Abstract

This study applies a Large Language Model to quantify the specificity of mutual funds' Environmental, Social, and Governance (ESG) disclosures. We find that greater specificity is positively associated with ESG scores of future fund holdings. Moreover, funds with more specific ESG disclosures attract higher fund flows. This effect is more pronounced for institutional-oriented funds and during periods of heightened climate concerns. These findings suggest that specific ESG disclosures signal credible commitments to investors and can help them make ESG-conscious investment decisions. This evidence supports recent regulatory calls for more structured and detailed ESG reporting. [94 words]

1 Introduction

The demand for sustainable investments has grown rapidly in recent years. To cater to this shift in preferences and attract investors, more and more actively-managed equity funds in the United States declare that they consider factors related to Environmental, Social, and Governance (ESG) in their Principal Investment Strategies (PIS) sections.[1] As shown in Figure 1, the proportion of funds disclosing ESG information in their PIS has climbed from 3.1% in 2010 to 29.3% in 2022.

[Insert Figure 1 about here]

Unsurprisingly, both regulators and investors have raised their concerns about the informativeness and truthfulness of these voluntary ESG disclosures.[2] In response, in May 2022, the U.S. Securities and Exchange Commission (SEC) proposed amendments to disclosure rules governing ESG-related investments. The amendments aim to allow investors to "determine whether a fund or adviser's ESG marketing statements translate into concrete and *specific* measures taken to address ESG goals and portfolio allocation."[3]

Does specificity in ESG disclosures matter for funds and investors? The voluntary nature of ESG disclosures introduces considerable variability in disclosure specificity, allowing us to examine the effects of specific versus generic ESG disclosures on future outcomes. We find that specificity in ESG disclosures does matter. Funds providing specific descriptions of ESG strategies are associated with subsequent improvements in ESG performance. Moreover, investors, particularly institutional investors, allocate more investments to funds with specific ESG disclosures, suggesting that they can distinguish between specific and generic ESG descriptions when selecting funds. In contrast, generic ESG disclosures are not associated with future ESG performance or fund flows.

To detect ESG disclosures and specific ESG disclosures in the PIS section of actively-

[1] The SEC mandates funds to describe in the PIS section "... the particular type or types of securities in which the Fund principally invests or will invest... explain in general terms how the Fund's adviser decides which securities to buy and sell." Refer to item 9 of Form N-1A https://www.sec.gov/files/form-n-1a.pdf.

[2] In 2022, the SEC charged BNY Mellow Investment Adviser, Inc. for misstatements and omissions about ESG considerations in marking investment decision. Refer to https://www.sec.gov/newsroom/press-releases/2022-86 for the SEC announcement.

[3] https://www.sec.gov/files/ia-6034-fact-sheet.pdf

managed equity funds in the United States (hereafter, 'funds'), we apply a large language model (LLM) to classify sentences in these sections.[4] LLMs possess reading comprehension capabilities that surpass human (Kiela et al., 2021). Thus, they can assist us to differentiate between generic and specific ESG disclosures, a crucial distinction given the growing concerns about the quality of ESG information. Echoing the SEC and investors' worries about "greenwashing", we observe that the rapid increase in ESG-related disclosures over the past decade mainly originates from funds providing only generic ESG information. Notably, the proportion of funds with specific ESG sentences in their Principal Investment Strategies (PIS) among those disclosing ESG information has declined from 66.7% in 2010 to 39.5% in 2022 (Figure 2).

[Insert Figure 2 about here]

Disclosures in SEC filings must be truthful. In this regard, specific disclosures are likely to reflect more credible commitments to future ESG performance than generic disclosures. This is because specific disclosures are associated with increased litigation risks and are thus more binding (Houston et al., 2019). Indeed, specific ESG disclosures often include tangible measures that hold funds accountable. To illustrate this, consider two examples of sentences that address specific ESG issues: (1)"In particular, a company must have stated operational sustainability commitments and demonstrated adherence to such commitments"[5]; (2)"This initial screen specifically includes quantitative measures that score the carbon emissions of each company."[6] In contrast, generic ESG disclosure may use multiple ESG-related words but lack concrete details that inform investors about how the fund incorporates ESG factors into its investment decisions. For instance, generic ESG disclosures might state: "ESG research are broad and cover environmental, social, and governance issues as appropriate for each company."

Building on the distinction between specific and generic ESG disclosures, our findings support the notion that specific disclosures reflect more credible commitments to future ESG performance. We show that funds providing more detailed ESG information—measured by the number of words in sentences detailing specific ESG considerations—tend to invest in stocks with higher ESG scores in the subsequent year, and the

[4]Refer to Section 2.1 for more detailed description of this model and our human benchmark results.
[5]https://www.sec.gov/Archives/edgar/data/1587982/000139834422019180/fp0079358_497k.htm
[6]https://www.sec.gov/Archives/edgar/data/1683471/000089418921002726/truesharesesgactiveopp497k.htm

result is significant at the 1% level. In contrast, generic ESG disclosures do not predict any changes in the ESG scores of funds' holdings.

Moreover, investors appear to recognise the credibility of specific ESG disclosures, as demonstrated by the strong positive relationship between specific ESG disclosure and future fund flows. For example, our results show that funds providing specific ESG disclosures attract, on average, an additional 0.47 percentage point in fund flows in the subsequent month compared to those offering only generic disclosures. This difference is economically significant because it represents 8.2% of a one-standard deviation of fund flows. It is also highly statistically significant at the 1% level. In contrast, we observe no significant impact on future fund flows from generic ESG disclosures.

Not all investors are equally skilled at interpreting disclosure information. Retail investors, in particular, often struggle to understand fund disclosures and may not thoroughly review them (Shapiro, 2023). Institutional investors, on the other hand, are generally more sophisticated and better equipped to assess the content of disclosures. If the observed relationship between fund flows and specific ESG disclosures reflect the credibility of the information rather than other omitted factors, we would expect this effect to be more pronounced among funds targeting institutional investors. Consistent with this expectation, we find that the positive response to specific ESG disclosures is observed only in institutional-oriented funds.

There is evidence that the sentiment of ESG influences the way investors process ESG-related information (Kvam et al., 2024). Building on this, we posit that the relationship between disclosure specificity and fund flows becomes more pronounced during periods of heightened climate risk concern. By dividing our sample into periods of high and low concern based on the Media Climate Change Concern (MCCC) index (Ardia et al., 2023), we find that the positive response of fund flows to specific ESG disclosures is only strong and highly significant in periods with high climate risk concerns but absent in periods with low climate risk concerns. Again, we find that the strong and significant flow-disclosure relationship is from institutional-oriented funds and absent in retail-oriented funds. This finding reinforces the notion that the observed relationship is driven by credible information on the future ESG performance of the funds conveyed through specific ESG disclosures.

This paper makes two contributions.

First, our study primarily contributes to the literature on mutual fund disclosures. Recent studies have demonstrated that fund disclosures are an important input in investor decisions. For example, see Abis and Lines (2023), Kostovetsky and Warner (2020), Ceccarelli et al. (2022) and Andrikogiannopoulou et al. (2022). Our paper is closely related to both Ceccarelli et al. (2022) and Andrikogiannopoulou et al. (2022). Ceccarelli et al. (2022) use Principles for Responsible Investment's ratings of sustainability disclosures provided by funds to demonstrate that investors value the quality of ESG disclosures. Instead of using a third-party rating of disclosure quality, we show that the specificity of ESG descriptions in fund prospectuses issued by funds themselves contain valuable information that predicts future ESG performance and attracts flows. Andrikogiannopoulou et al. (2022) use the discrepancy between ESG scores of funds' holdings and ESG disclosures to identify greenwashers and genuine green funds. They find investors cannot distinguish between greenwashers and genuinely green funds. While Andrikogiannopoulou et al. (2022) do not assess the quality of ESG disclosure, we focus on the specificity of ESG statements and their benefits for funds and investors. To our knowledge, we are the first to distinguish between specific and generic descriptions of ESG strategies. Our study contributes to this strand of literature by showing that specific ESG disclosures in fund prospectuses are associated with credible ESG commitments and strongly attract fund flows, whereas generic ESG disclosures do not. Our findings support the call by SEC for more specific disclosure of ESG measures by mutual funds.

Our study also contributes to the textual analysis literature of disclosures by showcasing a new methodology for analysing ESG strategies. Traditional research in this area adopts dictionary-based methods and word counts to measure specificity in risk factor disclosures (Hope et al., 2016), to distinguish between specific and generic financial sentences (Abis et al., 2022) in fund prospectuses, to measure climate risk exposure in earnings calls (Sautner et al., 2023) and 10-K filings (Berkman et al., 2024), as well as measure the level of ESG disclosures in mutual funds (Andrikogiannopoulou et al., 2022). Diverging from these approaches, we adopt cutting-edge technologies for textual analysis. We employ a small, fine-tuned LLM for zero-shot sentence classification, a novel technique especially effective when labeled training data are scarce or difficult to

categorize even for human experts.[7] This method not only allows us to differentiate between specific and generic ESG strategies, but also has the potential to be applied to studies on business and management topics using textual data, for example, potentially topics on diversity equity and inclusion and corporate culture.

The rest of the paper is organised as follows: Section 2 introduces the method used to identify ESG disclosures and specific ESG disclosures; Section 3 describes the data; Section 4 presents the methodology and discusses the main results; Section 5 concludes.

Keywords: Mutual Fund Strategies; ESG; Fund Flows; LLM; Prospectuses; Specificity

JEL Classifications: G11, G23

2 Specific and generic ESG disclosures

This section introduces the LLM used to classify PIS texts, presents the trend of ESG sentences over time, and reports on the traditional textual characteristics of these sentences.

2.1 Sentence classification method

Our workhorse for the sentence classification task is the "Bart-large-MNLI" model, which is a pre-trained LLM fine-tuned for zero-shot classification tasks introduced by Yin et al. (2019).[8] Zero-shot classification is a type of machine learning approach that allows a model to accurately classify data into categories that it has not explicitly been trained on.[9] The fine-tuning process equips the LLM to handle general sentence classification tasks effectively. When we provide a label "ESG issue", the BART-large-MNLI model (or "the LLM") constructs and tests the hypothesis "This text is about

[7] Section 2.1 describes how we use human benchmark to align LLM outputs with human decisions.

[8] The model used in this paper was downloaded from https://huggingface.co/facebook/bart-large-mnli/tree/main on September 1, 2020. BART (Lewis et al., 2019) is an open-source LLM developed by Meta. BART stands for Bidirectional (BERT-like) and Auto-Regressive (GPT-like) Transformer. It excels in both text generation and general language understanding tasks.

[9] The fine-tuning uses the Multi-Genre Natural Language Inference ("MNLI") dataset. The MNLI corpus is a collection of 433,000 sentence pairs labeled as entailment, neutral and contradiction. The fine-tuned model includes added classification layers and an extra 1 million parameters compared to the original BART-large model. As shown in Shu et al. (2022), this model outperforms a number of alternative LLMs in zero-shot classification tasks. More recent studies also demonstrate the superior performance of fine-tuned small LLMs relative to GTP-3, GPT-3.5 and GPT-4 in text classification (for example, see (Chae & Davidson, 2023) and (Juan José Bucher & Martini, 2024).

ESG issue". Based on the output probabilities, sentences are then classified into ESG and non-ESG.

This LLM is well-suited for our text classification tasks, as it is both free to use and capable of delivering reliable classification results without additional training. We do not use a dictionary based approach because ESG disclosures may not always contain ESG terms, and specific and generic ESG sentences can use similar words.[10] In contrast, LLMs have textual comprehension abilities that exceed human benchmarks (Kiela et al., 2021), allowing them to perform textual processing tasks traditionally handled by human research assistants.

We supply the LLM with two labels, "ESG issue" and "specific ESG issue", and task it with scoring each sentence in the funds' PIS section for its probability of being *independently* related to each label.[11] That is, the score for each label can range between 0 and 1.

Sentences can receive high scores on "ESG issue" but low scores on "specific ESG issue". For example, the sentence "The investment team may also consider environmental, social, and governance (ESG) factors in investment decisions" receives a probability score of 0.9174 for the "ESG issue" label and 0.3213 for "specific ESG issue". In contrast, some sentences score high for both the "ESG issue" label and the "specific ESG issue" label. The sentence "For example, the Fund may invest in companies that focus on lowering the cost of healthcare, combating the opioid epidemic, or offering ethically sourced products" receives a probability score of 0.8988 for "specific ESG issue" and 0.8444 for "ESG issue".[12]

What is the appropriate probability threshold to determine if a sentence is related to ESG issues and specific ESG issues? Even for sustainability finance experts, these tasks are challenging and unlikely to yield a unanimous decision. Therefore, we adopt a majority-of-vote approach using a human benchmark to select threshold probabilities

[10] We illustrate this point with an example sentence that addresses specific ESG issues (as classified by the LLM) but contains no ESG phrase from the ESG dictionary by Abraham et al. (2022): "Demonstrating a concern for justice and peace: this includes fair and ethical relationships with customers, suppliers, and business partners and avoiding products and services that promote weapons production and proliferation." https://www.sec.gov/Archives/edgar/data/1355064/000158064222005667/eventidedividendopp497k.htm.

