

The Allure of ESG: Do Sustainable ESG Investments Truly Attract Fund Investors? Insights from New Portfolio Analysis

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Abstract

This paper examines if equity funds' investment in environment, social, and governance (ESG) affects their capital flows and performance. Utilizing a novel fund-level ESG metric, we find that fund-portfolio-level ESG negatively attracts money inflows, this effect is more pronounced for unsophisticated investors. Also, stocks with high ESG scores tend to underperform, while funds with more ESG investment do not generate inferior performance. It suggests that fund managers process active skills to cover the cost of ESG investment and may find the optimal level of it in their portfolios. Further tests show that the skills of fund managers with more ESG investment may be attributed to their experienced ESG information in stock investment. Our results also provide new insights into the mechanisms behind investing in socially responsible funds.

Keywords: ESG Investing, Mutual funds, Fund flows, Fund performance, Active Fund Management

JEL classification: G11, G12, G23

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1. Introduction

Socially responsible investment is growing popular in the mutual fund industry. According to statistics in 2019, US equity mutual funds obtained an ESG rating reaching about \$7.19 trillion of net assets, representing 33.8% of the total net asset of \$21.3 trillion of mutual funds.¹ The number of funds with an ESG investment focus increased from 489 in 2019 to 881 in 2022, with the managed assets increasing from 276 billion dollars in 2019 to 460 billion dollars in 2022. The total assets of ESG funds reached 550 billion dollars about two times compared to the assets of 2019. The sustainable investment reaching 8.7 trillion dollars accounts for 12.6% of the total 66.6 trillion of assets under management in 2022 in the US.² With growing awareness of environmental, social and governance (ESG) investing, it is still unclear how sophisticated investors or unsophisticated investors respond to actively managed equity funds with different portfolio levels of ESG investment. Whether these ESG-focus mutual funds perform well or not? We fill the gap by using the detailed portfolio holdings data to measure fund managers' bet on sustainable opportunities to see the change in demand of fund investors regarding the ESG investment, and the forthcoming performance of ESG-focus funds.

In 1999, MSCI, a global research firm specialising in financial investment, launched their first ESG rating--- the MSCI ESG score, to help investors evaluate the ESG performance of stocks. We utilize these stock-level ESG scores³ and fund-holding data to measure fund portfolios' ESG performance (Ali, Chen, Yang, and Yu, 2008). Fund-level ESG scores are documented to attract money inflows (Hartzmark and Sussman, 2019). Nevertheless, few studies investigate from the perspective of fund portfolios. We utilized the fund holdings to calculate fund-level ESG scores.

¹ Statistics are from Morningstar Direct and the fact book of Investment company institute 2020.

² Statistics are from Sustainable Investment Forum 2022 and Investment Company Institute Factbook 2023.

³ According to definitions in Refinitiv/MSCI, higher ESG scores indicates better performance attributed to the field of environmental, social and governance issues.

This new measure allows mutual fund investors to consider the exact level of ESG investment from 1999 to 2022 and maximize their wealth in their fund selections⁴.

Our paper systematically investigates the fund-level ESG score using a novel metric by calculating ESG scores from mutual fund holdings, which reflects the extent to which mutual funds invest in environmental, social and governance factors in their portfolio. This paper aims to answer the questions, first, how do mutual fund investors respond to funds' ESG performance? As ESG investing has grown popular in recent years, and sophisticated investors utilize all priced or unpriced factors in their fund investment (Barber, Huang, and Odean, 2016), mutual fund investors may incorporate it into their existing decision mechanism and adjust their fund portfolio based on it. Second, does the ESG score act as an indicator of mutual fund performance? On the one hand, firms with better corporate social responsibility are found to experience high returns and better profitability during the financial crisis period (Lins, Servaes, and Tamayo, 2017), and corporate social responsibility can decrease firms' systematic risk and increase firm values. (Albuquerque, Koskinen and Zhang, 2019). On the other hand, socially responsible firms are found to have lower stock returns (Hong and Kacperczyk, 2009). Also, stock returns may respond negatively to high CSR ratings (Di Giuli and Kostovetsky, 2014). We examine the return predictability of ESG scores and seek to find a persistent pattern for investors to identify skilled funds.

