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Imbalanced ESG investing?☆

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ABSTRACT

This study investigates the imbalance of ESG investing across its environmental (E), social (S), and governance (G) pillars. We find that E plays a more significant role in influencing the imbalance level, and mutual funds prioritize mitigating E risks over S and G risks, which is more pronounced in funds with higher sustainability ratings. Moreover, our findings indicate that investors respond to ESG imbalance, with the level of imbalance showing a negative impact on fund flows, especially for funds with higher sustainability ratings. However, this negative relationship is mitigated as climate change concerns increase. Furthermore, we find that political ideology plays a role in the ESG imbalance, with the imbalance of funds in blue states being more driven by lower environmental considerations compared to those in red states. Additionally, we observe that the ESG imbalance is positively associated with various fund risks. Our study offers implications for policymakers and stakeholders in the asset management industry regarding ESG investing practices.

1. Introduction

The escalating public consciousness regarding environmental, social, and governance (ESG) issues encourages investors to incorporate ESG considerations into their investment decision-making processes, transforming ESG investing from a niche subfield into a mainstream practice (Nofsinger et al., 2019; Gillan et al., 2021; Pedersen et al., 2021; Edmans, 2023; Tsang et al., 2024). Literally,

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ESG investing is an umbrella term for investments that account for their long-term impact on the three dimensions—environmental (E), social (S), and governance (G)—and contribute to achieving the United Nations' Sustainable Development Goals[1] (SDGs). However, despite its holistic definition, ESG investments are often not approached as an integrated whole in practice. There is considerable debate criticizing the uneven progression of the three components in ESG investing, especially given the broad spectrum of the SDGs.[2] Nonetheless, there is a lack of studies exploring this critical imbalance.

To fill this gap, this study examines whether imbalanced ESG investing exists through the lens of mutual funds. We focus on the mutual fund industry since it represents a significant share of global financial markets (Kostovetsky and Warner, 2020). According to the Investment Company Institute, by 2023, open-end mutual funds managed about $68.85 trillion worldwide, holding 27 % of equity and debt markets.[3] More importantly, ESG incorporation has become widely recognized in investing across financial institutions, including the mutual fund industry (Renneboog et al., 2008; Raghunandan and Rajgopal, 2022; Cao et al., 2023; Gantchev et al., 2024). By the end of 2023, there were 5345 signatories to the United Nations Principles for Responsible Investment (UNPRI), managing over $121 trillion in assets.[4] Furthermore, according to the 2022 Russell Investments ESG Manager Survey, 92 % of respondents reported integrating ESG factors into their investment processes.[5] Therefore, mutual funds offer an appropriate setting for examining the imbalance of ESG investing.

Based on the sample of actively managed US equity funds from 2019 to 2024,[6] we document an uneven emphasis on the three dimensions of ESG investing, as evidenced by imbalanced Morningstar risk scores for E, S, and G factors. On average, fund managers prioritize E factors over S and G concerns, with S risks receiving the least attention, nearly 2.23 times higher than E risks and about 1.35 times higher than G risks. Moreover, we proxy for this imbalance using the standard deviation of Morningstar risk scores for E, S, and G factors. We observe that the level of ESG imbalance varies across different Morningstar fund sustainability ratings, with "High" rated funds exhibiting the highest imbalance and "Low" rated funds displaying the lowest inequality. This suggests that funds sacrifice the balance of E, S, and G factors to pursue higher sustainability levels.

Generally, the ESG imbalance implies the potential trade-offs in how fund managers weigh investing practices related to E, S, and G factors. We further explore how different levels of E, S, and G risks influence ESG imbalance while controlling for other relevant factors. We find that E risk is negatively associated with the ESG imbalance level, whereas S and G are positively related to the ESG imbalance level. Our additional analysis reveals that E risk is the primary driver of this imbalance.

Given that fund managers prioritize certain aspects of ESG over others, a natural question is how investors respond to the ESG imbalance. We find that greater disparities among the E, S, and G factors lead to more outflows of funds. One unit increase in the imbalance within E, S, and G considerations corresponds to an average outflow increase of approximately 17 basis points each month through December 2024. Furthermore, we estimate our regression at the fund share-class level, allowing us to distinguish between institutional and retail share classes. The ESG imbalance continues to have a significant negative impact on fund flows for both share classes. Furthermore, we create an interaction term between ESG imbalance and a dummy variable indicating the group of highly sustainable funds, defined as those with "Average," "Above Average," or "High" Morningstar sustainability ratings. We find that the coefficient of the interaction term is negative and statistically significant, indicating that investors respond more strongly to ESG imbalance in highly sustainable funds.

Then, why are mutual funds increasingly allocating more assets to low environmental risk holdings, potentially leading to an imbalanced focus within ESG investing? One potential reason is that, as climate concerns intensify, investors are more likely to favor funds with lower environmental risk, prioritizing environmental sustainability over social and governance considerations. We find that the negative effect of ESG imbalance on net fund flows for high sustainability funds is mitigated by rising climate change concerns, consistent with previous studies that indicate a strong investor preference for low environmental risk assets as climate change concerns increase (Krueger et al., 2020; Bolton and Kacperczyk, 2021; Pástor et al., 2021; Hossain et al., 2024). In addition, global initiatives like the Paris Climate Agreement and stricter environmental disclosure regulations have prompted fund managers to emphasize environmental sustainability in their investment strategies (Pedersen et al., 2021; Nofsinger and Varma, 2022; Cohen et al., 2023; Ceccarelli et al., 2024). However, this shift potentially sidelines social and governance aspects in fund portfolios.

Another reason may be related to political ideology. Previous studies argue that political ideologies influence mutual fund

[1] The SDGs encompass 17 interconnected global goals including No Poverty, Zero Hunger, Good Health and Well-being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable and Clean Energy, Decent Work and Economic Growth, Industry, Innovation and Infrastructure, Reduced Inequality, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace, Justice and Strong Institutions, and Partnerships for the Goals (https://www.un.org/sustainabledevelopment/).

[2] See, e.g., "It's Time to Focus on the 'G' in ESG" of Harvard Business Review (https://hbr.org/2022/11/its-time-to-focus-on-the-g-in-esg), "Neglecting the 'S' and 'G' and focusing too much on the 'E"' (https://blogs.lse.ac.uk/businessreview/2023/01/31/marketing-is-killing-esg-heres-how-we-can-save-it/), "Fixing the S in ESG" of Stanford Social Innovation Review (https://ssir.org/articles/entry/fixing_the_s_in_esg), and "Unlocking the Investment Potential of 'S' in ESG" (https://corpgov.law.harvard.edu/2023/05/22/unlocking-the-investment-potential-of-s-in-esg/).

[3] See https://www.ici.org/statistical-report/ww_q4_23 and the 2024 Investment Company Fact Book (https://www.idc.org/system/files/2024-05/2024-factbook.pdf).

[4] See https://www.unpri.org/signatories/signatory-resources/quarterly-signatory-update.

[5] This survey assesses the integration of ESG considerations in investment processes among equity, fixed income, and private markets managers (https://russellinvestments.com/uk/insights/articles/2022-esg-manager-survey).

[6] We focus on the US mutual fund market due to its dominating role (accounting for almost 40 % of the global mutual fund market) and the unavailability of data from other markets.

managers' investment preferences (Hong and Kostovetsky, 2012). For instance, republican fund managers or companies show significantly less concern about environmental risks (Di Giuli and Kostovetsky, 2014; Foroughi et al., 2024), which may result in differing asset allocation strategies regarding ESG considerations, ultimately contributing to varying levels of ESG imbalance. As such, funds in blue states tend to have an ESG imbalance driven primarily by lower environmental risk. To this end, we create an interaction term linking the local political ideology of each fund's state with the fund's E, S, and G risks. Our results show that a decrease (or increase) in E risk is associated with a significantly higher (or lower) ESG imbalance in blue state funds compared to those in red states, indicating that ESG imbalance in blue state funds is more strongly influenced by reduced E risk.

Finally, we explore the consequences of ESG imbalance on risk metrics and uncover a positive and statistically significant relationship between the level of ESG imbalance and various fund risk measures, including annualized volatility, value at risk (VaR), the second-order lower partial moment (LPM), and concentration risk. These findings indicate that as ESG imbalance increases, funds tend to face greater risk, which is associated with inadequate and uneven management of ESG factors.

In a nutshell, our study contributes to several strands of literature. First, our study contributes to the literature investigating the sustainable investing behaviors of funds (e.g., Raghunandan and Rajgopal, 2022; Heath et al., 2023; Gantchev et al., 2024). To the best of our knowledge, ours is the first empirical study to unveil and explore the imbalance among the three pillars of ESG investing. Hence, we enhance the understanding of how professional fund managers integrate E, S, and G considerations into their investment strategies. Second, our study extends existing literature that focuses on analyzing the effects of ESG investing on fund characteristics. Previous studies have offered blanket evidence about the influence of ESG investing on various fund characteristics, such as fund flows (Hartzmark and Sussman, 2019; Döttling and Kim, 2022; Ceccarelli et al., 2024), risk (Maxfield and Wang, 2021), financial performance (Renneboog et al., 2008; Madhavan et al., 2021), and shareholder ESG proxy voting (Dikolli et al., 2022; He et al., 2023). Unlike these studies that discuss the pearls or pitfalls of integrating ESG considerations into fund investment decisions, we focus on ESG investments themselves and explore how investors respond to ESG imbalances and the resulting impact of these imbalances on risk, offering a new perspective to the debate on the controversial role of ESG investment. Third, our study is also related to the literature on the effects of political ideologies or partisanship on investment strategies and behaviors (e.g., Hong and Kostovetsky, 2012; Cassidy and Vorsatz, 2021; Foroughi et al., 2024; Gormley et al., 2024). Our analysis of the role of political ideology in the ESG imbalance contributes to this stream of literature.