[11] The reason for using "ESG issue" instead of "ESG strategy" as the classification label is that the sentences in PIS mostly relate to strategy; predictions using "ESG strategy" tend to emphasise "strategy" and are less effective in distinguishing between sentences related ESG issues and those unrelated to ESG issues. In short, using "ESG strategy" as a label results in more tightly clustered probabilities, thus making the classification threshold harder to determine.

[12] More examples of sentence classification results can be found in Appendix A2.

for these classification tasks. Using our human benchmark, we classify sentences with probability scores of 0.8 or higher as ESG sentences. Within this category, sentences scoring 0.6 or higher are categorised as specific ESG sentences, while those scoring below 0.6 are generic ESG sentences.[13]

Specifically, we sample two sets of sentences, one for each classification task, to gather human classification results. The threshold probability for each task is then set to ensure that the classification results based on the LLM outputs align with human decisions. These two sets of sentences are included in a questionnaire distributed to 10 Ph.D. students majoring in accounting and finance at the University of Auckland.[14] The first section of the questionnaire asks respondents to classify 20 sentences from PIS sections as either "ESG issue" or "non-ESG issue." These 20 sentences comprise five randomly selected sentences from each of four probability bands. The sentences within these groups have zero-shot classification probabilities for the "ESG issue" label falling in the probability bands of 0.70-0.75, 0.75-0.80, 0.80-0.85, and 0.85-0.90, respectively. We consider sentences to be ESG-related disclosures if at least six respondents classify the sentence as related to ESG issues. The second section is structured similarly to the first but focuses on specific ESG issues, using probability bands ranging from 0.50 to 0.70 with increments of 0.05.

We determine the threshold probabilities for sentence classification by requiring that the majority of sentences in bands above the thresholds be deemed as related to ESG and specific ESG issues by human reviewers. As expected, in bands below these thresholds, only one or two sentences are classified by human reviewers as related to ESG or specific ESG issues.

2.2 ESG sentences over time

Over the years, ESG has become a notable discussion point in strategy disclosures, as shown in Figure 1. Both the numbers and percentages of funds that discuss ESG

[13] We have also attempted to further classify specific ESG sentences into environmental, social and governance components, in order to assess which aspect is the most influential for future ESG performance and fund flows. However, the resulting classification probabilities are almost perfectly correlated for these three classes because funds often touch on all three issues in one sentence. Given that this further decomposition provides little insight in the context of fund strategy disclosures, we have chosen not to report the results using decomposed E, S and G measures.

[14] See Internet Appendix IA.2 for the detailed questionnaire.

issues in their PIS sections have increased drastically over the years. The number of ESG-disclosure funds has increased from fewer than 50 in 2010 to about 500 in 2022. In 2010, ESG-disclosure funds constituted less than 5% of the funds in our sample. By 2022, this percentage had increased to more than 25%.

Interestingly, the exponential growth in the number of ESG-disclosure funds can be primarily attributed to an increase in the number of funds that discuss generic ESG issues, as shown in Figure 2. Of the roughly 500 ESG-disclosure funds in 2022, fewer than 200 funds discuss specific ESG issues in their PIS sections. As a percentage of ESG-disclosure funds, those discussing generic ESG issues has risen from about 70% in 2010 to over 90% in 2022. In sharp contrast, the percentage of funds that discuss specific ESG issues has declined from about 67% in 2010 to about 40% in 2022.

[Insert Figure 2 about here]

We observe a consistent pattern in the average length (in word counts) of sentences, where discussions on generic ESG issues have rapidly increased in length over time, as illustrated in Figure 3. In 2010, descriptions of generic ESG issues averaged 40 words per PIS. The average length has almost doubled to 80 words per PIS in 2022. In contrast, the total number of words in descriptions of specific ESG issues per PIS has oscillated between 70 and 100 words throughout our sample period.

[Insert Figure 3 about here]

2.3 Traditional textual measures

Using the LLM, we classify a total of 139,520 unique sentences in the PIS sections in our sample into 1,756 specific ESG sentences, 2,089 generic ESG sentences and 135,675 non-ESG sentences. Table 1 reports the summary statistics of important traditional textual measures of each sentence class. These summary statistics reassure us that specific and generic ESG sentences display certain expected textual characteristics, thus providing additional validation of the outputs from the LLM.

[Insert Table 1 about here]

The human benchmark results discussed in the earlier section have given us confidence in the sentence classification results of the LLM. In a separate test, we use the ESG dictionary from Abraham et al. (2022) and count the number of ESG phrases in specific ESG-disclosure sentences, generic ESG-disclosure sentences and non-ESG sentences. As expected, ESG-disclosure sentences on average contain more ESG phrases than non-ESG sentences. Both specific and generic ESG sentences contain about two ESG phrases on average, which is higher than the average of zero for non-ESG sentences (Table 1).

In addition, the summary statistics in Table 1 highlight the inherent challenges in using dictionary-based approaches for identifying ESG disclosures. Counting ESG phrases is likely to under-detect ESG disclosures because about 18% of our ESG sentences do not contain any ESG terms as defined by Abraham et al. (2022). More importantly, the dictionary-approach cannot distinguish between specific and generic ESG disclosures. As shown in panels B and A of Table 1, both specific and generic ESG sentences contain a similar average number of ESG phrases, at 1.97 and 1.92 per sentence, respectively.

Next, we examine the frequency of positive, negative, uncertainty, and litigious words, using the 2023 version of the Loughran-McDonald Word List (Loughran & McDonald, 2011).[15] We observe that specific and generic ESG sentences show noticeable differences in tone. Specific ESG disclosures incorporate more positive and negative words (0.61 and 0.37 per sentence, respectively) compared to generic ESG sentences (0.50 and 0.16 per sentence), perhaps because specific ESG sentences cover both the inclusion and exclusion principles of ESG investing. Furthermore, specific ESG sentences have a slightly lower average of uncertainty words (0.53 words per sentence) than generic ESG sentences (0.66 words per sentence), indicating that specific ESG issues are discussed with a more certain tone. On the other hand, generic ESG sentences tend to express a more tentative position on ESG issues.

[15]The Loughran-McDonald Word List are available for downloading at: http://www.nd.edu/~mcdonald/Word_Lists.html.

3 Data

3.1 Fund data

Our sample includes all actively managed equity funds in the CRSP Survivor-Bias-Free US Mutual Funds ("CMF") database from January 2010 to December 2022.[16] In addition, to mitigate the impact from small funds, we exclude funds with total net assets lower than $5 million.

Our analysis is conducted at the fund level, but fund returns, turnover ratios and expense ratios are reported at the share class level. We use total net assets in the previous month to compute value-weighted average flows, returns, turnover ratios and expense ratios at the fund level in all analyses.

Following the related literature, such as Huang et al. (2007) and Keswani and Stolin (2008), we compute the monthly net flow for fund class share j in month $t+1$ as follows:

$$Flow\%_{j,t+1} = \frac{TNA_{j,t+1} - TNA_{j,t} \times (1 + r_{j,t})}{TNA_{j,t}} \times 100 \tag{1}$$

,where $TNA_{j,t}$ represents the total net assets of the fund class share j at the end of month t, and $r_{j,t}$ denotes the net return of the fund class share j in the same period. To mitigate the impact of outliers, we winsorise all continuous variables at the 1% level on both tails in each month.

In all regressions, we control for value-weighted ESG scores of funds' holdings that would have been known to investors in month t. Stock level ESG scores are from Sustainalytics, with missing scores replaced by cross-sectional medians. Similar to other fund variables, each of the environmental, social and governance scores is aggregated at the fund level. The rank of a fund's ESG score is a cross-sectional rank of its holding-weighted ESG in a month in the CFM universe.[17] Stocks in the Sustainalytics database are merged with stocks held by funds on cusip and month, before we compute

[16] Actively managed equity funds include all equity funds (the first letter in the crsp_obj_cd string is "E") and exclude index funds (index_fund_flag = "B" or "D" or "E"), ETFs (et_flag = "ETF" or "ETN") and variable annuity underlying funds (vau_fund = "Y").

[17] From October 2019, Sustainalytics has changed its approach for ESG score. Before October 2019, higher ESG scores indicated better ESG performance; after October 2019, higher scores represent higher ESG risks. We reverse the cross-sectional percentile ranking from October 2019 onward in our analyses.

the holding-weighted environmental, social and governance scores at the portfolio level. Refer to Table A1 in the appendix for more detailed variable definitions.

3.2 Textual data

We use the SEC API[18] to download fund summary prospectuses (497K filings)[19] filed with the SEC between January 1, 2010 and December 31, 2022.[20]

We have downloaded a total of 176,607 summary prospectuses covering all types of US funds that contain text from the Principal Investment Strategy (PIS). The fund summary prospectus must present prescribed disclosure items following the order required by the SEC. This allows us to extract the text between the investment and risk sections as PIS text.[21]

To streamline this process, we parse each PIS text into sentences (where we consider bullet-point subsetences and enumerated subsentences as part of a sentence). Then we remove duplicate sentences to produce a list of unique sentences, before applying the LLM to each unique sentence to generate a probability score for the classification task as described in Section 2.1.

In merging textual variables extracted from PIS with monthly fund data, we use the crsp_cik_map in the CMF database, supplanted by hand-collected tickers for filings without a class_id or ticker in the data downloaded from the SEC API. A PIS needs to be no older than 12 months to be included in all analyses, because the SEC requires that funds update their summary prospectuses annually or more frequently as needed to report all significant changes in a timely manner. We have matched more than 97% of PISs with CMF data.

[18] SEC API website: https://sec-api.io.

[19] There are two kinds of prospectuses: (1) the statutory prospectus and (2) the summary prospectus (the 497K filings). The SEC has concluded that statutory prospectuses, even when prepared in compliance with Form N-1A requirements, are too long, complicated, and difficult for investors to use efficiently when comparing investment choices. The summary prospectus provisions of Form N-1A aim to provide investors with key information for making investment decisions in a concise, standardised, and user-friendly format that is easily accessible.

[20] Up to 2018, all text blocks in the flattened XBRL data provided by the SEC were truncated to 2,048 characters, affecting roughly half of all PIS text blocks. To avoid this data truncation issue, instead of directly downloading data from the EDGAR database, we download all 497K filings from SEC API.

[21] We use regular expressions (*re*, a Python package) to locate the beginning of the principal investment strategies section and the beginning of the principal risk section. We use a number of combinations of words to identify the PIS section under a variation of names which include principal/main/primary investment strategy/strategies. Similarly, the risk section is identified by titles that include principal/primary/main/key investment risk/risks.

After merging textual variables extracted from PIS with fund-month observations, we construct ESG disclosure measures. In each month, ESG-disclosure funds are ranked by the length of their specific and generic disclosures. These ranks are our main variables of interest in all analyses because investors allocated their investments to one or a few funds based on their preferences. To control for other textual attributes in our analyses, we compute several additional common textual measures for each PIS text, including readability and tonality. The construction of these variables can be found in Table A1 in the Appendix.

4 Methodology and results

4.1 Methodology

To investigate whether specific and generic ESG disclosures impact investors' decisions differently, our primarily interest lies in ESG-disclosure funds. From 2010 January to 2022 December, only 7.3% of the fund-month observations contain ESG disclosures in their PIS sections. Because discussions of ESG-related investment strategies are voluntary and funds do not choose to make ESG disclosures randomly, there is an obvious selection bias when our regressions only include ESG-disclosure funds, which we address using a two-step Heckman (1979) procedure.

As expected, ESG-disclosure funds differ significantly from non-ESG disclosure funds in many important aspects, as shown in Table 2.

First, funds have a stronger tendency to voluntarily disclose their ESG considerations if they face stronger peer pressure, which is proxied for by the proportion of ESG-disclosure funds in their fund category (Berkman et al., 2024). The average percentage of the category-level ESG disclosure ($CategoryESG_{i,t}$) amounts to 19% for the ESG fund sample, or 13 percentage points higher than the average for the non-ESG fund sample at a significance level of 1%.

Second, ESG-disclosure funds have a slightly stronger ESG performance than non-ESG disclosure funds. Because ESG ratings of funds are not widely available, we proxy for funds' ESG performance by holding weighted ESG scores of their portfolio

companies. The ranks of holding weighted ESG scores of ESG-disclosure funds are on average 53 percentile, or 3 percentile higher, than those of non-ESG disclosure funds and the difference is significant at a 1% level.

Last, ESG-disclosure funds are on average significantly smaller in terms of total net assets, slightly older, and have lower fund turnover ratios than their non-ESG disclosure counterparts. However, the two groups of funds do not significantly differ in their past 12-month net performance ($Ret12m_{i,t}$) or expense ratios ($ExpenseRtaio_{i,t}$).