Empirically, we start our analyses by examining whether investors are aware of ESG scores in their fund choice by conducting regressions of monthly ESG scores on risk-adjusted fund flows with controls for well-known fund characteristics. The regression results show that fund-level ESG is significantly and negatively associated with fund flows. This suggests that mutual fund investors

⁴ Another strand of literature uses the name and fund prospectus from Morningstar reports to identify ESG funds (Raghunandan and Rajgopal, 2022); however, the ESG fund identifier data can only be traced from October 2018, which is relatively too short to cover the period of the raise of ESG investment in last decades.

may realize the cost of ESG investment and anticipate lower returns from green assets (Pástor, Stambaugh and Taylor, 2021; Hartzmark and Sussman, 2019).

Next, we partition our sample following literature to capture sophisticated investors based on the distribution channel of direct-sold funds or broker-sold funds (Del Guercio and Reuter, 2013; Christoffersen, Evans, and Musto, 2013) and based on the investors' type of institutional investors or retail investors (Keswani and Stolin, 2008; Bailey, Kumar, and Ng, 2011). The sub-sample regressions show that the fund flows chasing the low ESG investment funds may be more pronounced among unsophisticated investors. The results suggest that institutional and direct-sold investors might utilize all factors to evaluate funds in their selection (Barber, Huang, and Odean, 2016), while retail and broker-sold investors are more sensitive to the cost of ESG investment that they might not forgive the financial returns for ESG commitment in their mutual fund portfolios. In sum, these results suggest that although ESG scores contribute to affecting money flows of mutual funds, sophisticated investors might utilize more information to evaluate future fund performance.

The findings have important implications for explaining investors' preference for ESG. First, institutional investors, in contrast to individual investors, are governed by increasing ESG investing mandates that limit their stock portfolios (Ilhan et al., 2021; Hoepner et al., 2024). Unlike institutional investors' public promises regarding ESG, retail investors' demand is typically motivated by social preferences and social signals (Riedl and Smeets, 2017). It may seem expensive to pursue such socially responsible goals, particularly when faced with adverse economic shocks (Döttling, R. and Kim, S., 2024). It is reasonable to assume that retail investors' limitations in funding and financial distress have caused investors to flee sustainable investments.

This would be in line with the idea that retail investors experience higher marginal costs when they pursue social preference (Pástor, Stambaugh and Taylor, 2021).

Furthermore, we test whether the stock-level and fund-level ESG scores are informative about future performance. We sort stocks and funds based on their ESG scores, construct calendar portfolios and calculate the return of long-short portfolios. The long-short portfolio shows that stocks with the highest ESG underperform stocks with the lowest ESG with a five-factor alpha of approximately -0.24% per month (or -2.88% per year). However, funds with the highest investment in ESG do not significantly underperform funds with the lowest investment in ESG. Taken together, we find that stock-level ESG is significantly and negatively associated with stock risk-adjusted performance. However, fund-level ESG does not lead to the negative risk-adjusted performance of funds. The results suggest that although the ESG investment may be at the expense of fund returns (Di Giuli and Kostovetsky, 2014; Hong and Kacperczyk, 2009; Bolton and Kacperczyk, 2021), fund managers do have skills to cover the cost of ESG investment and adjust their portfolio at the optimal level of ESG investment (Ferrell, Liang, and Renneboog, 2016; Lins, Servaes, and Tamayo, 2017).

To examine the robustness of our results and understand the reveal investor preference based on ESG investment, we first delves into the influence of being a signatory member to the Principles for Responsible Investment (PRI) on investor flow response. Literature collectively emphasize that PRI signatories are favorably perceived by investors, enhancing inflows. The PRI funds attract socially conscious investors regardless of performance concerns (Riedl and Smeets, 2017; Kim and Yoon, 2023); growing investor awareness on funds; alignment with socially responsible labels. (Joliet and Titova, 2018); PRI-signing hedge funds typically underperform yet garner higher investor inflows and fee income due to their lower ESG exposures and incentive

misalignment (Liang, Sun, and Teo, 2022). Our findings are robust and it shows that even through PRI funds attract positive fund flows despite significant, investors still respond negatively to fund-level ESG scores.