The remainder of the paper is organized as follows. Section 2 describes our data. Section 3 exhibits main empirical results and further analysis, followed by conclusions in Section 4.

2. Data

2.1. Sample selection

Our main data source is Morningstar Direct, a survivor-bias-free database that includes both active and defunct funds and is one of the most comprehensive databases on mutual funds globally. Consistent with previous research on mutual funds, such as Amihud and Goyenko (2013), Doshi et al. (2015), and Pástor et al. (2015), and also in line with the latest studies on sustainable investing in funds by Ammann et al. (2019) and Kim and Yoon (2023), we concentrate our analysis on actively managed US equity mutual funds. Consequently, we exclude all exchange-traded funds (ETFs), index funds, and funds of funds from our sample.[7] The Morningstar categories we have included are as follows: Large Blend, Large Growth, Large Value, Mid-Cap Blend, Mid-Cap Growth, Mid-Cap Value, Small-Cap Blend, Small-Cap Growth, and Small-Cap Value.

Our dataset includes the period from September 2019 to December 2024. We chose to start in September 2019, considering the consistency of our ESG imbalance measure. Morningstar introduced the Sustainability Rating in 2016, using company-level ESG performance scores from Sustainalytics in a holdings-based calculation. The Portfolio ESG Score, as well as E, S, and G Pillar Scores, was calculated as an asset-weighted average of normalized company-level scores. For these scores, higher values indicate better performance.[8] Further, in 2018, Sustainalytics developed a new company-level ESG Risk Rating, which measures the degree to which a company's economic value is at risk due to ESG issues, enabling cross-sector comparisons. In this rating system, lower ESG risk scores indicate lower risk and better performance. Accordingly, in September 2019, Morningstar updated its methodology by replacing the previous Sustainalytics ESG Rating with this new ESG Risk Rating.[9] Under this revised approach, Morningstar's Portfolio E, S, and G Pillar Scores are directly comparable and sum up to the overall Sustainability Score. This ensures that, for example, an E risk score is interpreted the same way as an S risk score of the same value, and that a lower E risk score indicates better performance than a higher E risk score. Thus, the initiation date of our data aligns with Morningstar's latest methodology modification for calculating funds' E, S, and G risk scores, ensuring consistency in our data. Moreover, public attention to ESG has increased dramatically in recent years. For example, there has been a fivefold growth in Google Trends for the search term "ESG" in the United States since 2019 (see Fig. 1). Hence, our sample period can accurately represent the current fund market landscape regarding ESG investing. As a result, we exclude

[7] Index funds and funds of funds are identified by the Morningstar indicators "Index Fund," "Enhanced Index Funds," and "Funds of Funds."

[8] However, after reviewing Morningstar's historical methodology documents, we were unable to find details on how the E, S, and G Pillar Scores were combined to derive the overall ESG Score (https://www.morningstar.com/content/dam/marketing/shared/Company/Trends/Sustainability/Detail/Documents/Morningstar-Sustainability-Rating-Methodology-0916.pdf?con=10356). More importantly, this raises concerns about the comparability of E, S, and G scores up until 2019. As a result, we exclude data from 2016 to 2019 when measuring ESG imbalance.

[9] The detailed explanation of the Morningstar Sustainability rating methodology is given in the Appendix.

fund share classes that were liquidated or merged before September 2019 and omit those launched after December 2023 to allow sufficient time for funds to establish their portfolios.

2.2. Variable construction

2.2.1. Fund features

Our main variable of interest is ESG imbalance. We use the standard deviation of Morningstar risk scores for E, S, and G factors to proxy for the imbalance of these considerations in funds. Moreover, we focus on two fund characteristics: fund flow and risk. Fund flow is derived by dividing the estimated monthly net money flow by the total net assets (TNA) at the end of the previous month, with both net flow and TNA being fund-level comprised of all share classes (Goldstein et al., 2017):

$$Flow_T = \frac{TNA_T - TNA_{T-1}(1 + R_T)}{TNA_{T-1}}, \tag{1}$$

where TNA_T is the fund's total net asset at the end of month T and R_T denotes the fund return during month T.

Additionally, following Hartzmark and Sussman (2019) and Ceccarelli et al. (2024), we also construct the normalized fund flow to avoid the effect of fund size: we segregate the funds into deciles based on their TNA each month, rank the funds by their net flows within each decile, and subsequently compute the percentiles of the net flow rankings to generate this variable.

Furthermore, we adopt four risk metrics to evaluate fund risk: annualized volatility, value at risk (VaR), the second-order lower partial moment (LPM), and fund concentration. The first three return-based metrics are calculated using the time series of daily fund returns within a month. VaR and LPM specifically gauge the downside risk of a fund, as established in previous studies (see, e.g., Bawa, 1975; Alexander and Baptista, 2002). VaR represents potential loss over a defined period for a given confidence level. We calculate the 5 % and 10 % historical VaR at the fund-month level via daily returns ranked in the bottom fifth and tenth percentile, denoted by VaR5 and VaR10, respectively. Besides, we use absolute values when measuring VaR so that smaller numbers reflect less downside risk. Regarding LPM, it quantifies the fund risk characteristic across the entire left tail of the return distribution and is defined as the square root of the mean of squared deviations below a target return, which, in this case, is set to 0. It is computed as follows:

$$LPM = \sqrt{\frac{\sum_{i=1}^{M} \left(r_{n,i} - \overline{r_n}\right)^2}{M - 1}}, \tag{2}$$

where $\overline{r_n}$ is the average of negative daily returns (denoted by $r_{n,i}$) and M represents the number of negative return observations during a given month.

In terms of control variables, following Hartzmark and Sussman (2019), we incorporate well-established control variables in our empirical analysis, including the log of size, the log of fund age, Morningstar star rating, return in the previous month, return over the preceding 12 months, return over the prior 24 months, expense, and turnover ratio. Specifically, the fund age is calculated by measuring the year distance between the inception month of the oldest fund share class and the respective month. In addition, we determine the expenses at the fund, institutional, and retail levels by calculating the asset-weighted expense ratios of the institutional and retail share classes. All variables have a monthly frequency except the turnover and expense ratios (yearly frequency). A detailed definition of the variable is presented in Table A1 of the Appendix.

2.2.2. Climate change concern

We employ the Media Climate Change Concerns (MCCC) index provided by Ardia et al. (2023) to proxy for public climate change concerns. The MCCC index is constructed using climate change-related news articles from major US newspapers, such as the New York Times, Los Angeles Times, and Wall Street Journal, as well as newswires like Associated Press Newswires and Reuters News. Specifically, it is created through a lexicon-based text analysis that measures the level of climate change concern in each article based on the discussion of risks and the sentiment expressed. Each article is scored based on how frequently risk-related terms appear and whether the tone is positive or negative, providing a measure of how much concern the media is communicating about climate change. These individual concern scores are then aggregated on a daily for each news source, and the scores are normalized to account for differences in the number of articles published by each source. In our analysis, we use the monthly updated MCCC index data to monitor shifts in media concern over time. Fig. 2 displays the MCCC index from 2019 to 2024, showing fluctuations over time. The index peaked in 2021 and 2022, with periods of decline and stabilization afterward.

2.2.3. State-level political ideology

To measure local political ideology, we first collect the location information of fund management companies from the Center for Research in Security Prices (CRSP) Survivor-Bias-Free Mutual Fund Database and merge it with our sample using fund Tickers. However, as noted by Pástor et al. (2015), over 30 % of funds listed in Morningstar Direct lack Tickers. We manually supplement the missing Tickers of these funds through various platforms such as the Refinitiv Eikon Data API, Yahoo Finance, and Bloomberg. We then use the Tickers to bridge Morningstar Direct and CRSP. Finally, we integrate the latest presidential election results into the CRSP-Morningstar merged sample. Given that our sample period spans from September 2019 to December 2024, we use the 2020 presidential election as the latest election result. We classify the state where the fund management company is located as a *blue state* if Joe

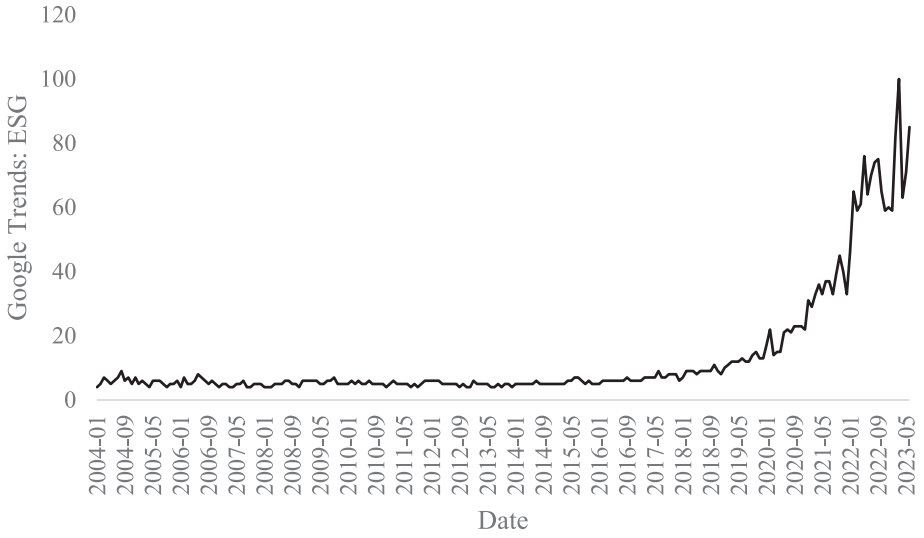

Fig. 1. Google trends of "ESG".
Notes: Data collected from Google Trends (https://trends.google.com/trends/). Fig. 1 shows a dramatic increase in the search term "ESG" in the United States from 2004 to 2023.