[Insert Table 2 about here]

In the first stage of the Heckman (1979) two-step procedure, we estimate a probit model to predict the probability that a fund discusses ESG issues in its PIS. The first-stage probit model uses the following equation:

$$\begin{aligned} Prob(ESGDis_{i,t} = 1) = \Phi(&\gamma_0 + \gamma_1 \cdot CategoryESG_{i,t} \\ &+ \sum \gamma \cdot \mathbf{Fundcontrols_{i,t}} \\ &+ \zeta \cdot \mathbf{CatFE} + \theta \cdot \mathbf{YMFE} + \epsilon_{i,t}) \end{aligned} \tag{2}$$

, where $ESGDis_{i,t}$ takes the value of 1 if the PIS of fund i as of month t contains one or more ESG sentences 0 otherwise. Following the recommendation of Lennox et al. (2012), in the first-stage probit model, we include an explanatory variable ($CategoryESG_{i,t}$) that is not used in second-stage regressions to identify the selection effect. The proportion of ESG-disclosure funds in a fund category, $CategoryESG_{i,t}$, is constructed as in Berkman et al. (2024). This variable represents the level of peer pressure to describe ESG considerations in PIS sections. $\mathbf{Fundcontrols_{i,t}}$ is a vector of control variables including holding-weighted ESG score, past 12-month net returns, the natural logarithm of fund size, the natual logarithm of fund age, the natural logarithm of the length of PIS, fund expense ratio, turnover ratio and other textual measures. More detailed definitions of other variables are provided in Table A1 in the Appendix. Because the category times year-month fixed effects, a control commonly used in the fund literature, are perfectly correlated with $CategoryESG_{i,t}$, this probit model instead controls for the fund category fixed-effects and year-month fixed effects separately.[22]

[22] Unlike Hope et al. (2016), we do not consider proprietary cost as a potential determinant for ESG disclosure. This is

[Insert Table 3 about here]

Table 3 presents the results of the Heckman (1979) first-stage probit regression model, as shown in Equation (2). Our findings suggest that peer pressure affects ESG disclosure choices because funds are more likely to include ESG sentences in their PIS when more peers in same category make ESG disclosures. This is suggested by the coefficient on $CategoryESG_{i,t}$ of 4.59 which is highly significant at the 1% level. Other variables also predict the likelihood of ESG-disclosure in the PIS section with expected signs. For example, funds with better ESG performance, measured by their cross-sectional percentile ranks in ESG scores of stocks held in their portfolios ($ESGScoreRk_{i,t}$), have a stronger tendency to disclose their ESG strategies. Funds with longer PIS sections are more likely to disclose ESG because the PIS section lengthens with additional disclosures. In addition, we find that funds' past performance and expense ratios are positively associated with the probability of ESG disclosure, while turnover ratios are negatively associated with the probability of ESG disclosure. All of these coefficients are statistically significant at the level 1%.

The predicted probabilities from the first-stage probit regression model are used to calculate the self-selection parameter, the IMR, which is then included as an additional control variable in the Heckman (1979) second-stage OLS estimation.[23]

4.2 ESG Disclosures and future ESG scores

In the first of many Heckman (1979) second-stage regressions, we regress the 12-month ahead changes in holding-weighted ESG scores on measures of ESG disclosures and control for important confounding variables. The regression is defined by the equation

because mutual funds are required to disclose holdings at the end of each quarter. This mandatory disclosure requirement diminishes the relevance of proprietary cost as a factor influencing ESG disclosures.

[23]The formula for the Inverse Mills Ratios (IMR) is defined as:

$$IMR = \frac{\phi(x)}{1 - \Phi(x)}$$

, where $\phi(x)$ denotes the Probability Density Function (PDF), and $\Phi(x)$ denotes the Cumulative Distribution Function (CDF) of the variable x.

below:

$$\begin{aligned}\Delta ESGScoreRk_{i,t,t+12} = \beta_0 + \beta_1 \cdot SpESGDisRk_{i,t} + \beta_2 \cdot GeESGRk_{i,t} \\ + \sum \tau \cdot \textbf{Fund controls}_{\textbf{i,t}} + \beta_3 \cdot IMR_{i,t} \\ + \lambda \cdot \textbf{Cat} \times \textbf{YMFE} + \epsilon_{i,t} \end{aligned} \tag{3}$$

Before presenting the regression results using the subsample of funds with ESG disclosures, we report the summary statistics of important variables and their correlation coefficients in Panels A and B of Table 4, respectively. In this subsample, the monthly cross-sectional rank of specific ESG disclosure ($SpESGDisRk_{i,t}$) averages 0.37 and has a median of 0.01, because less than 50% of ESG-disclosure funds include specific ESG discussions in their PIS. In contrast, the mean and median of the ranks of generic ESG disclosure ($GeESGDisRk_{i,t}$) are 0.47 and 0.49, respectively, because most ESG-disclosure funds contain generic ESG sentences.

Panel B of Table 4 show that independent variables are not highly correlated among each other, thus do not cause multicolinarity concerns. Correlation coefficients also have expected signs. For example, net return in the past 12 months ($Ret12m_{i,t}$), the rank of specific ESG disclosure ($SpESGDisRk_{i,t}$) and the rank of generic disclosure ($GeESGDisRk_{i,t}$) are all positively correlated with fund flows in the next month ($Flow\%_{i,t+1}$) at the 1% level.

Specific ESG disclosures typically outline clearer and more tangible criteria and commitments. As a result, mutual funds that provide more detailed ESG strategies also face greater litigation risks and regulatory scrutiny, which can lead to significant costs if they fail to deliver. Accordingly, we hypothesise that funds offering more specific and detailed ESG disclosures are more likely to demonstrate superior future ESG performance compared to their peers.

To test this hypothesis, we regress the change of 12-month ahead cross-sectional percentile rank of ESG scores of funds' holdings in 12 months ($\Delta ESGScoreRk_{i,t,t+12}$) on the percentile rank of the fund's ESG disclosure specificity ($SpESGDisRk_{i,t}$). All regressions control for a comprehensive set of fund characteristics and textual attributes of the PIS.

[Insert Table 5 about here]

As expected, the results in Table 5 show a strong positive relationship between the specificity of funds' ESG disclosures and changes in the ranks of their 12-month ahead ESG scores. Coefficients on the rank of specific ESG scores of funds' holdings range from 0.03 to 0.05 with significance levels between 1% and 5%. This result confirms that funds with more specific ESG disclosure tend to hold stocks with higher ESG scores in the following year, suggesting that specific ESG disclosures are associated with future improvements in funds' ESG performance. For example, statistically significant regression coefficient estimates of 0.05 in Column (4) indicates that, on average, a fund in the top specificity quartile improves its future ESG performance rank by at least by 2.5 percentile points more than a fund in the bottom specificity quartile. In contrast, generic ESG disclosures show no relationship with future ESG performance improvements (Columns (2) to (4)).

In Columns (1) to (3) of Table 5, fund characteristics are also linked to future ESG performance. For example, the positive effects of fund's annual return ($Ret12m_{i,t}$), age ($Ln(Age_{i,t})$), and fees ($ExpenseRatio_{i,t}$) align with the findings of Raghunandan and Rajgopal (2022). Some textual attributes of ESG disclosures also seem to predict future ESG score improvements: longer disclosures, more uncertain language and lower complexity are associated with positive changes in future ESG scores. However, most of the significant relationships between these characteristics and future ESG performance turn insignificant once we control for the current level of ESG scores of funds' holdings. We add this control variable because ESG scores of funds' holdings tend to revert to their means, as suggested by the negative and significant correlation of -0.34 between the change of holdings' ESG scores in the next 12 months and the current level of holdings' ESG scores in Panel B of Table 4.

Overall, the results in Table 5 support our hypothesis that funds voluntarily disclosing their ESG strategy with specific and concrete details are more likely to commit to and achieve better ESG performance in subsequent periods.

4.3 ESG-disclosure and future fund flow

If investors value the ESG qualities of funds strategies and can discern the credibility of ESG disclosures, the results in Table 5 suggest that funds providing more specific and detailed ESG disclosures should attract greater inflows. To test this hypothesis, we examine how the relative ranks of specific ESG disclosure lengths and those of generic ESG disclosure lengths affect future fund flows and report the results in Table 6.

[Insert Table 6 about here]

We begin by reporting the results from a baseline regression specification in Column (1) which includes only the rank of the holding-weighted ESG score and other control variables for fund characteristics. Interestingly, current ESG scores for their holdings ($ESGScoreRk_{i,t}$) are not significantly related to future fund flows – its slope coefficient is -0.06 and insignificant. This result suggests that investors may find it challenging to evaluate the ESG scores of underlying securities. In contrast, most other fund characteristics show a strong relation with subsequent fund flows. Consistent with prior literature documenting that investors tend to chase past performance (Ben-David et al., 2022; Sirri & Tufano, 1998), we find that past 12-month returns are a strong predictor of fund flows, with a slope coefficient of 6.30 which is significant at the 1% level. Additionally, we find that future fund flows tend to be higher for younger funds and for funds charging lower fees, which is consistent with findings in the existing literature (Christoffersen & Xu, 2017).

In Columns (2) and (3) of Table 6, we separately introduce the percentile ranks of a fund's specific and generic ESG disclosures into the regression model. A higher percentile rank for each type of ESG disclosure indicates that the fund provides more extensive disclosures of that type compared to its peers. As expected, we find a strong positive association between the rank of specific ESG disclosures and subsequent fund flows, with a slope coefficient of 0.66 (significant at the 1% level) in Column (2). In contrast, generic ESG disclosure do not predict future fund flows, with a slope coefficient being indistinguishable from zero (Column (3)). These findings remain unchanged when both types of percentile ranks are included simultaneously in the regression model in Column (4).

Our main finding is also robust to various additional textual measures (Column (5) of Table 6). The coefficient on the variable of main interest, rank of specific ESG disclosure ($SpESGDisRk_{i,t}$), remains large at 0.64 and highly significant at 1%. Textual measures, including the length of PIS documents, do not significantly influence future fund flows, despite their strong associations with future ESG performance shown in Columns (1) to (3) of Table 5. These findings suggest that investors may not view textual measures such as the PIS length, uncertainty words usage and readability as indicators of credible ESG strategies.

To further highlight the economic significance of the relationship, Column (6) of Table 6 replaces the continuous percentile rank of specific ESG disclosures with an indicator variable that takes the value of 1 if a PIS contains any specific ESG disclosure and zero otherwise. The slope coefficient on the dummy variable decreases slightly from 0.64 to 0.47 but remains statistically significant at the 1% level. This indicates that, on average, a fund with specific ESG disclosures experiences a 0.47% increase in fund flows in the following month compared to peers that do not provide specific disclosures.

4.4 ESG disclosures and institutional fund flows

Our key findings in the previous subsection suggest that mutual fund investors do not blindly seek funds that offer ESG disclosures. Instead, they distinguish between funds with specific, credible ESG disclosures and those with generic, less informative ones. Institutional investors are generally more sophisticated, with advanced knowledge of sustainability investment, and possess better resources than retail investors to identify and analyse ESG-related information. Motivated by the evidence in prior studies that institutional investors value and demand climate risk disclosures (Ilhan et al., 2023), we expect them to be both better equipped and more motivated to recognise and interpret specific ESG closures. Therefore, we expect the ESG disclosure-flow effect to be stronger for institutional-oriented funds and this is what we find. Table 7 reports the results.

[Insert Table 7 about here]

To test this hypothesis, we categorise funds into institutional-oriented and retail-

oriented funds using the institutional flag and the retail flag in the CMF database, following the approach of Chen et al. (2010). First, we regress future fund flows on measures of ESG disclosures with all control variables as in Columns (5) and (6) of Table 6, for institutional-oriented funds and retail-oriented funds, separately. The results are reported in Columns (1) to (4) of Table 7. Then, we investigate if these two types of funds differ significantly in their flow-ESG-disclosure relationships. Specifically, we run regressions using all fund-month observations and include an indicator variable for institutional-oriented funds, along with its interaction with the rank of a fund's specific ESG disclosures, and report the regressions results Columns (5) and (6). The results confirm our conjecture. The flow-disclosure relationship we document is primarily driven by institutional-oriented funds, rather than retail-oriented funds.

Both the rank of specific ESG disclosures and its indicator variable strongly predict future fund flows, but only for institutional-oriented funds in Columns (1) and (2) of Table 7 and are significant at the 1% level. If an institutional-oriented fund includes specific ESG disclosure in its PIS, its subsequent fund flows on average is 0.83 percentage point higher than its peers without specific ESG disclosures and the difference is significant at the 1% level (Column (2)). For retail-oriented funds, the coefficients on both the percentile ranks of a fund's specific ESG disclosure and the indicator variable for specific ESG disclosures are indistinguishable from zero (Columns (3) and (4)). The effect of specific ESG disclosures on future fund flows is also significantly stronger for institutional-oriented funds than for retail-oriented funds. As shown on Columns (5) and (6), the coefficients on the interaction term ($SpESGDisRk_{i,t} \times Insti_{i,t}$ and $SpESGDis_{i,t} \times Insti_{i,t}$) are 0.98 and 0.82, respectively, both highly significant at the 1% level.