Second, we examine the robustness of fund flow results during crisis periods such as COVID-19, the 2008 financial crisis, and times of economic policy uncertainty (EPU). Literature documents that most active funds underperformed passive benchmarks, contradicting common beliefs, during the COVID-19 crisis (Pástor and Vorsatz, 2020). In contrast, Döttling and Kim (2024) observed diminished demand for socially responsible investments (SRIs) during COVID-19, with more significant outflows linked to SRIs amidst severe economic impacts, resulting from retail investors' income shock. Lins et al. (2017) found firms with robust social capital had better stock returns during the 2008 crisis, attributing this to trust between firms and stakeholders. Furthermore, economic policy uncertainty affects corporate and consumer behaviors, prompting conservative strategies, as noted by Baker, Bloom, and Davis (2016), and Al-Thaqeb and Algharabali (2019). Our results are robust that negative predictability is noted predominantly during crisis periods, with significant negative fund-level coefficients, aligning with Döttling and Kim's (2024) findings of shifting investor priorities.

Third, we investigate how divergence in ESG ratings affects the results, building on the work of Berg, Koelbel, and Rigobon (2020), who identified discrepancies in ratings from six major ESG rating agencies. They attributed these differences mainly to measurement methods, scope, and weighting. To address these discrepancies, the study introduces the Thomson Reuters Refinitiv ESG score as an alternative. By constructing fund-level ESG scores using both current stock-level MSCI and Thomson Reuters ESG scores, as well as a 12-month weighted average for Thomson Reuters, the research finds consistent results. Our results show significant and negative coefficients

for alternative ESG measures in predicting mutual fund flows, reaffirming findings from previous analyses. This consistency suggests that despite different ESG scoring methodologies, the main outcomes regarding fund flows and ESG ratings remain robust.

To examine the robustness of the source of the skills of fund managers with more ESG investment, we first investigate fund strategies. Low betas strategies are documented to be positively associated with fund performance (Boguth and Simutin, 2018; Frazzini and Pedersen, 2014). We observe that fund-level ESG scores are negatively associated with funds' risk beta on size, value, investment, and management factors. However, these fund managers place more bet on the performance factor relating to the firm financial distress, the firm's bankruptcy probability(O-scores), momentum, gross profitability, and return on assets. This may be attributed to the evidence that firms' ESG performance can hedge the climate risk of stocks (Pástor et al., 2021) and alleviate their underperformance from mispricings(Bofinger, Heyden, and Rock, 2022; Lu et al., 2021). Funds with higher ESG scores put more weight on the stock anomalies with their ESG-informational advantage in their investment. The skills of higher ESG score funds may be attributed to the managers' ability in different beta strategies.

Second, we examine how mutual funds manage their portfolio diversification and industry concentration to adjust their portfolio based on stocks' ESG performance. Kacperczyk, Sialm, and Zheng (2005) demonstrate that mutual fund managers may opt to deviate from an industry-diversified portfolio and focus their investments in sectors where they possess informational advantages. Funds with greater concentration on certain sectors demonstrate better performance, suggesting that investment insight is more evident among managers whose portfolios are focused on a restricted number of industries. Besides, Pollet and Wilson (2008) observe that large-cap and small-cap funds adjust their investments in accordance with fund growth. Portfolios with greater

diversification or a higher number of stocks are correlated with superior performance. This effect is especially significant for small-cap funds. We find that funds with more ESG investment tend to concentrate on industries with their ESG information advantage, and they tend to increase the number of stocks in these industries for diversification purposes. The results suggest that fund managers utilize their knowledge or past experience in certain industries that are sensitive to the ESG score and focus on these sectors to make diversified investments to exploit the stock return premium. It is consistent with our results that fund managers may have the skills to deal with the expense of ESG investment (Ferrell et al., 2016; Lins et al., 2017).