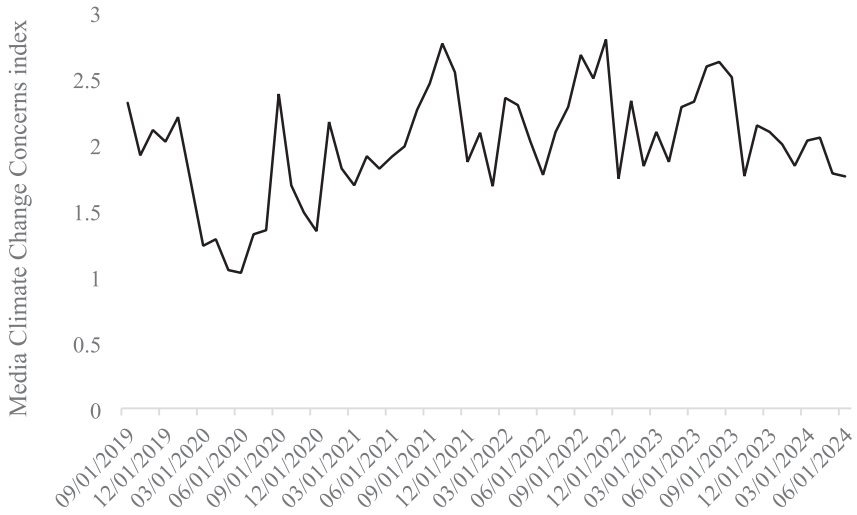

Fig. 2. Media Climate Change Concerns (MCCC) index.
Notes: Data collected from https://sentometrics-research.com/download/mccc/. Fig. 1 shows the fluctuations of MCCC index from 2019 to 2024.

Biden won the election in that state and as a *red state* if Donald Trump won.[10]

3. Empirical results

3.1. Summary statistics

Table 1 presents the summary statistics for the variables, excluding ESG-related measures, which will be examined in detail in subsection 3.2. These variables capture various aspects of fund characteristics, including fund flows, size, age, returns over different periods, and risk metrics.

[10] To account for the potential impact of swing states, we also use the vote ratio as an alternative measure. Specifically, we define a dummy variable that takes the value of one if Joe Biden received a voting percentage above the 75th percentile in our sample and zero otherwise.

Table 1
Summary statistics.

Variable	N	Mean	Std. dev.	Min	Max
ESG imbalance	78,714	1.891	0.965	0.052	3.858
Fund flow (%)	78,714	−0.535	3.054	−16.736	17.282
Normalized fund flow (%)	78,714	49.271	28.019	1.183	99.405
Size	78,714	20.166	1.886	15.426	24.584
Age	78,714	2.940	0.639	1.126	4.423
Star rating	78,714	3.129	1.039	1.000	5.000
Return 1 month (%)	78,714	1.021	5.673	−14.856	14.793
Return 12 month (%)	78,714	12.532	17.148	−23.259	58.122
Return 24 month (%)	78,714	25.379	22.791	−22.370	86.152
Expense ratio (%)	78,714	0.912	0.304	0.134	1.990
Turnover (%)	78,714	51.186	44.316	1.000	263.000
Volatility (%)	78,714	19.981	11.829	6.019	90.596
VaR5 (%)	78,714	1.529	1.040	0.239	7.464
VaR10 (%)	78,714	1.209	0.840	0.148	5.663
LPM (%)	78,714	0.774	0.516	0.142	3.451
Concentration (%)	78,714	32.900	14.328	6.312	80.901

This table provides the summary statistics of variables in the regressions. The variables include fund flow, normalized fund flow, the log of fund size, the log of fund age, Morningstar star rating, returns across 1-, 12-, and 24-month periods, the asset-weighted expense ratio, turnover ratio, risk metrics like annualized volatility, VaR5, VaR10, the lower partial moment (LPM), and fund concentration, and fund ESG imbalance level. VaR5 is the absolute Value at Risk (VaR) at 5 %, the maximum loss expected over a month with a 95 % confidence level. VaR10 is the absolute VaR at 10 %, the maximum loss expected over a month with a 90 % confidence level. VaR5 and VaR10 are absolute values, so smaller numbers reflect less downside risk. The statistics reported are the number of observations (N), mean, standard deviation (Std. dev.), minimum (Min), and maximum (Max) values for each variable. A more detailed explanation of each variable is included in Appendix Table A1.

On average, the sample funds experience monthly outflows equivalent to 0.535 % of their TNA, and the normalized mean value is close to 50 %, similar to Hartzmark and Sussman (2019). Other variables, such as the fund expense ratio (the asset-weighted average across share classes), which averages 0.912 %, are comparable to those in other studies on actively managed US equity mutual funds (see, e.g., Gantchev et al., 2024). Additionally, the sample funds have a mean size (log of TNA) of 20.166, corresponding to approximately $584 million in assets under management (AUM), and an average age of approximately 2.940 (log years), indicating that the funds are well-established. The turnover ratio is relatively high at 51.186 %, suggesting active portfolio management. The average Morningstar star rating, a metric of overall fund quality based on a 5-point scale, is 3.129, suggesting the sample includes mostly average- to above-average-rated funds.

In terms of performance, the funds exhibit an average 1-month return of 1.021 %, while 12- and 24-month returns average 12.532 % and 25.379 %, respectively, although with considerable variability, especially over longer periods. Moreover, regarding risk measures, annualized volatility averages 19.981 %, while monthly downside risk measures (absolute value) such as VaR5 and VaR10 have mean values of 1.529 % and 1.209 %. In addition, the concentration level of sample funds shows an average of 32.900 %, indicating diversification across holdings.

3.2. ESG imbalance

3.2.1. ESG imbalance overview

Table 2 provides an overview of the E, S, and G risk scores for actively managed US equity funds and examines the imbalance between these scores. Panel A offers summary statistics for the ESG risk scores, highlighting the variability in risk across these three dimensions. The average E risk score is 3.667, while the S and G risk scores are notably higher, averaging 8.172 and 6.048, respectively. This suggests mutual funds prioritize mitigating E risks over S and G risks, and fund managers are more actively reducing their exposure to firms with high carbon risk scores (Ceccarelli et al., 2024). As such, the ESG imbalance, which measures the degree of inconsistency between the E, S, and G risk levels within a fund, averages 1.891 with a standard deviation of 0.965, indicating substantial variability in how balanced funds are in managing these three types of risks. Actually, the emphasis on E over S and G is also reflected in funds' investment strategies. According to Andrikogiannopoulou et al. (2022), keywords associated with environmental factors in the Principal Investment Strategy (PIS) sections of fund prospectuses significantly outnumber those related to social and governance factors.[11] This suggests that fund managers make deliberate strategic choices regarding environmental factors, alleviating the concern that the observed ESG imbalance is driven by biases in third-party ESG ratings.

Furthermore, Panel B of Table 2 explores how ESG risk scores and imbalance levels vary across sustainability ratings, which range from "High" to "Low." Interestingly, funds with highest sustainability ratings (categorized as "High") exhibit lower E risk scores (mean of 3.058) but relatively higher S and G risk scores. In contrast, funds with lowest sustainability ratings have higher E risk scores (with a

[11] Their study provides summary statistics of ESG keywords from the PIS sections in fund prospectuses. Analyzing their results, we observe that *E*-related terms (e.g., green, climate change, clean energy, and carbon) constitute approximately 40 % of all ESG keywords, significantly exceeding the frequency of S- or G-related terms.

Table 2
Overview of fund E, S, and G risk scores and imbalance.