4.5 Climate Concerns and ESG Disclosures

While the investment community increasingly views climate change as a pressing issue, investor attention and response may vary with prevailing market sentiments. During periods of heightened concern about climate risks, investors are likely to devote more effort into seeking sustainable and responsible investments. As a result, we expect the relationship between specific ESG disclosures and fund flows to be stronger during

periods of elevated climate risk concern.

To test the hypothesis, we divide our sample into periods of high and low climate concern using the Media Climate Change Concern (MCCC) index in Ardia et al. (2023) and run separate regressions for each subsample. Our analysis reveals significant differences in the effect of specific ESG disclosures on subsequent fund flows between high and low climate concern periods.

In high climate concern periods (Columns (1) and (2) of Table 8), we observe a strong and favourable flow response to specific ESG disclosures, with a slope coefficient of 0.67 on the indicator variable for specific ESG disclosures (Column (2)). This shows that, on average, a fund making specific ESG disclosures sees a 0.67% increase in subsequent fund flows during high climate concern periods, which is 42.6 percentage points greater than the 0.47% flow increase observed in the overall sample periods reported in Table 6.

In contrast, during low climate concern periods (Columns (5) and (6) of Table 8), funds making specific ESG disclosures do not attract significant fund flows, as the slope coefficient for the specific ESG disclosures dummy is close to zero (–0.02 in Column (6)). Additionally, our results show that generic ESG disclosures have no impact on fund flows in either high or low climate concern period.

[Insert Table 8 about here]

We also find that institutional-oriented funds are the main driver behind the strengthened flow-disclosure relationship during periods of high climate concern. Specifically, the interaction term between the institutional indicator variable and the specific ESG disclosure indicator has a coefficient of 0.86, which is statistically significant at the 1% level during high concern periods (Column (4) of Table 8). This suggests that, on average, an institutional-oriented fund with specific ESG disclosures receives an additional 0.86% fund flows during high climate concern periods. In contrast, this effect diminishes to 0.22% and becomes insignificant during low climate concern periods (Column (8)). Overall, these findings highlight that specific ESG disclosures that credibly addresses climate concerns attract significant investor responses, particularly for institutional-oriented funds, but only during periods of heightened climate concerns.

5 Conclusion

This paper utilises a Large Language Model to develop a new metric for assessing the of specificity of voluntary ESG disclosures in mutual fund prospectus. Armed with this specificity measure, we provide empirical evidence that specific language reflects credible commitments to performance. Our results show that only specific ESG disclosures, as opposed to generic ones, are linked to higher ESG scores of funds' future holdings.

Furthermore, in line with investor recognition of this quality, we observe that specific ESG disclosures lead to increased fund flows, particularly in funds catering to institutional investors. These investors are more adept at evaluating the credibility of specific ESG language and are better positioned to act on these disclosures than retail investors. This pattern is especially prominent during periods of heightened ESG sentiment, which is proxied for by above median levels of climate risk concerns.

Overall, these findings suggest that ESG-conscious mutual fund investors place a high value on credible information in ESG disclosures, supporting recent regulatory initiatives for more structured and detailed ESG reporting. These proposed changes may help retail investors who seem to struggle to interpret and act on the quality of voluntary ESG disclosures. This calls for further work to investigate whether these regulatory changes effectively level the playing field for all investors.

References

Abis, S., Buffa, A. M., Javadekar, A., & Lines, A. (2022). Learning from prospectuses. *Available at SSRN: http://dx.doi.org/10.2139/ssrn.3865753*.

Abis, S., & Lines, A. (2023). Broken promises, competition, and capital allocation in the mutual fund industry. *Columbia Business School Research Paper No. 3851861, Available at SSRN: http://dx.doi.org/10.2139/ssrn.3851861*.

Abraham, J., Olbert, M., & Vasvari, F. (2022). Esg disclosures in the private equity industry. *Journal of Accounting Research*, forthcoming.

Andrikogiannopoulou, A., Krueger, P., Mitali, S. F., & Papakonstantinou, F. (2022). Discretionary information in esg investing: A text analysis of mutual fund prospectuses. *Available at SSRN: http://dx.doi.org/10.2139/ssrn.4082263*.

Ardia, D., Bluteau, K., Boudt, K., & Inghelbrecht, K. (2023). Climate change concerns and the performance of green vs. brown stocks. *Management Science*, *69*(12), 7607–7632.

Ben-David, I., Li, J., Rossi, A., & Song, Y. (2022). What do mutual fund investors really care about? *The Review of Financial Studies*, *35*(4), 1723–1774.

Berkman, H., Jona, J., & Soderstrom, N. (2024). Firm-specific climate risk and market valuation. *Accounting, Organizations and Society*, forthcoming.

Ceccarelli, M., Glossner, S., & Homanen, M. (2022). Catering through transparency: Voluntary esg disclosure by asset managers and fund flows. *Available at SSRN: http://dx.doi.org/10.2139/ssrn.4110596*.

Chae, Y., & Davidson, T. (2023). Large language models for text classification: From zero-shot learning to fine-tuning. *Open Science Foundation*.

Chen, Q., Goldstein, I., & Jiang, W. (2010). Payoff complementarities and financial fragility: Evidence from mutual fund outflows. *Journal of Financial Economics*, *97*(2), 239–262.

Christoffersen, S. E., & Xu, H. (2017). Investor attrition and fund flows in mutual funds. *Journal of Financial and Quantitative Analysis*, *52*(3), 867–893.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica: Journal of the Econometric Society*, *47*(1), 153–161.

Hope, O.-K., Hu, D., & Lu, H. (2016). The benefits of specific risk-factor disclosures. *Review of Accounting Studies*, *21*, 1005–1045.

Houston, J. F., Lin, C., Liu, S., & Wei, L. (2019). Litigation risk and voluntary disclosure: Evidence from legal changes. *The Accounting Review*, *94*(5), 247–272.

Huang, J., Wei, K. D., & Yan, H. (2007). Participation costs and the sensitivity of fund flows to past performance. *The Journal of Finance*, *62*(3), 1273–1311.

Ilhan, E., Krueger, P., Sautner, Z., & Starks, L. T. (2023). Climate risk disclosure and institutional investors. *The Review of Financial Studies*, *36*(7), 2617–2650.

Juan José Bucher, M., & Martini, M. (2024). Fine-tuned'small'llms (still) significantly outperform zero-shot generative ai models in text classification. *arXiv e-prints*, arXiv–2406.

Keswani, A., & Stolin, D. (2008). Which money is smart? mutual fund buys and sells of individual and institutional investors. *The Journal of Finance*, *63*(1), 85–118.

Kiela, D., Bartolo, M., Nie, Y., Kaushik, D., Geiger, A., Wu, Z., Vidgen, B., Prasad, G., Singh, A., Ringshia, P., et al. (2021). Dynabench: Rethinking benchmarking in nlp. *arXiv preprint arXiv:2104.14337*.

Kincaid, J. P., Fishburne, R., Rogers, R., & Chissom, B. (1975). Derivation of new readability formulas (automated reliability index, fog count and flesch reading ease formula) for navy enlisted personnel (research branch report 8-75). memphis, tn: Naval air station; 1975. *Naval Technical Training, US Naval Air Station: Millington, TN*.

Kostovetsky, L., & Warner, J. B. (2020). Measuring innovation and product differentiation: Evidence from mutual funds. *The Journal of Finance*, *75*(2), 779–823.

Kvam, E., Molnár, P., Wankel, I., & Ødegaard, B. A. (2024). Do stock prices react to esg sentiment? *Available at SSRN: http://dx.doi.org/10.2139/ssrn.4057988*.

Lennox, C. S., Francis, J. R., & Wang, Z. (2012). Selection models in accounting research. *The Accounting Review*, *87*(2), 589–616.

Lewis, M., Liu, Y., Goyal, N., Ghazvininejad, M., Mohamed, A., Levy, O., Stoyanov, V., & Zettlemoyer, L. (2019). Bart: Denoising sequence-to-sequence pre-training for natural language generation, translation, and comprehension. *arXiv preprint arXiv:1910.13461*.

Loughran, T., & McDonald, B. (2011). When is a liability not a liability? textual analysis, dictionaries, and 10-ks. *The Journal of Finance*, *66*(1), 35–65.

Raghunandan, A., & Rajgopal, S. (2022). Do esg funds make stakeholder-friendly investments? *Review of Accounting Studies*, *27*(3), 822–863.

Sautner, Z., Van Lent, L., Vilkov, G., & Zhang, R. (2023). Firm-level climate change exposure. *The Journal of Finance*, *78*(3), 1449–1498.

Shapiro, C. (2023). Green funds in a gray area: The esg fund labeling problem and how the sec can fix it. *Columbia Journal of Environmental Law*, *48*(2), 63–63.

Shu, L., Xu, H., Liu, B., & Chen, J. (2022). Zero-shot aspect-based sentiment analysis. *arXiv preprint arXiv:2202.01924*.

Sirri, E. R., & Tufano, P. (1998). Costly search and mutual fund flows. *The Journal of Finance*, *53*(5), 1589–1622.

Yin, W., Hay, J., & Roth, D. (2019). Benchmarking zero-shot text classification: Datasets, evaluation and entailment approach. *arXiv preprint arXiv:1909.00161*.

Figure 1: Funds with ESG disclosures

This figure plots the number and percentage of funds with ESG disclosures over time. "Funds with ESG disclosures" have one or more sentences on ESG issues in the PIS section of its prospectus. We use the "BART-large-MNLI" model, an open-source pre-trained Large Language Model (LLM) fine-tuned for zero-shot sentence classification from HuggingFace, to estimate the probability of a sentence belonging to the "ESG issue" class. Refer to Section 2.1 for more details on the classification method. The sample period runs from 2010m1 to 2022m12.

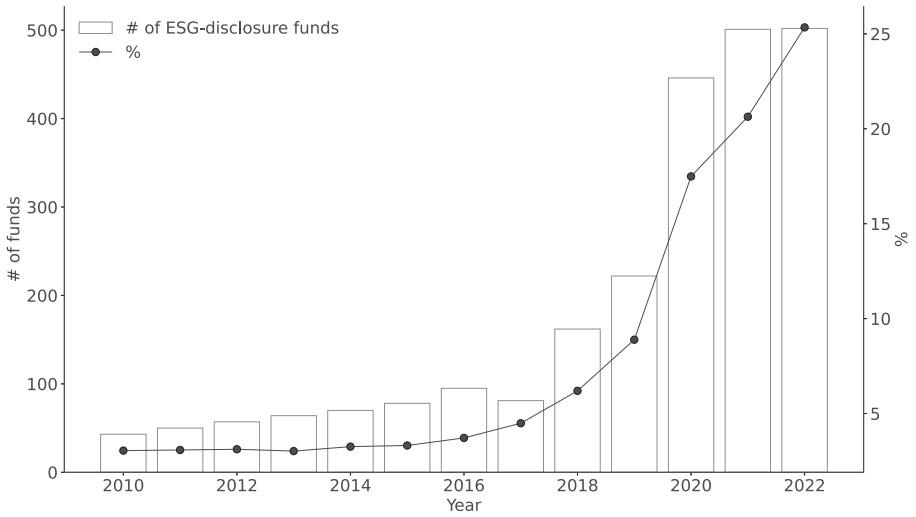


Figure 2: Funds with specific and generic ESG disclosures

This figure reports trends in specific and generic ESG disclosures over time. The bars show the number of funds with specific ESG disclosures and those with generic ESG disclosures in the PIS section of their prospectuses. The lines represent each type as a percentage of ESG-disclosure funds. Specific (generic) ESG disclosures have at least one sentence on specific (generic) ESG issues in the PIS section of their prospectuses filed in that year. Refer to Section 2.1 for more details on the classification method. The sample runs from 2010m1 to 2022m12.