Third, we investigate if the funds with more ESG investment demonstrate skills in their cash management. Simutin (2013) finds that fund managers with substantial cash reserves can defer investments in superior stocks while effectively managing transaction costs and accommodating fund outflows. Funds exhibiting high abnormal cash show performance exceeding those of their low abnormal cash peers by more than 2% annually. We find that the fund-level ESG positively forecasts the abnormal cash of funds. Fund managers with more ESG investment may also opt to maintain elevated levels of anomalous cash to target superior investment opportunities and to manage fund withdrawals.

Finally, we examine if our results are driven by the endogeneity issue. In accordance with El Ghoul et al. (2011), Attig et al. (2013), Deng et al. (2013), and Rakowski and Yamani (2021), we utilize the industry-level MSCI ESG score as the instrumental variable for our fund-level ESG metric. The regression findings of the instrumental variable models demonstrate that endogeneity does not affect our main results. These findings align with our primary results that increased ESG correlates with reduced money flows. The results align with the findings that greater ESG scores

correlate with diminished stock returns (Bolton and Kacperczyk, 2021; Pedersen, Fitzgibbons, and Pomorski, 2021).

This paper first contributes to the literature on the information set of equity fund investors in their fund selections. Berk and Van Binsbergen (2016) find that investors would utilize factors beyond traditional risk factors in their decision. Also, Barber, Huang, and Odean (2016) document that sophisticated investors utilize all factors that are priced or not priced in their fund decisions. We extend this literature by exhibiting that fund-level ESG is also one important perspective in identifying superior funds for mutual fund investors.

Second, this paper also contributes to explaining the skills of fund managers with more ESG investment. It reveals that investment mechanisms of success may be in line with different beta strategies, timing and cash holdings, ESG industry experience, and ESG information on stock selectivity in their portfolio. It enhances our knowledge of the operation of better ESG mutual funds. It contributes to the literature studying the ability of fund managers and offers a new point of view based on fund ESG to study the active skills of equity mutual funds (Kacperczyk, Sialm and Zheng, 2005; Cremers and Petajisto, 2009; Amihud and Goyenko, 2013).

Third, our paper sheds some light on the social motivates of investors. Recent literature finds that unsophisticated investors would not forgo performance to invest in socially responsible funds (Riedl and Smeets, 2017). Also, it documents that fund investors value ESG investment and intuitively may view sustainability as a negative predictor of fund performance (Bolton and Kacperczyk, 2021). Consistent with these papers, we utilize investor-type data to show that unsophisticated investor mainly contributes to the money flows driven by ESG in fund investment, while sophisticated investors are more conservative about investing in ESG to maximize their wealth. They might not forgo financial returns to value fund sustainability.

The rest of the paper is organized as follows: Section 2 provides the literature review and proposes hypotheses; Section 3 introduces the main methodologies; Section 4 presents empirical results; Section 5 tests the robustness of results; and Section 6 concludes.

2. Literature reviews and hypotheses developments

2.1 ESG investment and performance

Recent research in ESG (Environmental, Social, and Governance) and socially responsible investing (SRI) has garnered significant attention in the last decade, particularly in relation to the impact towards firms' stock performance. At its fundamentals, traditional finance posits that investors need to incur a cost for opting to filter based on social criteria, as screening constrains possible advantages from portfolio construction.

Pástor, Stambaugh, and Taylor (2021, 2022) highlight that green assets tend to underperform due to investor preferences and climate hedging. They also conclude that the superior performance of green assets in recent years is due to rising environmental demand rather than anticipated returns. Green U.S. stocks outpaced brown ones as climate concerns rose. According to theory, green stocks have lower predicted returns than brown ones. Similarly, Ramelli, Ossola, and Rancan (2021) find that European firms with high carbon emissions suffered negative stock impacts during climate activism events, reflecting growing public scrutiny. Importantly, Pedersen, Fitzgibbons, and Pomorski (2021) find that a firm's ESG performance can reflect the financial fundamentals of the company and have a significant impact on the investment preference of investors. They propose that there is an ESG frontier for investors that if it stays in the tangency point increasing ESG investment leads to an increasing Sharpe ratio, while if it exceeds a point the relation reverses. The costs and benefits of responsible investing must be fairly assessed by investors. Besides, Bolton

and Kacperczyk(2021) demonstrate that firms with high carbon emissions yield higher returns, though institutional investors often exclude such firms based on carbon risk.