Panel A. Fund ESG risk scores and imbalance

	N	Mean	SD	Min	Max
E risk	78,714	3.667	1.610	0.150	11.020
S risk	78,714	8.172	3.086	0.250	14.470
G risk	78,714	6.048	2.312	0.170	12.200
ESG imbalance	78,714	1.891	0.965	0.052	3.858

Panel B. Mean values of ESG risk scores and imbalance by sustainability rating

Sustainability rating	E risk	S risk	G risk	ESG Imbalance level
High	3.058	8.052	6.115	2.107
Above High	3.544	8.459	6.258	2.045
Average	3.724	8.168	6.032	1.857
Below Average	3.886	8.181	6.038	1.805
Low	3.845	7.473	5.461	1.596
T-test: Low - High	0.787***	−0.579***	−0.653***	−0.511***

This table summarizes the distribution of E, S, and G risk scores and the corresponding imbalance levels. Panel A presents the summary statistics for E, S, and G risk scores of actively managed US equity funds, alongside the imbalance level of ESG risks. Panel B illustrates the variation in E, S, and G risk scores, as well as the imbalance levels, across mutual funds with different sustainability ratings. These sustainability ratings are categorized from "High" to "Low". *t*-test results comparing mutual funds with "Low" versus "High" sustainability ratings are reported at the bottom of Panel B, with statistical significance levels indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

mean of 3.845). Notably, the imbalance in ESG risks decreases as sustainability ratings drop, with the "High" rating group showing the highest imbalance (2.107) and the "Low" group having the lowest imbalance (1.596). In addition, the *t*-test results comparing funds with "High" and "Low" sustainability ratings highlight statistically significant differences. Funds with a "High" sustainability rating have an environmental risk that is 0.787 lower, while their social and governance risks are 0.579 and 0.653 higher, respectively, both significant at the 1 % level. This suggests that funds with higher sustainability ratings tend to be significantly more effective in managing environmental risks, resulting in greater imbalances across the three ESG factors.

3.2.2. The E, S, G impacts on ESG imbalance

Table 2 points to an interesting overall trend: as fund sustainability ratings increase, the imbalance levels between E, S, and G risks rise. This suggests that while highly sustainable funds are more focused on reducing environmental risks, this often comes at the cost of a greater imbalance between different risk categories of ESG. To further verify this, we investigate how E, S, and G risks influence the ESG imbalance level through an ordinary least squares (OLS) multivariate regression model.[12]

The estimation results are reported in Table 3. In all columns, we control for category by year-month fixed effects (Cat by YM FE). We find that the coefficients for E risk are negative and statistically significant, indicating that lower (higher) environmental risk tends to increase (decrease) the overall ESG imbalance. Specifically, according to Column (1), a unit increase in E risk is associated with a decrease in ESG imbalance of 0.147 units, approximately a 7.774 % (−0.147/1.891) reduction in the ESG imbalance. In contrast, we find that the S and G risks are positively associated with the ESG imbalance across different specifications. For example, in Columns (2) and (3), a unit increase in S and G risks is associated with a 12.427 % (0.235/1.891) and 15.124 % (0.286/1.891) increase in ESG imbalance, respectively. Further, in Column (4), we control for the impact of other ESG factors by including all ESG factors in a single specification. We excluded the overall Sustainability rating from our control variables due to potential multicollinearity, as it is derived from the overall ESG risk, which is the sum of the E, S, and G risks. The results indicate that E risk remains negatively associated with ESG imbalance, whereas S and G risks are positively associated.

Therefore, focusing on E risk, although funds enhance their environmental performance, leads to a more imbalanced approach to their overall ESG strategy. We also investigate the distribution of E, S, and G risks across different levels of ESG investing imbalance in Table A2 of the Appendix. Likewise, we find that the E factor plays a more significant role in influencing the ESG imbalance level than the S and G factors.

3.3. ESG imbalance and fund flows

3.3.1. How does ESG imbalance influence fund flows?

In the previous section, our results uncover the existing ESG investing imbalance. This raises the question of whether investors respond to this imbalance. To answer this question, we estimate the following model:

$$Dep\ Var_{i,t} = \beta_1 ESG\ imbalance_{i,t-1} + \eta_{c,t-1} + category - time\ fe, \tag{3}$$

[12] To maintain consistency, the model specification, including control variables and fixed effects, aligns with that used in Section 3.3.1, where these details are discussed.

Table 3
ESG risks and ESG imbalance.

	(1)	(2)	(3)	(4)
Variables	ESG imbalance	ESG imbalance	ESG imbalance	ESG imbalance
E risk	−0.147***			−0.354***
	(0.018)			(0.007)
S risk		0.235***		0.328***
		(0.008)		(0.016)
G risk			0.286***	0.071***
			(0.009)	(0.021)
Size	0.021***	0.006	0.010*	−0.000
	(0.006)	(0.005)	(0.005)	(0.002)
Age	0.024	0.011	−0.004	0.002
	(0.015)	(0.013)	(0.014)	(0.004)
Star rating	0.021**	−0.011	0.010	−0.003
	(0.009)	(0.008)	(0.008)	(0.003)
Sustainability rating	0.029***	0.068***	0.046***	
	(0.010)	(0.008)	(0.008)	
Return 1 month	−0.002	0.002	−0.003	0.001
	(0.005)	(0.004)	(0.005)	(0.001)
Return 12 month	−0.004**	−0.000	−0.003*	−0.000
	(0.002)	(0.002)	(0.002)	(0.000)
Return 24 month	0.001	0.003***	0.002*	0.002***
	(0.001)	(0.001)	(0.001)	(0.000)
Expense ratio	−0.095**	−0.029	−0.034	0.013
	(0.037)	(0.032)	(0.032)	(0.012)
Turnover	−0.000	0.000*	0.000***	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Concentration	0.009***	0.009***	0.007***	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)
Constant	1.590***	−0.716***	−0.435***	−0.068
	(0.155)	(0.130)	(0.130)	(0.047)
Observations	77,649	77,649	77,649	77,649
Adjusted Within R-squared	0.209	0.463	0.383	0.897
Cat by YM FE	YES	YES	YES	YES

This table presents the results of examining factors contributing to the imbalance across E, S, and G risks. The dependent variable is the ESG imbalance level, and the independent variables include E risk, S risk, and G risk, along with fund characteristics, including the log of size in the previous month, the log of fund age, the Morningstar star rating in the preceding month, the Sustainability rating ranging from 1 ("Low") to 5 ("High") in the previous month, the return in the previous month, the return over the preceding 12 months, the return over the prior 24 months, the expense ratio in the prior year, the turnover ratio in the previous year and the portfolio concentration in the previous month. All of the columns control for category by year-month fixed effects (Cat by YM FE). The number of observations and the adjusted within R-squared values are also reported. Standard errors are double-clustered at the fund and year-month levels and reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

where the dependent variable $Dep\ Var_{i,t}$ is the *Fund flow* or *Normalized fund flow* of the fund i in month t, and $ESG\ Imbalance_{i,t-1}$ represents the imbalance of the E, S, and G integration of the fund i in month $t-1$. Following Hartzmark and Sussman (2019), we incorporate a set of control variables denoted by $\eta_{c,t-1}$, including the log of fund size (*Size*), the log of fund age (*Age*), the Morningstar star rating (*Star rating*), the *Sustainability rating* ranging from 1 ("Low") to 5 ("High"), the return in the previous 1 month (*Return 1 month*), return in the previous 12 months (*Return 12 month*), return on 24 months (*Return 24 month*), the expense ratio in the prior year (*Expense ratio*), the portfolio concentration in the previous month, the turnover ratio in the previous year (*Turnover*) and the concentration risk in the previous month (*Concentration*). Additionally, we include the Morningstar category by year-month fixed effects to control for time variation within each category, denoted by *category − time fe*.

The estimation results are presented in Columns (1) and (2) of Table 4 (Panel A). We find consistently negative and significant coefficients of *ESG imbalance*. Specifically, as shown in Column (1), a one-unit increase in ESG imbalance leads to 0.165 % monthly fund net outflows. In Column (2), we also find similar results when the dependent variable is *Normalized fund flow*. In terms of control variables, we find that the overall Sustainability rating does not significantly impact fund flows, which is inconsistent with Hartzmark and Sussman (2019). This is because Hartzmark and Sussman (2019) examine the fund flows after the publication of Morningstar Sustainability ratings in a short period, from March 2016 through January 2017. However, fund investors' sensitivity to Morningstar Sustainability ratings (a short-term shock) may have become attenuated in the long run, which has been demonstrated in recent studies (Ammann et al., 2019; Gantchev et al., 2024).

Meanwhile, to strengthen the robustness of our findings, we develop an alternative ESG imbalance metric: *ESG Imbalance_50*, a dummy variable that equals 1 if any single pillar (E, S, or G) accounts for ≥50 % of a fund's total ESG risk score, and 0 otherwise. This threshold-based measure identifies funds with an extreme concentration in one ESG dimension, complementing our continuous standard deviation approach. As shown in Appendix Table A3, results using *ESG Imbalance_50* align closely with our baseline findings, confirming the consistency of our conclusions across measurement methodologies.

Table 4
ESG imbalance and fund flows.