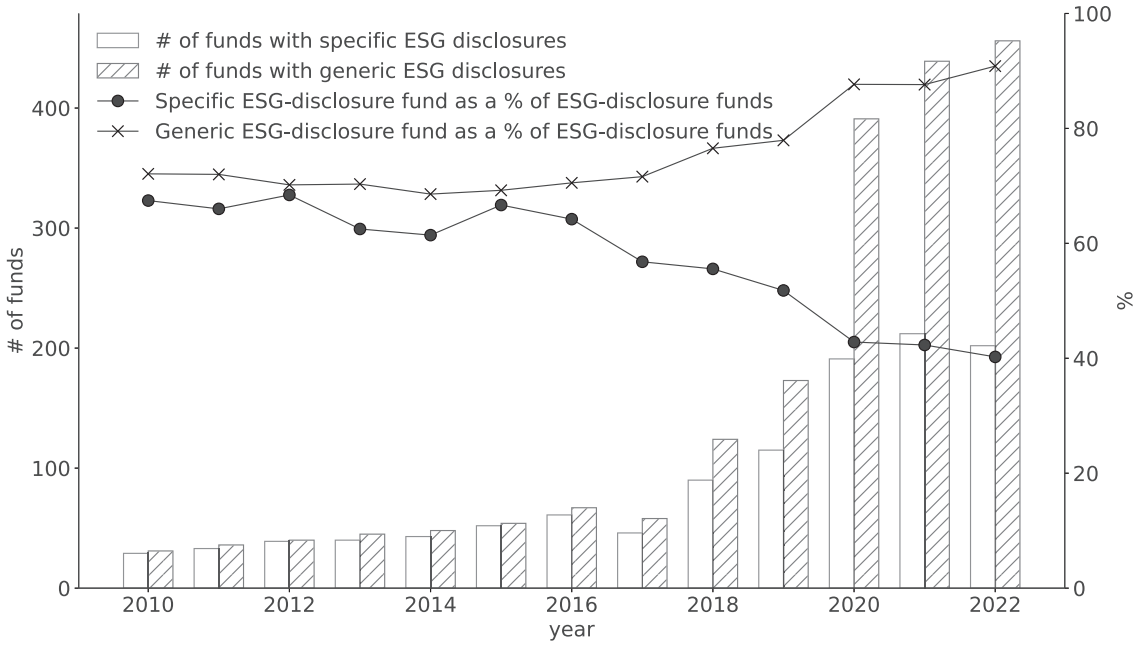


Figure 3: Length of specific and generic ESG disclosures

This figure shows the length of specific and generic ESG disclosures in the PIS section of fund prospectuses over time from 2010 to 2022. The length for each type of disclosure is the sum of numbers of words used in each type of sentences in a PIS. The sample runs from 2010m1 to 2022m12.

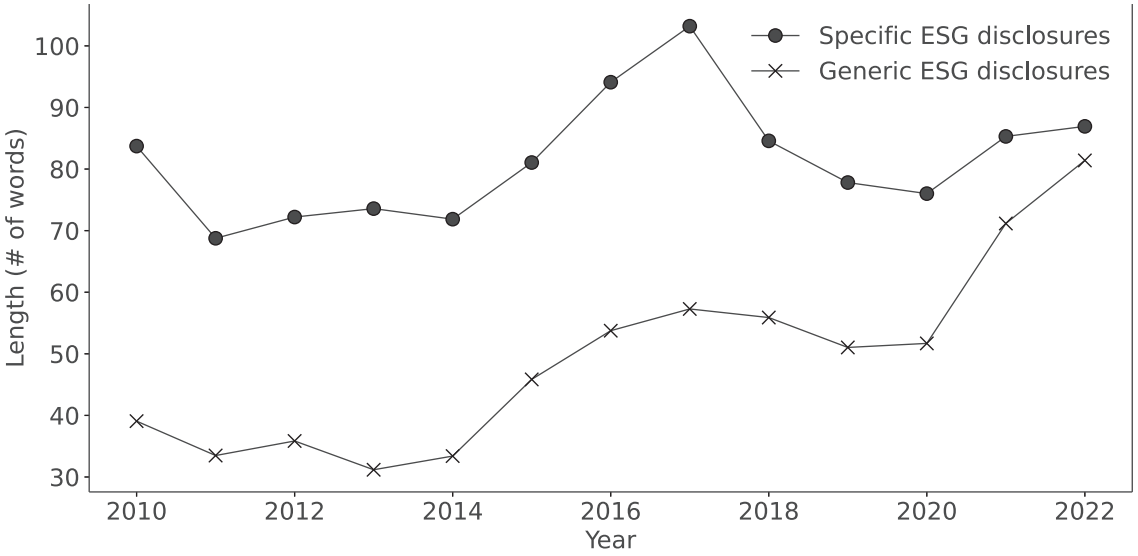


Table 1: Traditional textual characteristics of PIS sentences

These tables report word counts using the traditional dictionary approach for different types of sentences. Panels A, B and C report word counts of sentences on specific ESG issues ("Specific ESG disclosures"), sentences on generic ESG issues ("Generic ESG disclosures"), and other sentences ("Other"), respectively. Refer to Section 2.1 for the sentence classification method. "Total" refers to the word counts of a sentence. The rows titled "Positive", "Negative", "Uncertainty" and "Litigious" are sentiment word counts in a sentence using the 2023 version of the sentiment dictionary of Loughran and McDonald (2011). "ESG" refers to the count of ESG phrases in a sentence using the ESG dictionary from Abraham et al. (2022). The sample includes unique sentences in the PIS section contained in prospectuses of all actively managed equity funds in the CRSP Survivorship-Bias-Free US Mutual Funds dataset with total net assets greater than 5 million USD from 2010m1 to 2022m12 (referred to as "funds" in this document).

Panel A: Specific ESG disclosures

	count	mean	sd	p10	p25	p50	p75	p90
Total	1,756	45.11	38.75	17.00	25.00	34.00	54.00	81.00
ESG	1,756	1.92	2.02	0.00	1.00	1.00	3.00	4.00
Positive	1,756	0.61	0.96	0.00	0.00	0.00	1.00	2.00
Negative	1,756	0.37	1.08	0.00	0.00	0.00	0.00	1.00
Uncertainty	1,756	0.53	0.85	0.00	0.00	0.00	1.00	2.00
Litigious	1,756	0.07	0.32	0.00	0.00	0.00	0.00	0.00

Panel B: Generic ESG disclosures

	count	mean	sd	p10	p25	p50	p75	p90
Total	2,089	35.73	21.71	17.00	22.00	31.00	44.00	59.00
ESG	2,089	1.97	1.60	0.00	1.00	2.00	3.00	4.00
Positive	2,089	0.50	0.89	0.00	0.00	0.00	1.00	2.00
Negative	2,089	0.16	0.46	0.00	0.00	0.00	0.00	1.00
Uncertainty	2,089	0.66	0.90	0.00	0.00	0.00	1.00	2.00
Litigious	2,089	0.02	0.17	0.00	0.00	0.00	0.00	0.00

Panel C: Other

	count	mean	sd	p10	p25	p50	p75	p90
Total	135,675	34.53	22.54	15.00	21.00	29.00	42.00	58.00
ESG	135,675	0.04	0.31	0.00	0.00	0.00	0.00	0.00
Positive	135,675	0.33	0.77	0.00	0.00	0.00	0.00	1.00
Negative	135,675	0.18	0.55	0.00	0.00	0.00	0.00	1.00
Uncertainty	135,675	0.71	0.92	0.00	0.00	0.00	1.00	2.00
Litigious	135,675	0.08	0.35	0.00	0.00	0.00	0.00	0.00

Table 2: Summary statistics: funds with and without ESG disclosures

This table reports the means ("mean") and standard deviations ("sd") of the important characteristics of fund-month observations with and without ESG disclosures in their PIS sections. The numbers in the "Diff" column are the difference in means. ***, ** and * denote significance levels of 1%, 5%, and 10%, respectively, for the t-tests for equal means with unequal variance. The sample runs from 2010m1 to 2022m12. Refer to Appendix A1 for the definitions of variables.

	ESG		Non-ESG		Diff
	mean	sd	mean	sd	b
$CategoryESG_{i,t}$	0.19	0.16	0.07	0.08	-0.13***
$Ret12m_{i,t}$	0.08	0.22	0.08	0.16	-0.00*
$ESGScoreRk_{i,t}$	0.53	0.30	0.50	0.29	-0.03***
$Ln(TNA_{i,t})$	5.64	1.94	5.82	1.95	0.18***
$Ln(Age_{i,t})$	2.39	1.05	2.35	0.96	-0.04***
$ExpenseRatio_{i,t}$	0.01	0.00	0.01	0.00	-0.00
$Turnover_{i,t}$	0.57	0.58	0.69	0.82	0.11***
N	20,977		254,577		275,554

Table 3: Heckman two-step procedure: the first-stage selection model

This table reports the results from the first stage of the Heckman procedure using a probit regression. The t-statistics in parentheses are calculated using two-way clustered standard errors by fund and by year-month. ***, ** and * denote significance levels of 1%, 5%, and 10%, respectively. The sample runs from 2010m1 to 2022m12.

	(1) $ESGDis_{i,t}$
$CategoryESG_{i,t}$	4.59***
	(12.10)
$ESGScoreRk_{i,t}$	0.27***
	(3.27)
$Ret12m_{i,t}$	0.37***
	(3.93)
$Ln(TNA_{i,t})$	-0.03
	(-1.50)
$Ln(Age_{i,t})$	0.03
	(0.85)
$Ln(PISLen_{i,t})$	0.55***
	(10.68)
$ExpenseRatio_{i,t}$	26.68***
	(3.08)
$Turnover_{i,t}$	-0.12***
	(-3.30)
Category FE	YES
Year-Month FE	YES
N	274,679
Pseudo R^2	.2161

Table 4: Summary statistics and correlation coefficients: ESG-disclosure funds

Panel A summarises the important characteristics for the fund-month observations with ESG disclosures. These observations are used in the second-stage regressions of the Heckman (1979) two-step procedures in Tables 5 to 8. Panel B reports the Pearson pairwise correlation coefficients among these variables. ***, ** and * denote significance levels of 1%, 5%, and 10%, respectively. The sample runs from 2010m1 to 2022m12. Refer to Appendix A1 for the definitions of variables.

Panel A: Summary statistics

	count	mean	sd	p10	p25	p50	p75	p90
$\Delta ESGScoreRk_{i,t,t+12}$	10,813	-0.00	0.21	-0.21	-0.07	0.00	0.07	0.21
$Flow\%_{i,t+1}$	20,125	0.41	5.72	-2.82	-1.23	-0.30	1.04	4.10
$SpESGDisRk_{i,t}$	20,125	0.37	0.38	0.01	0.01	0.01	0.75	0.90
$GeESGDisRk_{i,t}$	20,125	0.47	0.31	0.01	0.21	0.49	0.74	0.90
$ESGScoreRk_{i,t}$	20,125	0.50	0.29	0.10	0.26	0.50	0.76	0.90
$Ret12m_{i,t}$	20,125	0.08	0.22	-0.18	-0.06	0.07	0.21	0.36
$Ln(TNA_{i,t})$	20,125	5.64	1.95	3.01	4.14	5.68	7.09	8.09
$Ln(Age_{i,t})$	20,125	2.39	1.05	0.88	1.73	2.66	3.18	3.44
$ExpenseRatio_{i,t}$	20,125	0.01	0.00	0.01	0.01	0.01	0.01	0.01
$Turnover_{i,t}$	20,125	0.57	0.58	0.15	0.25	0.43	0.70	1.13
$Ln(PISLen_{i,t})$	20,125	6.10	0.45	5.57	5.81	6.10	6.39	6.66
$PosShr_{i,t}$	20,125	0.01	0.01	0.00	0.01	0.01	0.02	0.02
$NegShr_{i,t}$	20,125	0.01	0.01	0.00	0.00	0.00	0.01	0.01
$UncertShr_{i,t}$	20,125	0.02	0.01	0.01	0.02	0.02	0.03	0.04
$LitShr_{i,t}$	20,125	0.00	0.00	0.00	0.00	0.00	0.00	0.01
$FKGrade_{i,t}$	20,125	16.22	2.06	13.90	14.80	16.00	17.40	18.70

Panel B: Pearson correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
$\Delta ESGScoreRk_{i,t,t+12}$	1.00															
$Flow\%_{i,t+1}$	-0.00	1.00														
$SpESGDisRk_{i,t}$	-0.01	0.07***	1.00													
$GeESGDisRk_{i,t}$	-0.01	0.05***	0.03***	1.00												
$ESGScoreRk_{i,t}$	-0.34***	0.01	0.18***	0.18***	1.00											
$Ret12m_{i,t}$	0.01	0.18***	-0.05***	0.05***	0.01	1.00										
$Ln(TNA_{i,t})$	0.01	-0.11***	-0.22***	-0.05***	-0.14***	0.10***	1.00									
$Ln(Age_{i,t})$	-0.01	-0.23***	-0.20***	-0.14***	-0.08***	-0.02*	0.57***	1.00								
$ExpenseRatio_{i,t}$	0.02	-0.02	0.10***	-0.03***	-0.09***	-0.18***	-0.28***	-0.01	1.00							
$Turnover_{i,t}$	0.03**	-0.02*	-0.10***	0.04***	-0.10***	-0.04***	-0.14***	-0.05***	0.14***	1.00						
$Ln(PISLen_{i,t})$	0.01	0.06***	0.21***	0.27***	0.10***	-0.00	-0.19***	-0.29***	0.00	0.02	1.00					
$PosShr_{i,t}$	-0.01	0.02	0.09***	0.10***	0.13***	0.10***	-0.05***	0.03**	-0.02	-0.11***	-0.04***	1.00				
$NegShr_{i,t}$	0.02*	0.00	-0.04***	-0.08***	0.01	-0.01	-0.01	-0.08***	-0.07***	-0.03***	0.04***	0.13***	1.00			
$UncertShr_{i,t}$	0.04***	-0.04***	-0.31***	-0.05***	-0.04***	0.03**	0.07***	0.02*	-0.09***	0.01	-0.05***	-0.02	0.57***	1.00		
$LitShr_{i,t}$	-0.01	0.01	0.02**	-0.07***	-0.01	0.00	0.05***	-0.01	0.03**	0.07***	0.12***	0.02	0.42***	0.40***	1.00	
$FKGrade_{i,t}$	-0.04***	0.08***	0.19***	0.13***	0.01	0.05***	-0.11***	-0.13***	0.10***	0.01	0.14***	0.16***	0.03**	-0.12***	-0.02*	1.00

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: ESG disclosure and ESG scores

This table reports the association between ESG disclosures and 12-month ahead changes in the ranks of ESG scores of holdings. $\Delta ESGScoreRk_{i,t,t+12}$ is the change in the rank of weighted average of ESG scores of fund i's holdings in 12 months. "IMR" is the Inverse Mills Ratio from the first-stage Heckman (1979) procedure. All second-stage regressions control for fund category and year-month fixed effects ("Cat × YM FE"). The t-statistics in parentheses are calculated using two-way clustered standard errors by fund and by year-month. ***, ** and * denote significance levels of 1%, 5%, and 10%, respectively. The sample period runs from 2010m to 2022m12.

