

Figure 2: **Physical risk and MeCCO**



Note: The variable on the y-axis corresponds to the MeCCO index. The variable on the x-axis corresponds to the the Actuaries Climate Index (ACI) which is a proxy for for climate-related physical risk. Specifically, it captures the intensity of abnormal climate events and reflects observed changes in extreme weather and sea levels.

Appendix A

In this appendix, we present the estimation results of the regression of logarithm of MeCCO on ACI. We run the following regression model:

$$log(Mecco_t) = \alpha + \sum_{k=0}^{2} \beta_k log(ACI_{t-k}) + ResMecco_t \tag{3}$$

Regression results are displayed in Table A1, lagged ACI have positive and statistically significant coefficients. This outcome suggests that MeCCO reflects certain abnormal weather events, which can be associated with past physical risks.

Table A1: Regression results of MeCCO on ACI

Dependent variable:	Log(Mecco)
	(1)
ACI_t	0.029
	(0.077)
ACI_{t-1}	0.110
	(0.086)
ACI_{t-2}	0.135*
	(0.076)
Constant	1.340***
	(0.059)
N	193
Adj. R^2	0.067

NOTE: The table reports the coefficients of a OLS regression. Monthly data for the period October 2006 to December 2022. Standard errors in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$.

Appendix B

Table B1: Holding analysis: portfolios' shares held

	Dependent variable: Log(shares held)		
	(1)	(2)	(3)
Mecco × Green fund × L.Emission Intensity	-0.0031***	-0.0037***	-0.0033***
	(0.001)	(0.001)	(0.001)
L.Log(Holding volume)	0.9113***	0.9101***	0.9109***
	(0.003)	(0.004)	(0.004)
Mecco × L.Log(Total value) × L.Emission Intensity	-0.0001	0.0000	0.0000
	(0.000)	(0.000)	(0.000)
Mecco × L.Total expense ratio × L.Emission Intensity		0.0003	0.0003
		(0.000)	(0.000)
Mecco × L.PBR × L.Emission Intensity		-0.0001	-0.0001
		(0.000)	(0.000)
Mecco × L.Performance × L.Emission Intensity		-0.0003**	-0.0002*
		(0.000)	(0.000)
Mecco × Green fund × L.Firm size			0.0039***
			(0.001)
Mecco × Green fund × L.Stock Return			-0.0008
			(0.007)
Observations	8,083,873	6,730,296	5,865,915
Adjusted R-squared	0.975	0.976	0.974

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

Table B2: Holding analysis: persistence of portfolios' shares held

	(1)	(2)	(3)	(4)	(5)
	Log(shares held)	F.Log(shares held)	F2.Log(shares held)	F3.Log(shares held)	F4.Log(shares held)
Mecco × Green fund × L.Emission Intensity	-0.0033***	-0.0056***	-0.0080***	-0.0100***	-0.0139***
	(0.001)	(0.002)	(0.002)	(0.003)	(0.004)
Mecco × L.Emission Intensity × Fund-level controls	Y	Y	Y	Y	Y
Mecco × Green fund × Firm-level controls	Y	Y	Y	Y	Y
Observations	5,865,915	5,241,560	4,718,172	4,277,275	3,895,639
Adjusted R-squared	0.974	0.957	0.945	0.936	0.928

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

Table B3: Holding analysis: high and low emitting companies

	Dependent variable: Log(shares held)		
	(1)	(2)	(3)
Mecco × Green fund × Low Emission Intensity	0.0027**	0.0026**	0.0009
	(0.001)	(0.001)	(0.001)
Mecco × Green fund × High Emission Intensity	-0.0014*	-0.0026***	-0.0026***
	(0.001)	(0.001)	(0.001)
L.Log(Holding volume)	0.9113***	0.9101***	0.9109***
	(0.003)	(0.004)	(0.004)
Mecco × L.Log(Total value) × L.Emission Intensity	-0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)
Mecco × L.Emission Intensity × Fund-level controls	N	Y	Y
Mecco × Green fund × Firm-level controls	N	N	Y
Observations	8,083,873	6,730,296	5,865,915
Adjusted R-squared	0.975	0.976	0.974

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

Table B4: Holding analysis: portfolios' shares held and physical vs transition risk

	Dependent variable: Log(shares held)		
	(1)	(2)	(3)
Mecco (physical risk) × Green fund × L.Emission Intensity	-0.0013***	-0.0015***	-0.0013***
	(0.000)	(0.000)	(0.000)
Mecco (transition risk) × Green fund × L.Emission Intensity	0.0023	0.0013	0.0023
	(0.003)	(0.003)	(0.003)
L.Log(Holding volume)	0.9113***	0.9101***	0.9108***
	(0.003)	(0.004)	(0.004)
Mecco (physical risk) × Green fund × L.Log(Total value)	-0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)
Mecco (transition risk) × Green fund × L.Log(Total value)	0.0001	-0.0001	0.0000
	(0.000)	(0.000)	(0.000)
Mecco × L.Emission Intensity × Fund-level controls	N	Y	Y
Mecco × Green fund × Firm-level controls	N	N	Y
Observations	8,083,873	6,730,296	5,865,915
Adjusted R-squared	0.975	0.976	0.974

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

Table B5: Holding analysis: portfolios' shares held pre vs post 2016

	Dependent variable: Log(shares held)			
	(1)	(2)	(3)	(4)
	PRE-2016		POST-2016	
Mecco × Green fund × L.Emission Intensity	-0.0014	-0.0012	-0.0038***	-0.0036***
	(0.002)	(0.002)	(0.001)	(0.001)
L.Log(Weight)	0.9080***	0.9073***	0.9149***	0.9151***
	(0.005)	(0.005)	(0.004)	(0.004)
Mecco × L.Log(Total value) × L.Emission Intensity	-0.0000	-0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)
Mecco × L.Total expense ratio × L.Emission Intensity	0.0027***	0.0028***	0.0002	0.0002
	(0.001)	(0.001)	(0.000)	(0.000)
Mecco × L.PBR × L.Emission Intensity	-0.0014***	-0.0012***	-0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Mecco × L.Performance × L.Emission Intensity	0.0001	-0.0004	-0.0002**	-0.0002*
	(0.001)	(0.000)	(0.000)	(0.000)
Mecco × Green fund × L.Firm size		0.0057***		0.0036**
		(0.002)		(0.001)
Mecco × Green fund × L.Stock Return		0.0455**		0.0262*
		(0.022)		(0.016)
Observations	523,268	452,819	6,205,834	5,412,103
Adjusted R-squared	0.975	0.974	0.976	0.975

NOTE: The table reports the coefficients of a panel OLS regression with the fund-firm-quarter-year level data from December 2006 to December 2022. Regressions include fund*time and firm*time fixed effects. Standard errors clustered at the fund and firm level in parentheses: * $p < .10$; ** $p < .05$; and *** $p < .01$

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