	Panel A: All share classes		Panel B: Retail share classes		Panel C: Institutional share classes	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Fund flow	Normalized fund flow	Fund flow	Normalized fund flow	Fund flow	Normalized fund flow
ESG imbalance	−0.165**	−2.189***	−0.138**	−2.348**	−0.229**	−2.177**
	(0.070)	(0.795)	(0.062)	(0.910)	(0.113)	(0.913)
Size	−0.106***	−0.626***	−0.105***	−1.097***	−0.194***	−0.924***
	(0.017)	(0.235)	(0.019)	(0.283)	(0.026)	(0.216)
Age	−0.253***	−4.008***	−0.333***	−3.024***	−0.061	−2.335***
	(0.047)	(0.546)	(0.064)	(0.804)	(0.068)	(0.550)
Star rating	0.443***	5.686***	0.303***	5.003***	0.736***	6.481***
	(0.030)	(0.355)	(0.028)	(0.405)	(0.049)	(0.388)
Sustainability rating	−0.029	0.070	−0.014	0.351	−0.052	0.022
	(0.025)	(0.294)	(0.026)	(0.371)	(0.039)	(0.302)
Return 1 month	0.115***	1.137***	0.114***	1.408***	0.162***	1.056***
	(0.018)	(0.168)	(0.017)	(0.166)	(0.027)	(0.163)
Return 12 month	0.033***	0.392***	0.024***	0.383***	0.036***	0.321***
	(0.006)	(0.067)	(0.006)	(0.065)	(0.009)	(0.075)
Return 24 month	0.016***	0.136***	0.014***	0.149***	0.025***	0.166***
	(0.004)	(0.038)	(0.004)	(0.045)	(0.006)	(0.040)
Expense ratio	−0.170	−3.313**	−0.530***	−8.219***	−0.098	−0.172
	(0.111)	(1.309)	(0.115)	(1.588)	(0.184)	(1.663)
Turnover	−0.001	−0.025***	0.000	−0.019**	−0.002**	−0.025***
	(0.001)	(0.007)	(0.001)	(0.008)	(0.001)	(0.008)
Concentration	0.004*	0.040	0.002	0.016	0.004	0.017
	(0.002)	(0.031)	(0.003)	(0.040)	(0.004)	(0.036)
Constant	0.483	53.158***	1.533***	67.977***	0.596	49.051***
	(0.438)	(5.173)	(0.492)	(6.009)	(0.600)	(5.090)
Observations	78,714	78,714	62,965	62,965	62,334	62,334
Adjusted Within R-squared	0.059	0.104	0.057	0.099	0.056	0.102
Cat by YM FE	YES	YES	YES	YES	YES	YES

This table presents the results of how the level of ESG imbalance influences fund flows. Panel A reports the results for fund flows from all share classes, Panel B reports the results for retail share classes, and Panel C reports the results for institutional share classes. The dependent variable in Columns (1), (3), and (5) is fund flow (%), while in Columns (2), (4), and (6) it is normalized fund flow (%). The key independent variable is *ESG imbalance*. The regression model incorporates a set of control variables, including the log of size in the previous month, the log of fund age, the Morningstar star rating in the preceding month, the Sustainability rating ranging from 1 ("Low") to 5 ("High") in the previous month, the return in the previous month, the return over the preceding 12 months, the return over the prior 24 months, the expense ratio in the prior year, the turnover ratio in the previous year and the portfolio concentration in the previous month. All of the columns control for category by year-month fixed effects (Cat by YM FE). The number of observations and the adjusted within R-squared values are also reported. Standard errors are double-clustered at the fund and year-month levels and reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

The negative impact of ESG imbalance on fund flows suggests that investors prefer balanced ESG considerations, and they are more likely to withdraw their capital from funds that demonstrate substantial imbalances across the environmental, social, and governance dimensions. Generally, an imbalanced E, S, and G integration favoring one aspect over others may not align with many investors' holistic sustainability objectives and can be perceived as a risk. For instance, if a fund has strong environmental considerations but neglects the governance factor, it could be seen as susceptible to management-related risks despite its environmental strengths. This finding complements prior studies on the impact of ESG integration on fund flows and offers a new perspective on investors' perception of ESG investing (Riedl and Smeets, 2017; Hartzmark and Sussman, 2019).

3.3.2. ESG imbalance and fund flows: Institutional share class vs. retail share class

Next, we extend our tests to examine whether the impact of ESG imbalance varies between retail and institutional share classes of funds. Many mutual funds offer both institutional and retail share classes for the same underlying fund portfolio but target different investors. Thus, we can compare the responses of institutional and retail investors to ESG imbalance. We estimate Eq. (3) separately at the retail and institutional share class levels. Our results are reported in Panels B and C of Table 4.

In Panel B, we present the estimation results for the retail share class. We find that the coefficients of *ESG imbalance* are all negative and statistically significant at the 5 % level. For example, in Column (3), controlling for fund category by year-month fixed effects, a unit decrease (increase) in the fund's ESG imbalance level is associated with a 0.138 % increase (decrease) in fund flows. In Panel C, we display the results for the institutional share class. Likewise, the coefficients of *ESG imbalance* are all negative and statistically significant at the 5 % level. Specifically, as shown in Column (5) of Panel C, a unit decrease (increase) in the fund's ESG imbalance level is associated with a 0.229 % increase (decrease) in fund flows. The results indicate that both retail and institutional investors respond to ESG imbalance.

3.3.3. ESG imbalance, high sustainability rating, and fund flows

The results of Table 4 demonstrate that both retail and institutional investors react negatively to ESG imbalances, as evidenced by significant net outflows from funds exhibiting this characteristic. In light of Hartzmark and Sussman (2019), investors value sustainability and respond actively to Morningstar's published sustainability ratings, as demonstrated by substantial net inflows to highly rated funds. Hence, we expect the ESG-focused investors of these highly rated funds to react even more strongly to the imbalanced ESG approaches.

To examine whether the impact of ESG imbalance on fund flows is more pronounced for funds with relatively high sustainability ratings, we create an interaction term between the ESG imbalance level and a dummy variable, *High sustainability rating*, which takes the value of one if the fund's sustainability rating is "Average," "Above average," or "High."[13] Then, we estimate Eq. (3). Our results are reported in Table 5. We find that the coefficients on the interaction term *ESG imbalance * High sustainability rating* are almost negative and statistically significant across different panels. These results indicate that investors' responses to ESG imbalance, as shown in the fund net outflows, are more pronounced among funds with high sustainability ratings. In other words, ESG-focused investors are more sensitive to imbalanced strategies and seek more balanced ESG investments in funds with high sustainability ratings. This suggests that, in high-sustainability funds, investors expect not only strong overall ESG performance but also a balanced approach across the environmental, social, and governance dimensions.

3.4. Further analysis

In this section, we perform a battery of further analyses to explore the potential factors playing roles in the ESG imbalance and to examine other influences of the ESG imbalance on funds.

3.4.1. ESG imbalance, climate change concern, and fund flows

ESG imbalance highlights the trade-offs fund managers face when weighing investing practices related to environmental, social, and governance factors. Our analysis indicates that E risk is the primary driver of this imbalance. Funds with a higher ESG imbalance tend to prioritize E factors, while risks related to S and G factors are comparatively underemphasized. This skewed strategy, driven by lower E risk, positively correlates with fund net outflows, particularly for high-sustainability funds.

However, existing literature suggests that climate-related concerns are increasingly shaping investment behavior toward greener assets, even when such choices may involve a potential sacrifice in financial performance (Bollen, 2007; Riedl and Smeets, 2017; Pástor et al., 2021; Bolton and Kacperczyk, 2021; Ardia et al., 2023). The growing public awareness of climate change has also influenced institutional investors. Krueger et al. (2020) argue that institutional investors are particularly attentive to climate risks, impacting their engagement strategies and portfolio allocations. Hence, as climate concerns intensify, fund managers are likely to increasingly favor assets with lower E risks, further reinforcing the trend toward imbalanced ESG strategies. Consequently, we anticipate rising concerns over climate change may offset the outflows associated with imbalanced strategies in high-sustainability funds. To examine this, we estimate the following model:

$$\begin{aligned} Dep\ Var_{i,t} = {} & \beta_1 ESG\ imbalance_{i,t-1} \times High\ sustainability\ rating_{t-1} \times Climate\ concern_{t-1} + \\ & \beta_2 ESG\ imbalance_{i,t-1} \times High\ sustainability\ rating_{t-1} + \\ & \beta_3 ESG\ imbalance_{i,t-1} \times High\ sustainability\ rating_{t-1} + \\ & \beta_4 High\ sustainability\ rating_{t-1} \times Climate\ concern_{t-1} + \\ & \eta_{c,t-1} + category - time\ fe, \end{aligned} \tag{4}$$

where the dependent variable $Dep\ Var_{i,t}$ is the *Fund flow* or *Normalized fund flow* of the fund i in month t. The triple interaction term $ESG\ imbalance_{i,t-1}$*$High\ sustainability\ rating_{t-1}$*$Climate\ concern_{t-1}$ examines whether increasing public concern about climate change mitigates the impact of imbalanced ESG strategies on net outflows of highly sustainable funds. We include several control variables and fixed effects, consistent with the approach used in previous regressions.

The results are presented in Table 6. We find that the coefficients on the triple interaction term $ESG\ imbalance_{i,t-1} \times High\ sustainability\ rating_{t-1} \times Climate\ concern_{t-1}$ are positive and statistically significant in Columns (1), (3), and (5), which represent the impact on fund flows of all share classes, retail share classes, and institutional share classes, respectively. Additionally, in Columns (2), (4), and (6), with *Normalized fund flow* as the dependent variable, the coefficients remain positive and statistically significant. These results suggest that the negative relationship between *ESG imbalance* × *High sustainability rating* and fund flows, as shown in Table 5, has been mitigated. In other words, rising climate concerns appear to alleviate the negative effect of ESG imbalance on net flows in funds with high sustainability ratings. Specifically, imbalanced ESG strategies, where a fund's portfolio has lower environmental risk, tend to attract greater inflows as climate-related concerns intensify. Our findings align with previous literature suggesting

[13] As a robustness check, we also employ a dummy variable set to one if a fund's sustainability rating is "Above Average" or "High," excluding the "Average" rating. The results remain consistent and are available upon request.