	$\Delta ESGScoreRk_{i,t,t+12}$			
	(1)	(2)	(3)	(4)
$SpESGDisRk_{i,t}$	0.03**		0.03**	0.05***
	(2.36)		(2.35)	(3.40)
$GeESGDisRk_{i,t}$		0.00	0.00	0.02
		(0.10)	(0.20)	(1.07)
$ESGScoreRk_{i,t}$				-0.29***
				(-6.07)
$Ret12m_{i,t}$	0.26***	0.25***	0.26***	0.05
	(3.78)	(3.72)	(3.75)	(1.14)
$Ln(TNA_{i,t})$	-0.02***	-0.02***	-0.02***	-0.01
	(-3.47)	(-3.44)	(-3.38)	(-1.08)
$Ln(Age_{i,t})$	0.02***	0.02***	0.02***	0.01
	(2.80)	(2.66)	(2.74)	(1.09)
$ExpenseRatio_{i,t}$	17.46***	17.15***	17.49***	2.37
	(4.37)	(4.40)	(4.31)	(0.93)
$Turnover_{i,t}$	-0.10***	-0.10***	-0.10***	-0.03
	(-4.50)	(-4.48)	(-4.42)	(-1.56)
$Ln(PISLen_{i,t})$	0.39***	0.38***	0.39***	0.06
	(5.12)	(5.17)	(5.10)	(1.37)
$PosShr_{i,t}$	-0.22	-0.23	-0.24	0.65
	(-0.33)	(-0.33)	(-0.35)	(0.89)
$NegShr_{i,t}$	-0.54	-0.36	-0.52	-0.27
	(-0.60)	(-0.40)	(-0.58)	(-0.29)
$UncertShr_{i,t}$	1.22**	0.88*	1.22**	1.07*
	(2.40)	(1.81)	(2.40)	(1.97)
$LitShr_{i,t}$	-2.60	-2.00	-2.54	-2.33
	(-1.22)	(-0.95)	(-1.20)	(-1.09)
$FKGrade_{i,t}$	-0.01***	-0.01***	-0.01***	-0.01***
	(-3.26)	(-2.97)	(-3.21)	(-2.71)
$IMR_{i,t}$	0.89***	0.87***	0.89***	0.09
	(5.48)	(5.42)	(5.36)	(0.99)
Constant	-3.73***	-3.66***	-3.73***	-0.28
	(-5.16)	(-5.16)	(-5.10)	(-0.71)
Cat × YM FE	YES	YES	YES	YES
N	10,624	10,624	10,624	10,624
Adj R^2	.282	.28	.282	.324

Table 6: ESG disclosures and fund flows

This table reports the results from regressing future fund flows ($Flow\%_{i,t}$) on measures for ESG disclosures. The t-statistics in parentheses are calculated using two-way clustered standard errors by fund and by year-month. ***, ** and * denote significance levels of 1%, 5%, and 10%, respectively. The sample runs from 2010m1 to 2022m12.

	$Flow\%_{i,t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$SpESGDisRk_{i,t}$		0.66***		0.66***	0.64***	
		(3.23)		(3.26)	(2.90)	
$SpESGDis_{i,t}$						0.47***
						(2.84)
$GeESGDisRk_{i,t}$			0.20	0.23	0.17	0.24
			(0.74)	(0.86)	(0.62)	(0.85)
$ESGScoreRk_{i,t}$	0.10	0.02	0.09	0.00	-0.21	-0.15
	(0.33)	(0.06)	(0.28)	(0.01)	(-0.51)	(-0.36)
$Ret12m_{i,t}$	6.56***	6.60***	6.56***	6.60***	6.25***	6.30***
	(7.34)	(7.34)	(7.36)	(7.36)	(6.66)	(6.76)
$Ln(TNA_{i,t})$	0.02	0.03	0.02	0.03	0.05	0.05
	(0.48)	(0.66)	(0.42)	(0.60)	(1.00)	(0.89)
$Ln(Age_{i,t})$	-1.16***	-1.14***	-1.15***	-1.13***	-1.17***	-1.17***
	(-10.81)	(-10.64)	(-10.71)	(-10.53)	(-10.09)	(-10.03)
$ExpenseRatio_{i,t}$	-61.61*	-56.60*	-61.02*	-55.86*	-74.17*	-71.09*
	(-1.97)	(-1.83)	(-1.96)	(-1.81)	(-1.90)	(-1.83)
$Turnover_{i,t}$	-0.13	-0.14	-0.14	-0.15	-0.04	-0.06
	(-1.01)	(-1.10)	(-1.05)	(-1.16)	(-0.21)	(-0.30)
$Ln(PISLen_{i,t})$					-0.43	-0.33
					(-0.65)	(-0.50)
$PosShr_{i,t}$					10.14	10.52
					(0.98)	(1.02)
$NegShr_{i,t}$					-16.87	-16.56
					(-1.28)	(-1.26)
$UncertShr_{i,t}$					1.48	1.57
					(0.17)	(0.18)
$LitShr_{i,t}$					6.76	5.89
					(0.18)	(0.16)
$FKGrade_{i,t}$					0.02	0.02
					(0.41)	(0.50)
$IMR_{i,t}$	-0.23	0.06	-0.17	0.13	-0.90	-0.72
	(-0.52)	(0.14)	(-0.39)	(0.30)	(-0.59)	(-0.47)
Constant	3.48***	2.70***	3.30***	2.50***	6.48	5.45
	(4.08)	(3.25)	(3.82)	(2.94)	(1.04)	(0.88)
Cat × YM FE	YES	YES	YES	YES	YES	YES
N	20,125	20,125	20,125	20,125	20,125	20,125
Adj R^2	.14	.142	.14	.142	.142	.142

Table 7: ESG disclosures and fund flows: institutional-oriented funds

This table reports the results from regressing future fund flows ($Flow\%_{i,t+1}$) on measures for ESG disclosures for institutional-oriented funds (Columns (1) and (2)), retail-oriented funds (Columns (3) and (4)) and all funds (Columns (5) and (6)). t-statistics in parentheses are calculated using two-way clustered standard errors by fund and by year-month. ***, ** and * denote significance levels of 1%, 5%, and 10%, respectively. The sample runs from 2010m1 to 2022m12.

	Institutional		Retail		All	
	(1)	(2)	(3)	(4)	(5)	(6)
$SpESGDisRk_{i,t}$	1.05***		-0.11		0.05	
	(3.40)		(-0.32)		(0.18)	
$SpESGDis_{i,t}$		0.83***		-0.12		-0.01
		(3.49)		(-0.49)		(-0.04)
$SpESGDisRk_{i,t} \times Insti_{i,t}$					0.98**	
					(2.54)	
$SpESGDis_{i,t} \times Insti_{i,t}$						0.82***
						(2.88)
$GeESGDisRk_{i,t}$	0.10	0.20	0.44	0.42	0.19	0.18
	(0.26)	(0.52)	(1.39)	(1.30)	(0.54)	(0.52)
$GeESGDiskRK_{i,t} \times Insti_{i,t}$					-0.07	0.04
					(-0.16)	(0.08)
$Ret12m_{i,t}$	5.59***	5.67***	6.44***	6.43***	7.03***	7.02***
	(3.26)	(3.32)	(5.28)	(5.29)	(6.88)	(6.90)
$Ret12m_{i,t} \times Insti_{i,t}$					-1.12	-1.09
					(-1.50)	(-1.47)
$ESGScoreRk_{i,t}$	-0.72	-0.60	-0.54	-0.55	-0.17	-0.14
	(-0.69)	(-0.58)	(-1.17)	(-1.19)	(-0.41)	(-0.35)
$ESGScoreRk_{i,t} \times Insti_{i,t}$					-0.08	-0.06
					(-0.17)	(-0.12)
$Insti_{i,t}$					-0.40	-0.49
					(-1.16)	(-1.41)
$IMR_{i,t}$	-2.10	-1.79	-3.53*	-3.61*	-0.98	-0.94
	(-0.48)	(-0.41)	(-1.80)	(-1.81)	(-0.65)	(-0.62)
Constant	11.52	10.06	17.72**	18.12**	6.88	6.66
	(0.61)	(0.54)	(2.37)	(2.38)	(1.12)	(1.08)
All controls	YES	YES	YES	YES	YES	YES
Cat × YM FE	YES	YES	YES	YES	YES	YES
N	11,298	11,298	8,159	8,159	20,125	20,125
Adj R^2	.105	.105	.21	.21	.143	.143

Table 8: ESG disclosures, fund flows and climate concerns

This table reports results from regressing future fund flows ($Flow\%_{i,t}$) on ESG disclosure measures in periods of high climate concerns (Columns (1) to (4)) and low climate concerns (Columns (5) and (8)). The high (low) period of climate concern includes months when the climate concern index (MCCC) (Ardia et al., 2023) is greater than or equal to (below) the median in our sample period. These regressions control for all variables as in Table 6. t-statistics in parentheses are from standard errors clustered by fund and year-month. ***, ** and * denote significance levels of 1%, 5%, and 10%, respectively. The sample period runs from 2010m to 2022m12.

	$Flow\%_{i,t+1}$ (High concern)				$Flow\%_{i,t+1}$ (Low concern)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$SpESGDisRk_{i,t}$	0.93***		0.22		-0.19		-0.19	
	(4.16)		(0.76)		(-0.41)		(-0.33)	
$SpESGDis_{i,t}$		0.67***		0.12		-0.02		-0.12
		(3.93)		(0.56)		(-0.04)		(-0.27)
$SpESGDisRk_{i,t} \times Insti_{i,t}$			1.06***				-0.06	
			(2.83)				(-0.06)	
$SpESGDis_{i,t} \times Insti_{i,t}$				0.86***				0.22
				(3.09)				(0.32)
$GeESGDisRk_{i,t}$	0.20	0.26	0.01	0.02	0.20	0.21	0.68	0.64
	(0.67)	(0.88)	(0.02)	(0.06)	(0.36)	(0.37)	(0.95)	(0.87)
$GeESGDiskRK_{i,t} \times Insti_{i,t}$			0.24	0.33			-1.21	-1.09
			(0.55)	(0.74)			(-0.98)	(-0.85)
$Ret12m_{i,t}$	5.38***	5.49***	5.73***	5.76***	9.74***	9.81***	11.62***	11.69***
	(6.21)	(6.37)	(6.28)	(6.28)	(4.00)	(4.01)	(3.96)	(3.97)
$Ret12m_{i,t} \times Insti_{i,t}$			-0.39	-0.38			-3.62	-3.57
			(-0.67)	(-0.64)			(-1.27)	(-1.26)
$ESGScoreRk_{i,t}$	-0.18	-0.05	-0.13	-0.07	-0.78	-0.78	-0.77	-0.74
	(-0.41)	(-0.12)	(-0.35)	(-0.20)	(-0.98)	(-0.98)	(-0.97)	(-0.93)
$ESGScoreRk_{i,t} \times Insti_{i,t}$			0.02	0.05			-0.11	-0.21
			(0.04)	(0.10)			(-0.10)	(-0.18)
$Insti_{i,t}$			-0.64**	-0.71**			0.25	0.11
			(-2.01)	(-2.19)			(0.27)	(0.11)
$IMR_{i,t}$	-0.38	0.02	-0.20	-0.05	-3.05	-2.94	-3.36	-3.29
	(-0.26)	(0.01)	(-0.14)	(-0.04)	(-1.02)	(-0.98)	(-1.15)	(-1.12)
Constant	4.56	2.57	4.10	3.30	16.84	16.46	19.17	18.91
	(0.76)	(0.43)	(0.69)	(0.56)	(1.33)	(1.30)	(1.57)	(1.55)
All controls	YES	YES	YES	YES	YES	YES	YES	YES
Cat × YM FE	YES	YES	YES	YES	YES	YES	YES	YES
N	15,439	15,439	15,439	15,439	4,686	4,686	4,686	4,686
Adj R^2	.124	.123	.125	.125	.164	.164	.166	.166