Conversely, additional studies examine the possible positive impact of ESG investment. Dai, Liang, and Ng (2021) illustrate the CSR effect from customers to suppliers, enhancing operational efficiency and valuation. Krueger, Sautner, and Starks (2020) report that institutional investors acknowledge the financial implications of climate risks, despite these risks being underpriced in equity markets. Engle et al. (2020) propose a portfolio strategy using ESG scores to hedge against climate risks, while Choi, Gao, and Jiang (2020) find that abnormal temperature shifts lead to higher returns for low-emission companies. Finally, Lins, Servaes, and Tamayo (2017) emphasize that firms with higher CSR exhibited stronger performance during the 2008 financial crisis, fostering trust between investors and companies. Dyck, Lins, Roth, and Wagner (2019) further demonstrate the positive relationship between institutional ownership and E&S performance, driven by both financial and cultural factors. This strand of paper underscores the growing influence of ESG factors in shaping stock performance, investor preferences, and corporate strategies in response to environmental and social challenges.

Following this strand of literature, it shows that mutual fund investors do have an ESG preference in their fund investments. The trust between investors and companies pays off and trusted companies tend to have higher stock returns during the financial crisis (Lins et al, 2017). More emphasis is being placed on green stocks by the biggest institutions (Pástor et al, 2023). Therefore, it is anticipated that fund portfolios will yield more on companies with comparable higher ESG performance ratings. Mutual fund investors communicate their governance preferences through voting outcomes, and their governance preferences are adopted by mutual funds (Couvert, 2020). On the contrary, sin companies with public stock that produce tobacco,

alcohol, and gaming products exhibit significant positive stock return patterns (Hong and Kacperczyk, 2009). Companies with high carbon emissions lead to higher stock returns, and investors demand compensation for carbon risk exposure (Bolton, and Kacperczyk, 2021). Thus, it appears that some investors are recognizing these cross-sectional disparities and factoring in the risk associated with ESG. Given that ESG engagement includes both positive and negative effects on stock returns, the following hypothesis is proposed:

Hypothesis 1: *The mutual fund investors respond negatively to the ESG investment of fund managers.*

2.2 ESG investment and fund management

ESG investment in mutual funds draws the increasing attention of investors, resulting in money inflows/outflows for investors because the ESG information in fund portfolio significant impact on its performance (Lins et al., 2017; Pástor et al., 2022) or investors have a corporate social preference in holding ESG stocks shares (Hartzmark and Sussman, 2019; Cao et al., 2023) and it creates capital gains for the fund investors.

Hartzmark and Sussman (2019) show that mutual fund investors place value on sustainability, with funds rated highly for sustainability attracting inflows, while those with low ratings experience outflows. This highlights that sustainability is a favourable attribute for many investors. Similarly, Alok, Kumar, and Wermers (2020) find that fund managers located close to climate-disaster zones tend to overreact to climate risk. They show that fund managers located in a major climate-disaster area significantly underweight disaster zone stocks compared to fund managers who are located farther away from the disaster zone. Pástor et al. (2023) reveal that smaller institutions and those with more active shares invest more in ESG-related assets, with an overall preference for green over brown assets among institutions. However, households and other

institutions are increasingly investing in brown assets, suggesting a divergence in investment strategies. This research highlights the complex and evolving nature of sustainability in investment decisions, with varying reactions to climate risks and ESG factors across different investor groups.

Cremers, Riley, and Zambrana (2023) find that ESG expertise is crucial for mutual fund performance, with ESG-specialized funds benefiting from higher active ESG shares, while non-specialized funds do not. Madhavan, Sobczyk, and Ang (2021) show that funds with strong environmental scores have favourable factor loadings, particularly in quality and momentum, positively impacting fund alpha. Gao, Gao, and Song (2018) reveal that hedge fund managers skilled in addressing rare disaster concerns outperform their peers, especially during high market fear, achieving a 0.96% monthly excess return. This strand of research underscores the importance of ESG specialization, factor-based analysis, and disaster risk management in driving mutual fund and hedge fund performance.