Table 5
ESG imbalance, high sustainability rating, and fund flows.

	Panel A: All Share Classes		Panel B: Retail Share Classes		Panel C: Institutional Share Classes	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Fund flow	Normalized fund flow	Fund flow	Normalized fund flow	Fund flow	Normalized fund flow
ESG imbalance × High sustainability rating	−0.092***	−0.918***	−0.058**	−0.089	−0.134***	−0.832***
	(0.027)	(0.218)	(0.028)	(0.258)	(0.041)	(0.243)
ESG imbalance	−0.108**	−1.558***	−0.103**	−2.263***	−0.150*	−1.582**
	(0.050)	(0.504)	(0.044)	(0.475)	(0.083)	(0.604)
High sustainability rating	0.074	1.201***	0.053	0.933*	0.083	0.694
	(0.054)	(0.430)	(0.054)	(0.536)	(0.086)	(0.513)
Size	−0.108***	−0.653***	−0.106***	−1.101***	−0.195***	−0.943***
	(0.009)	(0.105)	(0.012)	(0.109)	(0.015)	(0.082)
Age	−0.250***	−4.005***	−0.331***	−3.044***	−0.058	−2.343***
	(0.022)	(0.243)	(0.032)	(0.301)	(0.035)	(0.231)
Star rating	0.446***	5.756***	0.306***	5.017***	0.741***	6.571***
	(0.018)	(0.179)	(0.016)	(0.201)	(0.028)	(0.188)
Return 1 month	0.115***	1.135***	0.114***	1.406***	0.162***	1.052***
	(0.017)	(0.165)	(0.016)	(0.160)	(0.026)	(0.158)
Return 12 month	0.033***	0.389***	0.024***	0.382***	0.035***	0.315***
	(0.005)	(0.056)	(0.004)	(0.053)	(0.008)	(0.064)
Return 24 month	0.015***	0.133***	0.014***	0.149***	0.025***	0.161***
	(0.002)	(0.025)	(0.003)	(0.032)	(0.004)	(0.027)
Expense ratio	−0.179***	−3.405***	−0.535***	−8.222***	−0.105	−0.247
	(0.063)	(0.560)	(0.063)	(0.526)	(0.105)	(0.713)
Turnover	−0.001***	−0.025***	0.000	−0.019***	−0.002***	−0.025***
	(0.000)	(0.004)	(0.000)	(0.004)	(0.001)	(0.004)
Concentration	0.004***	0.039***	0.002	0.018	0.004*	0.017
	(0.001)	(0.010)	(0.001)	(0.011)	(0.002)	(0.014)
Constant	0.397	53.115***	1.488***	68.434***	0.431	49.021***
	(0.259)	(2.189)	(0.323)	(1.966)	(0.360)	(1.753)
Observations	78,714	78,714	62,965	62,965	62,334	62,334
Adjusted Within R-squared	0.059	0.105	0.057	0.099	0.056	0.102
Cat by YM FE	YES	YES	YES	YES	YES	YES

This table presents the results of regression models examining whether fund outflows are more pronounced in highly sustainable funds with greater ESG risk imbalances. Panel A reports the results for fund flows from all share classes, Panel B reports the results for retail share classes, and Panel C reports the results for institutional share classes. Columns (1), (3), and (5) report results with fund flow (%) as the dependent variable, while Columns (2), (4), and (6) use normalized fund flow (%). The regression model incorporates a set of control variables, including the log of size in the previous month, the log of fund age, the Morningstar star rating in the preceding month, the return in the previous month, the return over the preceding 12 months, the return over the prior 24 months, the expense ratio in the prior year, the turnover ratio in the previous year and the portfolio concentration in the previous month. All of the columns control for category by year-month fixed effects (Cat by YM FE). The number of observations and the adjusted within R-squared values are also reported. Standard errors are double-clustered at the fund and year-month levels and reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

that, as climate sensitivity grows, investors are more inclined to favor green assets (see, e.g., Bolton and Kacperczyk, 2021; Krueger et al., 2020).

3.4.2. ESG imbalance and political ideology

Our previous results indicate that mutual funds employing imbalanced strategies are more likely to experience fund outflows. However, this negative relationship between imbalanced strategies and fund flows is alleviated when climate change concerns heighten. When climate change becomes a prominent concern, investors tend to favor funds that aggressively invest in environmentally friendly sectors, and imbalanced strategies may no longer be a concern. In this section, we delve deeper into the reasons why mutual funds tend to allocate assets with significantly lower environmental risk compared to social or governance risk, resulting in higher levels of imbalance. A plausible explanation is the influence of the local political environment. Prior research suggests local political ideologies affect investment strategies and behaviors (e.g., Hong and Kostovetsky, 2012; Foroughi et al., 2024). To investigate this, we estimate the following model:

$$Dep\ Var_{i,t} = \beta_1 E\ risk\ (S\ risk\ or\ G\ risk)_{i,t-1} \times Blue\ state_{t-1} + \beta_2 E\ risk\ (S\ risk\ or\ Grisk)_{i,t-1} + Blue\ state_{t-1} + \eta_{c,t-1} + category - time\ fe, \quad (5)$$

where the dependent variable is *ESG imbalance*. we construct an interaction term $E\ risk\ (S\ risk\ or\ G\ risk)_{i,t-1}$*$Blue\ state_{t-1}$, to examine

Table 6
Climate change concern, ESG imbalance, and fund flows.

	Panel A: All Share Classes		Panel B: Retail Share Classes		Panel C: Institutional Share Classes	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Fund flow	Normalized fund flow	Fund flow	Normalized fund flow	Fund flow	Normalized fund flow
Climate concern × ESG imbalance × High sustainability rating	0.396***	1.888**	0.257*	1.876*	0.475**	2.132*
	(0.129)	(0.877)	(0.136)	(1.033)	(0.234)	(1.065)
Climate concern × ESG imbalance	−0.084	0.406	−0.223	−3.338*	−0.081	1.507
	(0.204)	(1.773)	(0.211)	(1.884)	(0.377)	(2.256)
Climate concern × High sustainability rating	−0.631*	−2.728	−0.157	0.110	−0.842	−3.398
	(0.345)	(2.438)	(0.343)	(3.117)	(0.591)	(3.013)
ESG imbalance × High sustainability rating	−0.353***	−2.140***	−0.220**	−1.257	−0.461***	−2.256***
	(0.101)	(0.669)	(0.103)	(0.775)	(0.171)	(0.772)
ESG imbalance	−0.048	−1.745	0.037	−0.032	−0.083	−2.494*
	(0.133)	(1.052)	(0.150)	(1.335)	(0.262)	(1.415)
High sustainability rating	0.504*	2.990	0.152	0.793	0.675	3.018
	(0.267)	(1.886)	(0.259)	(2.300)	(0.422)	(2.103)
Size	−0.110***	−0.632***	−0.109***	−1.070***	−0.201***	−0.928***
	(0.009)	(0.113)	(0.013)	(0.116)	(0.016)	(0.089)
Age	−0.251***	−3.929***	−0.341***	−3.103***	−0.044	−2.188***
	(0.024)	(0.256)	(0.034)	(0.319)	(0.037)	(0.230)
Star rating	0.441***	5.659***	0.305***	4.870***	0.743***	6.484***
	(0.019)	(0.187)	(0.017)	(0.207)	(0.030)	(0.198)
Return 1 month	0.117***	1.141***	0.117***	1.422***	0.166***	1.067***
	(0.017)	(0.171)	(0.016)	(0.167)	(0.027)	(0.164)
Return 12 month	0.030***	0.357***	0.024***	0.382***	0.032***	0.284***
	(0.005)	(0.055)	(0.005)	(0.054)	(0.008)	(0.064)
Return 24 month	0.015***	0.127***	0.013***	0.133***	0.025***	0.158***
	(0.003)	(0.026)	(0.003)	(0.031)	(0.004)	(0.028)
Expense ratio	−0.188***	−3.505***	−0.550***	−8.460***	−0.115	−0.215
	(0.067)	(0.598)	(0.067)	(0.537)	(0.112)	(0.763)
Turnover	−0.001***	−0.030***	0.000	−0.023***	−0.002***	−0.029***
	(0.000)	(0.004)	(0.000)	(0.003)	(0.001)	(0.004)
Concentration	0.004***	0.041***	0.002	0.014	0.005**	0.018
	(0.001)	(0.010)	(0.001)	(0.010)	(0.002)	(0.015)
Constant	0.555**	53.701***	1.639***	69.450***	0.543	49.080***
	(0.267)	(2.328)	(0.336)	(2.035)	(0.382)	(1.866)
Observations	72,907	72,907	58,135	58,135	57,482	57,482
Adjusted Within R-squared	0.057	0.101	0.058	0.097	0.055	0.099
Cat by YM FE	YES	YES	YES	YES	YES	YES

This table presents regression results analyzing whether climate concerns influence fund flow reactions to ESG imbalance, particularly for highly sustainable funds. Panel A reports the results for fund flows from all share classes, Panel B reports the results for retail share classes, and Panel C reports the results for institutional share classes. The interaction term, *Climate concern* × *ESG imbalance* × *High sustainability rating*, captures the effect of climate concern on fund flows in funds with high sustainability ratings and imbalanced ESG risks. Columns (1), (3), and (5) use fund flow (%) as the dependent variable, while Columns (2), (4), and (6) focus on normalized fund flow (%). The model incorporates a set of control variables, including the log of size in the previous month, the log of fund age, the Morningstar star rating in the preceding month, the return in the previous month, the return over the preceding 12 months, the return over the prior 24 months, the expense ratio in the prior year, the turnover ratio in the previous year and the portfolio concentration in the previous month. All of the columns control for category by year-month fixed effects (Cat by YM FE). The number of observations and the adjusted within R-squared values are also reported. Standard errors are double-clustered at the fund and year-month levels and reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

whether the effect of changes in E, S, and G risks on ESG imbalance is influenced by the political ideology of the fund management company's location. We hypothesize that for mutual funds located in blue states, a decrease (or increase) in E risk will contribute more to an increase (or decrease) in ESG imbalance compared to funds in red states, as companies in blue states tend to prefer assets with lower environmental risk (Hong and Kostovetsky, 2012; Foroughi et al., 2024; Gormley et al., 2024).