Appendix

A1 Variable definitions

Variable	Definition
(a) ***Dependent variables***	
$Flow\%_{i,t+1}$	Monthly net percentage fund flow in month $t+1$ for fund class share i, calculated as the change in total net assets excluding the growth in total net assets as a result of fund returns. Fund flow, fund returns, turnover ratios and expense ratios are all aggregated to the fund level, which are weighted averages of all fund class shares using their total net assets in the previous months. Data are from the CRSP Survivor-Bias-Free US Mutual Funds database ("CMF").
(b) ***ESG disclosure measures based on LLM outputs***	
$ESGDis_{i,t}$	An indicator variable that takes a value of 1 (0) if the PIS section in fund i's prospectus as of month t contains one or more (zero) sentences on ESG issues. A prospectus must have been filed no more than 12 months before the end of the month t to be used in our analysis. We use the "BART-large-MNLI" model, an open-source pre-trained LLM fine-tuned for zero-shot sentence classification from HuggingFace to identify sentences on ESG issues. Refer to Section 2.1 for more details on this method.
$CategoryESG\%_{i,t}$	The number of funds with ESG disclosures ($ESGDis_{i,t} = 1$) as a percentage of funds in the same category as fund i in month t (or funds with the same "crsp_obj_cd" in CMF).
$SpESGDisRk_{i,t}$	The cross-sectional rank in decimal points in month t of the total number of words of specific ESG disclosures in the prospectus of fund i. Specific ESG disclosures include all sentences on specific ESG issues in the PIS section of a fund prospectus. We use the "BART-large-MNLI" model to identify if an ESG sentence is on specific ESG issues. Refer to Section 2.1 for more details on this method.
$SpESGDis_{i,t}$	An indicator variable that takes the value of one if the prospectus of fund i as of month t contains one or more specific ESG sentences, and zero otherwise.
$GeESGDisRk_{i,t}$	The cross-sectional rank in decimal points in month t of the total number of words of generic ESG disclosures in the PIS section of fund i's prospectus. Generic ESG disclosures include all nonspecific ESG sentences in the PIS section of a fund prospectus. Refer to Section 2.1 for more details on this method.
(c) ***Fund characteristics***	
$ESGScoreRk_{i,t}$	The rank in decimal points of the holding-weighted ESG score of fund i for stocks held by the fund that are known to investors at the end of month t. ESG scores of stocks are sourced from the Morningstar Sustainalytics database. Funds' holding information is from the CMF database. Within the Sustainalytics universe, we linearly interpolate to fill in missing values of ESG scores in gaps without data for a stock. Within the universe of holdings of funds in the CMF dataset, we fill in the missing values with the median score.
$Ret12m_{i,t}$	Net monthly return to a fund accumulated over the last 12 months as of month t in decimal points. It is calculated as $\prod_{j=0}^{11}(1 + r_{i,t-j}) - 1$, where the net monthly return $r_{i,t}$ is the monthly total return (*mret* in CMF) net of a $1/12^{th}$ of the annual expense ratio for the corresponding fiscal year. We obtain net monthly returns for each fund before computing cumulative returns. If a fund does not have 12 consecutive months of non-missing returns up to month t, we accumulate the non-missing returns and normalise the cumulative returns to 12 months.
$Ln(TNA_{i,t})$	The natural logarithm of the fund i's total net assets in USD millions in month t.
$Turnover_{i,t}$	Turnover ratio (*turn_ratio* in CMF) in decimal points for fund i in the most recent year prior to month t.

Variable	Definition
$ExpenseRatio_{i,t}$	Expense ratio (*exp_ratio* in CMF) in decimal points of fund i in the annual period prior to t.
$Ln(Age_{i,t})$	The natural logarithm of fund age in years as of month t. The age is calculated as the difference between month t and the inception month of fund i, scaled by 12.
$Insti_{i,t}$	An indicator variable if the total net assets of the institutional class share are greater than those of retail class share of fund i in month t. We use institutional and retail flags in the CMF database.
(d) ***Other textual characteristics***	
$Ln(PISLen_{i,t})$	The natural logarithm of the total number of words of mutual fund i's PIS section as of month t.
$PosShr_{i,t}$	The fraction of positive words, as defined in the 2023 dictionary of (Loughran & McDonald, 2011), in the PIS section of fund i's prospectus as of month t.
$NegShr_{i,t}$	The fraction of negative words, as defined in the 2023 dictionary of (Loughran & McDonald, 2011), in a PIS section of fund i's prospectus as of month t.
$UncertShr_{i,t}$	The fraction of uncertain words, as defined in the 2023 dictionary of (Loughran & McDonald, 2011), in a PIS section of fund i's prospectus as of month t.
$LitShr_{i,t}$	The fraction of litigious words, as defined in the 2023 dictionary of (Loughran & McDonald, 2011), in a PIS section of fund i's prospectus as of month t.
$FKGrade_{i,t}$	A measure for readability of the PIS section in fund i's prospectus as of month t. We use the Flesch-Kincaid grade (Kincaid et al., 1975) to measure text readability, which is computed as $0.39\times\left(\frac{\text{Total words}}{\text{Total sentences}}\right)+11.8\times\left(\frac{\text{Total syllables}}{\text{Total words}}\right)-15.59$. A higher grade indicates more complexity hence lower readability.

A2 Examples of specific and generic ESG sentences

This section presents examples of specific ESG sentences and generic ESG sentences from PIS sections in mutual fund summary prospectuses (or, 497K filings), along with probability scores from the LLM. For additional examples of ESG sentences and their repective PIS sections, refer to Section IA.1 in the Internet Appendix.

Specific ESG sentences

- **Sentence**: For example, the Fund may invest in companies that focus on lowering the cost of healthcare, combatting the opioid epidemic, or offering ethically sourced products.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.8987, 0.8443]

- **Sentence**: The Fund attempts to achieve investment results that reflect the return of the U.S. stock market as represented by its benchmark index, the Russell 3000®Index, while investing in companies whose activities are consistent with the Fund's ESG criteria, which include additional criteria relating to carbon emissions and fossil fuel reserves.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.9415, 0.8189]

- **Sentence**: Companies that are involved in specific business activities which have high potential for negative social and/or environmental impact, such as alcohol, gambling, tobacco, nuclear power, conventional weapons, nuclear weapons, controversial weapons and civilian firearms, are ineligible for inclusion.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.9216, 0.8008]

- **Sentence**: The Index Provider excludes any companies with a carbon-to-revenue footprint standard score of greater than three.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.8617, 0.7024]

- **Sentence**: It is our experience that it is the governance element that also leads to Environmental and Social improvements in the business practices of our portfolio companies.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.9411, 0.6138]

Generic ESG sentences

- **Sentence**: The investment team may also consider the risks and return potential presented by environmental, social, and governance (ESG) factors in investment decisions.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.917, 0.3213]

- **Sentence**: To achieve its investment objective, the Fund invests in, or seeks exposure to, companies based on various financial factors and fundamental sustainability factors such as environmental, social and governance performance of such companies.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.8940, 0.5150]

- **Sentence**: The Fund's advisor, Eventide Asset Management, LLC ("Eventide"or the"Advisor") analyzes the performance of potential investments not only for financial strengths and outlook, but also for the company's ability to operate with integrity and create value for customers, shareholders and society.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.8072, 0.4447]

- **Sentence**: The Fund maintains a portfolio of stocks intended to parallel the investment performance of the U.S. large cap value equities market, while incorporating socially responsible investing criteria.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.8938, 0.4628]

- **Sentence**: The Adviser assesses a company's Environmental, Social and Governance ("ESG") profile through conducting ESG research and leveraging engagement when appropriate through dialogue with company management teams as part of its fundamental due diligence process.
  Labels: [ESG issue, specific ESG issue], **scores**: [0.9071, 0.4753]

Internet Appendix

IA.1 Examples of PIS

This appendix includes excerpts from mutual fund PIS sections featuring both generic and specific ESG sentences. Specific ESG sentences are underlined, while generic ESG sentences are highlighted in bold font. Following the PIS text, we demonstrate the computation of the length of specific and generic ESG disclosures contained in a PIS.

Fund Name: Vanguard Baillie Gifford Global Positive Impact Stock Fund,
Prospectus Date: April 2022

Under normal circumstances, the Fund invests at least 80% of its net assets (plus any borrowings for investment purposes) in stocks of companies that Baillie Gifford Overseas Limited, the Fund's advisor (Baillie Gifford) determines contribute towards a more sustainable and inclusive world. The Fund seeks to meet its investment objective by investing in a global portfolio of stocks of companies located in a number of countries throughout the world, including in developed, emerging, and frontier markets. The Fund invests in common and preferred stocks directly, such as through trading on local stock markets around the world, and indirectly, such as through depositary receipts. The Fund is not constrained with respect to market capitalization or industry allocation.

The portfolio managers employ a bottom-up approach to stock selection and select companies without being constrained by any benchmark or securities index. The portfolio managers focus on company research and the long-term outlook of companies and industries. Ideas can come from a wide variety of sources, including, but not limited to, research trips, company meetings, and relationships with industry thought leaders and academic institutions. Stock ideas are normally researched to assess a range of factors, including: long-term growth potential, geographic and industry positioning, competitive advantage (or attributes that give a company a favorable business position relative to its competitors), management, financial strength and valuation. **In parallel, the portfolio managers assess potential holdings' contributions to sustainability and inclusiveness, focusing on the ability of companies to deliver positive change in areas including: (1) Social Inclusion and Education, focusing on a more inclusive society and access to and quality of education; (2) Healthcare and Quality of Life, focusing on improving healthcare that affects quality of life; (3) Environment and Resource Needs, focusing on environmental impacts that affect basic resources; and (4) Base of the Pyramid, focusing on addressing the needs of the poorest populations.** The portfolio managers assess positive change across these four categories by considering the company's intent, how its products and services contribute to solving a global challenge, and the company's business practices. To measure and report on impact, the portfolio managers monitor the progress of each issuer using metrics and/or milestones specific to each company

and selected by Baillie Gifford. The portfolio managers pursue an active, positive approach; investment decisions are generally not made on the basis of negative "screening" of companies viewed as socially irresponsible.

The intended outcome is a portfolio of between 25 and 50 growth companies with the potential to outperform the Fund's benchmark over the long term and which the portfolio managers consider to have core ambitions of delivering a positive change. The process can result in significant exposure to a single country or a small number of countries.

The Fund is a non-diversified fund, which means that it may invest a relatively large percentage of its assets in a small number of issuers, industries or sectors. The Fund aims to hold securities for long periods (typically 5-10 years), which results in relatively low portfolio turnover and is in line with the Fund's long-term investment outlook.

The Fund may invest without limitation in securities quoted or denominated in currencies other than the U.S. dollar and may hold such currencies. The Fund does not expect to engage in currency hedging and thus expects to be fully exposed to currency fluctuations relative to the U.S. dollar.]

Length of specific and generic ESG sentences: one specific ESG sentence with 82 words and one generic ESG sentence with 43 words.

Fund Name: American Century Investments Balanced Fund,
Prospectus Date: March 2022

For the equity portion of the fund, the fund will generally invest in large capitalization companies it believes show sustainable business improvement using a proprietary multi-factor model that combines fundamental measures of a stock's value and growth potential with environmental, social, and governance (ESG) metrics. The model assigns each security a financial metrics score and an ESG score that are combined to create an overall score.

To measure value, the portfolio managers may use ratios of stock price-to-earnings and stock price-to-cash flow. To measure growth, the managers may use the rate of growth of a company's earnings and cash flow and changes in its earnings estimates. The model also considers price momentum. **The team arrives at an ESG score by evaluating multiple metrics of each ESG characteristic—environmental, social, and governance. The portfolio managers utilize internal data and research, as well as third party commercial data sources and scoring systems, to evaluate each security's ESG characteristics. For example, portfolio managers will consider, among others, a company's carbon emission profile (environmental), a company's employee turnover rates and digital privacy (social), and a company's corporate leadership, including board chair independence and the independence of audit and compensation committees (governance).** If information on a specific metric is unavailable, the security may still be selected for the portfolio if the portfolio managers believe they can evaluate the security qualitatively, or if the financial metrics and remaining ESG scores merit investment.