Farroukh et al. (2023) find that ESG-named and ESG-voting mutual funds are smaller, more diversified, and allocate only 25%-33% of their assets to ESG-focused investments. However, there is little evidence that ESG considerations significantly affect their voting or portfolio decisions. Raghunandan and Rajgopal (2022) argue that ESG funds often fall short of their claims, investing in companies with high carbon emissions despite better disclosures. They also tend to “greenwash” their portfolios, leading to weaker financial performance and higher fees compared to non-ESG funds. This research suggests potential gaps between ESG claims and actual practices.

Based on this strand of literature, mutual fund managers may utilize the ESG information to attract money flows since ESG investment is trending among investors, and the successful incorporation of ESG in their fund portfolio choice requires active skills to process the ESG information. On the one hand, it is documented that only within ESG-specialized funds there is a

positive relation between Active ESG Shares and future fund performance. The skills of ESG investment cannot be explained by other strategies (Cremer et al., 2023). There is a downside protection from ESG-related systematic risk that responsible investment offers (Jin, 2018). The highest ESG Norwegian mutual funds in the European category with higher ESG have considerably positive alphas than their peers with lower ESG (Steen, Moussawi, and Gjolberg, 2020). On the other hand, it shows that mutual funds that have managerial ownership and co-investing managers are less likely to purchase ESG stocks. Fund managers might not consider ESG investment as an improved method of managing portfolios to optimize risk-adjusted returns (Orlov et al., 2023). ESG funds may not have persistent ESG aims in the longer term. Changes in the holdings are the reason for the lack of long-term persistence (Wimmer, 2013). Based on the literature above, we propose the second hypothesis.

Hypothesis 2: *Fund managers have skills in dealing with the negative effects of ESG investment.*

3. Data and methodology

We collect mutual fund data from CRSP and Morningstar Direct, retrieve the fund holding data from the Thomson Reuters SDC database and merge them using the MFLINK database. The stock-level ESG data are downloaded from MSCI ESG databases. Following Barber, Huang, and Odean (2015), we eliminate bond, index, sector and international funds and focus on actively managed US equity funds. Following Berk and Van Binsbergen (2015), we merge the mutual fund

data from CRSP⁵ and Morningstar Direct⁶. For funds with multiple share classes, we take the value-weighted fund characteristics from different share classes. We eliminate the fund observations before the initial offer date. To avoid the omission bias problem (Elton, Gruber, and Blake, 2001), we select funds with net assets of at least \$15 million. Our sample covers 3692 US equity funds from 1999 to December 2022 with MSCI ESG data coverage. As MSCI launched their ESG scores in 1999, we started our sample from 1999.

3.1 Fund-level ESG measure

We measure monthly fund-level ESG scores following Ali, Chen, Yao and Yu (2007) and define it as follows:

$$fund_level\ ESG_{i,t} = \sum_j^N w_{i,j,t} * ESG\ score_{j,t}$$

Where $ESG\ score_{j,t}$ is the average ESG scores in the past 12 months for stock j across all stocks at month t , $w_{i,j,t}$ is the weight, measured as the market capitalization of the shares of stock j divided by the whole market capitalization of fund i 's portfolio, of stock j in the stock portfolio of fund I month t . High fund-level ESG indicates that the fund invests more money into stocks with better ESG performance.⁷

3.2 Fund flows

We measure monthly fund flows following Barber, Huang, and Odean (2016) and define it as follows:

⁵ U.S. equity funds are identified by policy code CS; Lipper codes EIEI, G, LCCE, LCGE, LCVE, MCCE, MCGE, MCVE, MLCE, MLGE, MLVE, SCCE, SCGE, SCVE, CA, EI, G, GI, MC, MR, or SG; Strategic Insight codes AGG, GMC, GRI, GRO, ING, or SCG; or Wiesenberger codes G, GCI, IEQ, LTG, MCG, or SCG. We eliminate the index funds according to the index fund flag (`index_fund_flag`), which categorises them as index-based funds (B), pure index funds (D), or improved index funds (E). We eliminate the ETF funds according to the ETF fund flag (`et_flag`), which indicates whether they are ETF funds (F) or ETN funds (N). We also examine fund names and exclude index funds if their names include "exchange-traded|exchange traded|etf|ETF|dfa|index|Index|indx|inx|idx|dow jones|ishare|s&p|s &p|s& p|s & p|500|WILSHIRE|RUSSELL|RUSSELL|MSCI," and eliminate target income funds if their names contain "2060|2055|2050|2045|2040|2035|2030|2025|2020|2015|2010|2005|target."

⁶ The detail of matching process follows the data Appendix by Berk and Van Binsbergen (2015).

⁷ We use alternative measure that change the ESG score and the horizon to construct the fund level ESG measure. Our results are robust under alternative constructions.

$$flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} * (1 + RET_{i,t})}{TNA_{i,t-1}}$$

$TNA_{i,t}$ is the total net assets of fund I in month t, $RET_{i,t}$ is the return of funds from the net asset value (NAV) of fund I in month t, which is obtained from monthly fund reports.

3.3 Risk-adjusted performance

We utilize monthly return data of funds to estimate the risk-adjusted performance of the period 2015–2020. To calculate the out-of-sample risk-adjusted alpha of each fund at month t, we proceed in two steps. First, we estimate a rolling window of 24 months (2 years) from t-1 to t-24 using five different models: the capital asset pricing model (CAPM), the Fama-French three-factor model (FF3), the Fama-French-Carhart model (FFC4), the Fama-French five-factor model (FF5), and the Q-factor model from Hou, Xue, and Zhang (2015). We require the funds to have at least 24 months of observations for each 24-month window (Akbas, Armstrong, Sorescu, and Subrahmanyam, 2016). Then we obtain the parameters as the coefficient of each risk factor and utilize them to calculate the out-of-sample alpha in month t. In the case of the Fama-French-Carhart model, we run the regression using the monthly returns from t-1 to t-60 as :

$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_{1,t}(R_{m,t} - R_{f,t}) + \beta_{2,t} * SMB_t + \beta_{3,t} * HML_t + \beta_{4,t} * UMD_t + \varepsilon_{i,t}$$

where $R_{i,t}$ is the mutual fund return of fund I in month t, $R_{f,t}$ is the risk-free rate in month t, $R_{m,t}$ is the market portfolio return, $R_{m,t}$ is the size premium, HML_t is the value premium, UMD_t is the momentum premium.

Second, we obtain the estimated coefficients of each risk factor and utilize them to calculate out-of-sample alphas in month t (Barber, Huang, and Odean, 2016). In the case of the Fama-French-Carhart model.

$$\widehat{\alpha}_{i,t} = (R_{i,t} - R_{f,t}) - [\widehat{\beta}_{1,t}(R_{m,t} - R_{f,t}) + \widehat{\beta}_{2,t} * SMB_t + \widehat{\beta}_{3,t} * HML_t + \widehat{\beta}_{4,t} * UMD_t]$$

We repeat this procedure for all months (t) of each fund and obtain a times series of monthly alphas and betas in our samples.

3.4 Summary statistics

Table 1 presents fund characteristics in our sample from 1999 to 2022. The sample covers 3566 actively managed domestic equity funds in the US, where their assets under management reach a \$15 million threshold. In Panel A, we report aggregate fund characteristics, including the number of funds, fund size, fund flow, expense ratio, fund turnover, and fund age measured by months. The number of funds shows an increasing trend from 1999 to 2022, while aggregate fund size grew from its minimum of \$1206.92 million in 2009 to \$4678.45 million in 2022. The average fund-level MSCI ESG score shows the highest risk of 4.96 in 2022, while it shows the lowest score of 0.56 in 1999. The average of fund flows ranges from -0.71% to 1.11% and shows a general outflow trend in the last ten years. The average CAPM alpha ranges from -0.55% to 0.94%. Funds show a relatively high aggregate turnover of 58.61% in 2020 within the past five years.