The results presented in Table 7 show that the coefficients for the interaction term $E\,risk\ (S\,risk\ or\ G\,risk)_{i,t-1}{*}Blue\ state_{t-1}$ are negative and statistically significant across all models.[14] This indicates that mutual funds in blue states experience a more pronounced reduction in ESG imbalance as E and G risks increase, compared to funds in red (Republican) states. Specifically, after controlling for fund category by year-month fixed effects, a unit increase in E risk corresponds to a decrease in ESG imbalance of 0.358 units (0.336 +

[14] We also employ an alternative measure of political ideology, the vote ratio above the 75th percentile, to account for swing states. The results remain consistent (available upon request).

Table 7
Political ideology and ESG imbalance.

	(1)	(2)	(3)
Variables	ESG imbalance	ESG imbalance	ESG imbalance
Blue state × E risk	−0.022***		
	(0.004)		
Blue state × S risk		−0.011***	
		(0.001)	
Blue state × G risk			−0.018***
			(0.001)
Blue state	0.065***	0.068***	0.082***
	(0.010)	(0.007)	(0.007)
E risk	−0.336***	−0.350***	−0.349***
	(0.005)	(0.006)	(0.005)
S risk	0.386***	0.397***	0.390***
	(0.006)	(0.005)	(0.005)
G risk	−0.016	−0.022**	−0.011
	(0.011)	(0.010)	(0.010)
Size	0.005***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)
Age	−0.011	−0.014**	−0.014**
	(0.007)	(0.006)	(0.007)
Star rating	−0.004*	−0.003	−0.003
	(0.002)	(0.002)	(0.002)
Sustainability rating	0.001	0.000	0.001
	(0.003)	(0.003)	(0.003)
Return 1 month	−0.000	−0.000	−0.000
	(0.001)	(0.001)	(0.001)
Return 12 month	0.001**	0.001***	0.001***
	(0.001)	(0.001)	(0.001)
Return 24 month	−0.001**	−0.001***	−0.001**
	(0.000)	(0.000)	(0.000)
Expense ratio	0.032***	0.032***	0.034***
	(0.008)	(0.008)	(0.009)
Turnover	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Concentration	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
Constant	−0.104***	−0.104***	−0.120***
	(0.023)	(0.025)	(0.026)
Observations	2270	2270	2270
Adjusted Within R-squared	0.946	0.946	0.947
Cat by YM FE	YES	YES	YES

This table presents regression results examining whether ESG imbalance varies across states with different political ideologies. Columns (1), (2), and (3) report results on the role of E risk, S risk, and G risk in ESG imbalance, respectively. All of the columns control for category by year-month fixed effects (Cat by YM FE). The number of observations and the adjusted within R-squared values are also reported. Standard errors are double-clustered at the fund and year-month levels and reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

0.022) in blue states and 0.336 units in red states, as shown in Column (1). In Column (2) and Column (3), a unit increase in S risk and G risk is associated with changes in ESG imbalance of 0.386 units (increase) and − 0.029 units (decrease) in blue states, compared to 0.397 units (increase) and − 0.011 units (decrease) in red states, respectively. These findings suggest that ESG imbalance levels in blue states are more strongly influenced by lower E risk than in red states. Furthermore, in blue state funds, increases in E risk significantly reduce ESG imbalance compared to the influence of S and G risks.

The above findings imply that mutual funds in blue states place greater emphasis on environmental considerations, probably driven by factors such as stricter regulatory pressures, investor preferences, or broader societal expectations prevalent in Democratic-leaning regions (Anderson and Robinson, 2024; Gormley et al., 2024), leading to lower fund environmental risk and, consequently, a greater ESG imbalance. Overall, our analysis underscores the significant role of political ideology in shaping the ESG risk profiles of mutual funds, particularly concerning environmental risk.

3.4.3. ESG imbalance and fund risks

An important question is the consequence of an imbalanced ESG investment strategy. We have shown that investors seek more balanced ESG investments and react negatively to ESG imbalance, as evidenced by significant net outflows. This is likely because investors may view ESG imbalance as a sign of undiversified investment strategies, which can lead to significantly higher risk and potentially harm their interests. To empirically answer this, we explore how imbalanced ESG investment affects fund risk metrics, specifically in terms of volatility, downside risk, and concentration risk. We estimate Eq. (3), replacing the dependent variable with different risk metrics to capture various dimensions of fund risk. Our results are presented in Table 8.

Table 8
ESG imbalance and fund risks.

	(1)	(2)	(3)	(4)	(5)
Variables	VaR5	VaR10	LPM	Volatility	Concentration
ESG imbalance	0.097***	0.074***	0.048***	1.165***	7.228***
	(0.022)	(0.020)	(0.009)	(0.256)	(0.688)
Size	0.012***	0.010***	0.005***	0.124***	−0.570***
	(0.003)	(0.003)	(0.001)	(0.037)	(0.201)
Age	−0.014	−0.011	0.002	−0.083	−1.184**
	(0.009)	(0.008)	(0.005)	(0.116)	(0.489)
Star rating	−0.061***	−0.053***	−0.025***	−0.795***	−0.531*
	(0.008)	(0.007)	(0.004)	(0.088)	(0.281)
Sustainability rating	−0.041***	−0.030***	−0.016***	−0.439***	0.039
	(0.007)	(0.006)	(0.003)	(0.074)	(0.245)
Return 1 month	−0.008	−0.009	0.002	−0.064	0.156**
	(0.010)	(0.009)	(0.004)	(0.117)	(0.066)
Return 12 month	0.000	−0.002	0.001	−0.010	0.039
	(0.003)	(0.003)	(0.001)	(0.038)	(0.027)
Return 24 month	0.008***	0.008***	0.003***	0.100***	0.060**
	(0.002)	(0.002)	(0.001)	(0.024)	(0.025)
Expense ratio	0.063***	0.050**	0.032***	0.665**	10.716***
	(0.023)	(0.019)	(0.011)	(0.282)	(1.205)
Turnover	0.001***	0.001***	0.000***	0.008***	−0.046***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.005)
Constant	1.174***	0.929***	0.562***	16.027***	26.215***
	(0.094)	(0.082)	(0.043)	(1.059)	(4.495)
Observations	78,729	78,729	78,728	78,729	77,739
Adjusted Within R-squared	0.089	0.084	0.039	0.083	0.203
Cat by YM FE	YES	YES	YES	YES	YES

This table examines the relationships between ESG imbalance and different fund risk measures, namely annualized volatility (%), VaR5 (%), VaR10 (%), LPM (%), and portfolio concentration (%). The key independent variable, ESG imbalance, shows a statistically significant positive effect across all models. Each model incorporates a set of control variables, including the log of size in the previous month, the log of fund age, the Morningstar star rating in the preceding month, the return in the previous month, the return over the preceding 12 months, the return over the prior 24 months, the expense ratio in the prior year, and the turnover ratio in the previous year. All of the columns control for category by year-month fixed effects (Cat by YM FE). The number of observations and the adjusted within R-squared values are also reported. Standard errors are double-clustered at the fund and year-month levels and reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

From Columns (1) to (3), we investigate the impact of ESG imbalance on downside risk, using VaR5, VaR10, and LPM as our risk measures. Specifically, in Column (1), where we control for category by year-month fixed effects, we find that a unit increase in ESG imbalance is associated with an increase in VaR5 of 0.097. For VaR10, the coefficient in Column (2) is 0.074 and significant at the 1 % level. Regarding LPM, Column (3) demonstrates that ESG imbalance has a positive and statistically significant effect on LPM, significant at the 1 % level. These results suggest that funds with higher ESG imbalance have higher downside risk. In addition, in Column (4), we examine the impact of ESG imbalance on volatility risk. We find that coefficients on *ESG imbalance* are both positive and statistically significant. This indicates that funds with higher ESG imbalances also exhibit greater return volatility. Finally, Column (5) presents a significant result for fund concentration, suggesting that higher ESG imbalance is associated with increased portfolio concentration, which, to some extent, explains why ESG imbalance brings increased fund risk.

Overall, our findings suggest that funds employing imbalanced ESG strategies tend to have higher risk profiles and support the notion that ESG imbalance may lead to undiversified portfolios and increased risk, which could adversely affect investors' decisions.