Final scores for each security are evaluated on a sector-specific basis, and the fund seeks to hold securities with the strongest scores in their respective sectors. **Using this process, the portfolio managers attempt to build a portfolio of stocks that has sustainable competitive advantages, provides better returns without taking on significant additional risk, and maintains a stronger ESG profile than the S&P 500 Index.**

For the fixed-income portion of the fund, the portfolio managers invest in a diversified portfolio of high- and medium-grade non-money market debt securities. These securities, which may be payable in U.S. or foreign currencies, may include corporate bonds and notes, government securities, bank loans, securities backed by mortgages or other assets and collateralized debt obligations (including collateralized loan obligations). Shorter-term debt securities round out the portfolio.

Length of specific and generic ESG sentences: two specific ESG sentences totaling 65 words (25 + 40) and three generic ESG sentences totaling 104 words (45 + 21 + 38).

Fund Name: John Hancock Emerging Markets Equity Fund
Prospectus Date: March 2022

Under normal market conditions, the fund invests at least 80% of its net assets (plus any borrowings for investment purposes) in equity and equity-related securities of emerging-market issuers. The manager may consider, but is not limited to, the classifications by the World Bank, the International Finance Corporation, or the United Nations and its agencies in determining whether a country is an emerging- or a developed-market country. The fund seeks to invest in securities that the manager considers to be undervalued or otherwise offer good prospects for capital growth.

The fund intends to invest in equity securities listed on bonafide securities exchanges or actively traded on over-the-counter markets. Equity and equity-related securities include common stocks, preferred stocks, convertible securities, warrants, and other similar securities. The fund may also invest in other investment companies (including closed-end funds) and other pooled investment vehicles that also invest in developing or emerging market economies. Fundamentals-based stock selection lies at the heart of the manager's investment process, which focuses on high quality companies within a diverse range of dynamic emerging economies. The manager seeks to invest in companies with strong assets that exhibit balance sheet strength, superior management, and high levels of free cash-flow to support a sustainable dividend payout. Although, there is no sector or geographical bias, the fund may focus its investments in a particular sector or sectors of the economy. The fund may invest in companies of any market capitalization.

The manager considers environmental, social, and/or governance (ESG) factors, alongside other relevant factors, as part of its investment process. The ESG characteristics utilized in the fund's investment process may change over time and one or more characteristics may not be relevant with respect to all issuers that are eligible fund investments.

Due to volatile conditions in emerging markets, the fund's investment process may result in a higher-than-average portfolio turnover ratio, which could increase transaction costs.

The fund may attempt to mitigate the risk of unintended currency fluctuations through the use of exchange-listed or over-the-counter financial derivatives instruments, including currency forwards, non-deliverable forwards, currency options, and index options. The fund may also enter into forward currency contracts to facilitate the settlement of foreign securities purchases, repatriation of foreign currency balances, or exchange of one currency to another. The fund may use derivatives such as futures contracts and options on futures contracts to gain market exposure on uninvested cash, pending investment in securities, or to maintain liquidity to pay redemptions.

Length of specific and generic ESG sentences: zero specific ESG sentence with a length of 0 word and two generic ESG sentences totaling 52 words (20+32).

IA.2 Questionnaire: human benchmark of ESG sentence classification

Part 1: Identifying ESG sentence

In this section, you will be presented with 20 sentences extracted from fund prospectuses. Your task is to read each sentence and determine whether it addresses an Environmental, Social, and Governance (ESG) issue. For each sentence, please select "ESG Issue" if you believe the sentence pertains to ESG considerations, or select "Non-ESG Issue" if you think otherwise. Please make your selection based on the content of the sentence only, without considering external knowledge or context.

Examples to Guide You:

- "ESG issue" Example: "The investment team may also consider the risks and return potential presented by environmental, social, and governance (ESG) factors in investment decisions."
- "Non-ESG issue" Example: "The Fund seeks to meet its investment objective by investing in a global portfolio of stocks of companies located in a number of countries throughout the world, including in developed, emerging, and frontier markets."

Part 2: Identifying Specific vs. Generic ESG sentence

In this section, you will also be presented with 20 sentences extracted from fund prospectuses. Your task is to read each sentence and decide whether it represents a Specific ESG Disclosure or a Generic ESG Disclosure based on the definitions provided below. For each sentence, please select "Specific ESG Issue" if you believe the sentence pertains to targeted and detailed ESG considerations, or select "Generic ESG Issue" if the sentence broadly addresses ESG integration without specific details.

Definitions to Guide You:

- Specific ESG Issue: These disclosures describe how the fund implements its ESG strategy, for example, by applying detailed selection or exclusion criteria. These criteria could include specifics of the evaluation methodology, the inclusion or exclusion of particular industries/sectors, or more specific ESG investment themes.
- Generic ESG Issue: This refers to mentioning the fund's ESG principles without providing any implementation details.

A1 Part 1: Classify ESG sentence

(Type "Y" in one of the two options)

Sentence	ESG Issue	Non-ESG Issue
1. 'Specifically, the sub-advisor assesses various climate related risks and opportunities as part of its bottom-up stock selection process.'		
2. 'As part of the team's fundamental investment process, the team may integrate environmental, social and governance ("ESG") factors alongside traditional fundamental factors.'		
3. 'Under normal market conditions, the Fund invests at least 80% of its net assets (including amounts borrowed for investment purposes) in equity securities of companies located in developing countries.'		
4. 'The portfolio manager then evaluates each stock to determine whether the company enhances the quality of life in America by considering its record in the areas of protection and improvement of the environment and the proper use of our natural resources, occupational health and safety, consumer protection and product purity and equal employment opportunity.'		
5. 'Investments may seek to achieve multiple areas of impact.'		
6. 'The investment strategy is based on the sub-adviser's ("Sub-Adviser") belief that investment in securities of companies in natural resources industries can protect against eroding monetary values or a rise in activity which consumes one or more types of commodities.'		
7. 'The Fund concentrates (invests more than 25% of its total assets) in the water-related resource sector, which includes water utilities, companies that provide water and wastewater services, such as water treatment, distribution, and infrastructure, and companies that manufacture water-related equipment, such as filtration, metering and environmental controls.'		
8. 'As a result, the Fund may own stocks of smaller-capitalization companies.'		
9. 'This means that we seek investments that we think will pay dividends and other income, while attempting to minimize volatility.'		
10. 'The investment manager may consider selling an equity security when it believes the security has become overvalued due to either its price appreciation or changes in the company's fundamentals, when there is significant deterioration of its ESG factors, or when the investment manager believes another security is a more attractive investment opportunity.'		
11. 'Consideration of ESG factors is just one component of the portfolio managers' assessment of issuers eligible for investment and the Fund's portfolio managers may still invest in securities of issuers that may be viewed as having a high ESG risk profile.'		

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Sentence	ESG issue	Non-ESG issue
12. 'As part of its security strategy, the adviser also evaluates whether environmental, social and governance factors could have material negative or positive impact on the cash flows or risk profiles of many companies in the universe in which the Fund may invest.'		
13. 'As part of the team's fundamental investment process, the team will integrate traditional fundamental factors with environmental, social and governance ("ESG") factors.'		
14. 'In addition, these companies tend to work towards improving in these areas, and, in our opinion, these efforts over the long-term will serve investors well.'		
15. 'This means avoiding companies and issuers whose principal business activities and practices include Involvement in abortion, including producing or distributing abortifacients, medical facilities that perform abortions, or consistently and proactively promoting abortion through philanthropy.'		
16. 'Calvert Emerging Markets Equity Fund seeks to invest in emerging market companies whose products/services or industrial/business practices contribute towards addressing one or more global sustainability challenges in their local and/or international markets.'		
17. 'The Fund attempts to achieve the return of the U.S. stock market as represented by its benchmark, the Russell 3000®Index, while investing only in companies whose activities are consistent with the Fund's social criteria.'		
18. 'The Portfolio Managers seek to identify investment opportunities in emerging market countries by comparing their analysis of each country's macroeconomic data and qualitative fundamentals (such as political stability and other ESG factors) against market expectations for that country measured by credit spreads, local interest rate levels and exchange rate valuations.'		
19. 'The subadvisor for the Growth Component actively integrates sustainability into the investment process by using environmental, social and governance ("ESG") factors as a lens for additional fundamental research, which can contribute to investment decision-making.'		
20. 'The intended outcome is a portfolio of between 25-50 quality growth companies with the potential to outperform the benchmark over the long-term and which the portfolio managers consider to have core ambitions of delivering a positive change in at least one of the following areas: social inclusion and education, healthcare, the environment, and addressing basic needs and aspirations of the world's poorest populations.'		

A2 Part 2: Classify Specific or Generic ESG sentence

(Type "Y" in one of the two options) (If the sentence is unrelated to an ESG issue in your opinion, please assign it to the "Generic ESG issue" category)

Sentence	Specific ESG Issue	Generic ESG Issue
1. 'Such companies include those that (i) have a low carbon transition score of neutral or better as rated by MSCI within the MSCI World Climate Change Index, (ii) have an above average environmental score as rated by MSCI, and/or (iii) have an above average environmental systematic score as rated by FMR (FMR E Score).'		
2. 'In selecting securities for investment, the Adviser first uses a proprietary environmental focus scoring system to evaluate municipal securities based on pre-determined environmental focus and sustainability factors to determine suitability for inclusion in the Fund's portfolio.'		
3. 'Second, the portfolio managers will evaluate, at the time of investment, the materiality of the holdings with in each CLO managed by an Eligible CLO Manager that would be excluded from the Fund's eligible investment universe pursuant to the proprietary ESG exclusionary screening process described above.'		
4. 'Such factors include (i) whether a company's primary business is in a prohibited industry (e.g., oil, gas, coal, tobacco); (ii) whether a company is involved in producing goods in a controversial business area (e.g., fossil fuels, nuclear power, genetically modified organisms ("GMOs"), military weapons, pesticides); (iii) whether a company has a history of controversial business practices relating to human rights, labor rights, environmental protection, or business malpractice (e.g., corruption, extreme tax avoidance); as well as (iv) standards and performance criteria related to environmental impacts (e.g., emissions, harmful chemicals in product portfolio, biodiversity management) and human impacts (e.g., hiring practices related to diversity, supply chain standards, health risk in product portfolio).'		
5. 'The companies in which the Fund invests will have demonstrated a commitment to positive carbon impact activities, as determined by the Sub-Advisor, based on its fundamental research and review of public documents, such as regulatory filings and investor and public communications.'		
6. 'Under normal circumstances, the fund invests the majority of its assets in securities whose use of proceeds, in the Adviser's opinion, provide positive social or environmental benefits.'		
7. 'Columbia also integrates environmental, social, and governance (ESG) considerations into its investment process.'		
8. 'The Fund seeks to achieve its investment objective while applying an environmental, social and governance ("ESG")methodology developed by the Fund's subadvisor in the selection of portfolio investments.'		
9. 'As part of the investment strategy utilized by Schroder Investment Management North America Inc. ("SIMNA")with respect to the portion of the Portfolio it manages, SIMNA evaluates certain factors as part of the investment process, including environmental, social and governance("ESG") characteristics.'		

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Sentence	Specific ESG issue	Generic ESG issue
10. 'As of December 31, 2010, there were 674 companies in the Index, though this number will change over time due to company mergers or changes due to Calvert's evaluation of an issuer's conduct relative to the Fund's sustainable and socially responsible investment criteria.'		
11. 'The Socially Responsive Fund believes that there is a direct correlation between companies that demonstrate an acute awareness of their impact on the society within which they operate and companies that offer attractive long-term investment potential.'		
12. 'In selecting the Fund's investments, the portfolio managers sometimes consider the extent to which businesses have leaders who prudently manage their environmental sustainability and social responsibilities with good governance and solid financial resources.'		
13. 'Companies that meet our ESG requirements or sustainability criteria typically have transparent sustainability data and policy reporting.'		
14. 'While these factors are considered, securities of issuers presenting ESG-related risks may be purchased and retained by the Fund and considerable autonomy is given to the investment team in making such decisions.'		
15. 'This assessment is supported by quantitative analysis from the Sub-Advisers' proprietary ESG tools which provide detailed ESG analytics for each company.'		
16. 'Environmental factors may include, for example, environmental footprint, pollution impact and resource management.'		
17. 'Over extended time horizons, the Adviser believes that ESG risks are more likely to materialize, and externalities not borne by the company are more likely to be priced into the value of securities.'		
18. 'The sub-advisor uses ESG factors as a tool to assess sustainability in the context of an individual company's circumstances.'		
19. 'The Adviser intends to invest in small- and mid-capitalization companies that it believes will implement UN Sustainable Development Goals aligned practices.'		
20. 'The Adviser generally seeks to exclude investments that do not meet the criteria for high potential positive environmental impact as described above, from the list of eligible Fund investments.'		