4. Conclusions

In this study, we explore the imbalance in ESG investing across the environmental, social, and governance pillars, shedding light on how these dimensions are prioritized within mutual fund portfolios. Our findings reveal a pronounced focus on environmental risks, particularly among funds with higher sustainability ratings, suggesting that E risks receive more strategic attention than S and G risks. Our analysis also demonstrates that ESG imbalances can adversely impact fund flows, particularly for funds with high sustainability ratings, as investors appear to favor a more balanced approach to ESG integration. However, we observe that this negative effect is moderated by growing public concern over climate change, which may influence investor tolerance for certain imbalances in favor of environmental priorities. Moreover, we find that political ideology plays a significant role in ESG imbalance, with the imbalance of funds in blue states being more driven by lower environmental considerations than those in red states. Meanwhile, we find an association between ESG imbalance and higher risk profiles, including volatility, downside risk, and fund concentration, suggesting that prioritizing one ESG dimension, especially environmental factors, could compromise portfolio diversification, increasing the overall risk borne by investors.

These findings have important implications for policymakers, asset managers, and investors. For policymakers, the results suggest that regulatory guidelines promoting a balanced approach to ESG investing could support more diversified and sustainable portfolios.

For asset managers, understanding investor sensitivities to ESG balance could inform more beneficial ESG strategies, aligning with investor preferences and reducing potential outflows. Finally, for investors, our study highlights the importance of scrutinizing ESG balance to ensure that funds meet their sustainability expectations without compromising diversification and risk management.

Future research could explore how changes in public policy and regulatory standards around ESG disclosures affect the degree of ESG balance in investment strategies. Additionally, examining ESG imbalance within asset classes beyond mutual funds, such as private equity or real estate investment trusts, could broaden the understanding of ESG prioritization and its implications across the whole asset management industry.

CRediT authorship contribution statement

Maria-Eleni K. Agoraki: Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Georgios P. Kouretas:** Writing – review & editing, Supervision, Methodology, Investigation, Conceptualization. **Haoran Wu:** Writing – original draft, Methodology, Formal analysis, Data curation, Validation, Conceptualization, Investigation. **Binru Zhao:** Writing – original draft, Validation, Methodology, Formal analysis.

Appendix A

Table A1
Variable definition.

Variable name	Definition	Data source
E risk	Morningstar fund environmental risk score. The lower, the better.	Morningstar Direct
S risk	Morningstar fund social risk score. The lower, the better.	Morningstar Direct
G risk	Morningstar fund governance risk score. The lower, the better.	Morningstar Direct
ESG imbalance	The standard deviation of Morningstar risk scores for E, S, and G factors	Authors' calculation
Fund flow	Dividing the estimated monthly net money flow by the total net assets (TNA) at the end of the previous month.	Authors' calculation
Normalized fund flow	Percentage ranking of net flows of the fund within the decile sorted by size of all funds in a given month.	Authors' calculation
Sustainability rating	The Morningstar sustainability rating, on a 1 to 5 scale representing "Low," "Below Average," "Average," "Above Average," and "High."	Morningstar Direct
Volatility	The annualized volatility of daily return within the month, in percentage.	Authors' calculation
VaR5	The maximum possible daily loss at a 95 % confidence level within the month, in percentage and absolute value.	Authors' calculation
VaR10	The maximum possible daily loss at a 90 % confidence level within the month, in percentage and absolute value.	Authors' calculation
LPM	The square root of the mean of squared deviations below a target return (0), in percentage.	Authors' calculation
Concentration	The percentage of top 10 holdings in the whole fund portfolio.	Morningstar Direct
Size	The log of the fund's assets under management (AUM) in USD in month t.	Authors' calculation
Age	The log of fund age, calculated by measuring the year distance between the inception month of the oldest fund share class and the respective month.	Authors' calculation
Morningstar star rating	The Morningstar star rating, on a 1–5 scale representing 1 star to 5 stars.	Morningstar Direct
Return 1 month	The return in the previous 1 month.	Morningstar Direct
Return 12 month	The return in the previous 12 months.	Morningstar Direct
Return 24 month	The return in the previous 24 months.	Authors' calculation
Expense ratio	The asset-weighted expense ratios of the corresponding share classes (fund, institutional, and retail levels), in percentage.	Authors' calculation
Turnover	A measure of a fund's trading activity, the percentage of portfolio holdings that have changed over the past year.	Morningstar Direct
Climate concern	The log of the media climate change concerns index at the monthly level	Provided by Ardia et al. (2023).
High sustainability rating	A dummy variable that takes the value of one if the mutual fund's sustainability rating is "Average," "Above Average," and "High."	Morningstar Direct
Blue state	A dummy variable that takes the value of one if the mutual fund is located in a blue state in a given month. A blue state is defined as a state where the Democratic presidential candidate won in the most recent presidential election.	Dave Leip's Atlas of U.S. Presidential Elections

Table A2
The distribution of ESG risks across different levels of ESG imbalance.

	ESG imbalance		
	High (top 25 %)	Medium (25–75 %)	Low (bottom 25 %)
E risk	4.045	4.516	3.101
S risk	9.624	9.207	10.456
G risk	7.095	6.802	7.679

(*continued on next page*)

Table A2 (*continued*)

	ESG imbalance		
	High (top 25 %)	Medium (25–75 %)	Low (bottom 25 %)
	High (top 25 %)	Medium (25–50 %)	Low (bottom 50 %)
E risk	4.045	4.883	3.625
S risk	9.624	8.739	10.066
G risk	7.095	6.452	7.416

The table shows the mean values of E, S, and G risks across different levels of ESG investing imbalance. The imbalance levels are categorized into two classifications: High (top 25 %), Medium (25–75 %), Low (bottom 25 %); and High (top 25 %), Medium (25–50 %), Low (bottom 50 %).

Table A3
ESG imbalance and fund flows using alternative imbalance measures.

	(1)	(2)
Variables	Fund flow	Normalized fund flow
ESG imbalance_50	−0.426***	−5.626***
	(0.074)	(0.898)
Size	−0.106***	−0.619**
	(0.017)	(0.234)
Age	−0.263***	−4.118***
	(0.047)	(0.549)
Star rating	0.436***	5.583***
	(0.030)	(0.353)
Sustainability rating	−0.038	−0.036
	(0.024)	(0.283)
Return 1 month	0.114***	1.123***
	(0.018)	(0.164)
Return 12 month	0.033***	0.392***
	(0.006)	(0.065)
Return 24 month	0.016***	0.145***
	(0.004)	(0.038)
Expense ratio	−0.149	−3.101**
	(0.112)	(1.323)
Turnover	−0.001	−0.025***
	(0.001)	(0.007)
Concentration	0.004	0.035
	(0.002)	(0.030)
Constant	0.292	50.368***
	(0.426)	(5.111)
Observations	77,648	77,648
Adjusted Within R-squared	0.059	0.105
Cat by YM FE	YES	YES

This table presents the results of how the level of ESG imbalance influences fund flows using alternative imbalance measures. The dummy variable, *ESG imbalance_50*, equals 1 if any individual E, S, or G risk score contributes at least 50 % of the overall ESG risk score, and 0 otherwise. The regression model incorporates a set of control variables, including the log of size in the previous month, the log of fund age, the Morningstar star rating in the preceding month, the Sustainability rating ranging from 1 ("Low") to 5 ("High") in the previous month, the return in the previous month, the return over the preceding 12 months, the return over the prior 24 months, the expense ratio in the prior year, the turnover ratio in the previous year and the portfolio concentration in the previous month. All of the columns control for category by year-month fixed effects (Cat by YM FE). The number of observations and the adjusted within R-squared values are also reported. Standard errors are double-clustered at the fund and year-month levels and reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

Morningstar sustainability rating

Morningstar has altered the methodology for calculating the sustainability ratings of mutual funds multiple times. Launched in March 2016, Morningstar generated funds sustainability ratings based on their portfolio sustainability scores. Subsequently, in August 2018, Morningstar replaced these scores with historical portfolio sustainability scores, the weighted average of the preceding 12 months' portfolio sustainability scores. In September 2019, the underlying company-level ESG scores used for computing portfolio sustainability scores were substituted with Sustainalytics ESG risks that reflect the extent to which ESG factors jeopardize a firm's economic value.

The computation of the Morningstar Sustainability rating of funds involves three stages. Initially, funds with at least 50 % of their

assets possessing a company-level ESG score from Sustainalytics are given a monthly Morningstar portfolio sustainability score. Subsequently, the Morningstar historical sustainability score is calculated as the weighted average of the previous 12 months' Morningstar portfolio sustainability scores. Finally, the Morningstar sustainability ratings are allocated to all scored funds within Morningstar categories based on their sustainability scores, including "High" (globe-5, top 10 %), "Above average" (globe-4, next 22.5 %), "Average" (globe-3, next 35 %), "Below average" (globe-2, next 22.5 %), and "Low" (globe-1, bottom 10 %). Thus, higher ratings are more desirable and suggest that a fund has, on average, a larger proportion of its assets invested in companies with lower ESG risk, as defined by Sustainalytics.

Data availability

The data used in this study are subject to third-party restrictions and were obtained under license from Refinitiv Eikon, WRDS CRSP, and Morningstar Direct. As such, they are not publicly available. Access to the data may be granted by the authors upon reasonable request and with permission from the respective providers.

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