<Insert Table 1>

In Panel B, for fund performance, we find that the aggregate equity fund market has an average CAPM alpha of -0.0314% and it offers a risk-adjusted performance close to zero (Gruber, 1996, Pástor et. al, 2021). Fund-level MSCI ESG shows an average of 3.228, and they show an increase over the years in Figure 1, which indicates that fund managers have become more aware of ESG investing in recent years (Albuquerque et al., 2019).

4. Empirical results

4.1 Do investors value sustainable funds?

To examine if ESG scores drive fund flows, we conduct flow regression analyses and regress monthly fund flows on fund-level ESG scores. We estimate the following models that control for multiple fund characteristics affecting fund flows following the prior literature (Sirri and Tufano, 1999, Bessembinder et al., 2023):

$$flows_{i,t} = \alpha + \beta_1 ESG_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t-1}$$

Where $flows_{i,t}$ is the monthly flows for fund i in month t , $ESG_{i,t-1}$ is the MSCI ESG scores of fund i in month $t-1$; $X_{i,t}$ is a vector of control variables, including the log of fund size, fund turnover, the fund ages, the total expense ratio, prior 12-months return volatility and average past 12-months fund return.

<Insert table 2>

In table 4, we find that investors allow their money away from funds with high ESG investing in their portfolio. The result shows that fund-level MSCI ESG scores have a negative and significant coefficient of -0.08014 ($t=-4.518$) in column 3 and of -0.56006 ($t=-3.233$) at the 1% level in Column 6. The effect is economically significant compared to the average monthly flows of -0.0331% in the sample, and the economic magnitudes align with those of previous research(e.g., 0.0612 in Hartzmark, and Sussman, 2019). It implies that some mutual fund investors might consider the cost of ESG investment and chase premiums compensated for the cost of their fund investment. Consistent with the findings that high ESG leads to low stock returns (Bolton and Kacperczyk, 2021), these results suggest that, for equity mutual funds, which is the most actively

managed fund type, some investors are aware of the cost of ESG investment in their fund choice and they tend to buy funds with low investment in ESG stocks.⁸⁹¹⁰

4.2 Which investors prefer sustainable funds?

The above analyses demonstrate the positive pattern of ESG to predict fund flows. We further examine if sophisticated investors value fund ESG investment. We follow the literature to partition our sample based on investor sophistication. Table 3 presents the regression results based on investor sophistication. We first turn to test the difference between direct-sold funds and broker-sold funds (Bergstresser et al. 2008). Del Guercio and Reuter (2014) find that fund investors chase risk-adjusted performance, and direct-sold funds tend to show a superior performance of active funds than broker-sold funds. Christoffersen, Evans, and Musto (2013) find that payments to brokers significantly affect the fund inflows of broker funds, while investors in direct-sold funds tend to use a more sophisticated model to evaluate fund performance.

<Insert table 3>

In Table 3 Panel A, Column 2 and Column 4, the fund-level ESG score shows insignificant coefficients of -0.00109 ($t=-0.022$) and 0.19271 ($t=0.335$) for the institutional funds for the direct-sold funds, while in Column 6 and Column 8, it demonstrates negative and significant coefficients of -0.08224 ($t = -4.555$) and -0.58814 ($t = -3.336$) at the 1% level for broker-sold funds. It indicates that broker-sold investors are more prone to avoid funds with better investment in ESG stocks, while direct-sold investors may not chase the ESG investment in their fund choice.

⁸ We include the Principle responsible investment (PRI) and the ESG funds dummy identified by the fund prospectus in our regressions in Appendix Table 2. Our baseline results remain unchanged.

⁹ In Appendix Table 3, we conduct sub-period analysis and find that the results mainly keep unchanged on the crisis periods of the covid-19, the financial crisis 2008, and economic policy uncertainty.

¹⁰ We use alternative measures to construct the portfolio ESG measure using the current level of stock ESG comparing to the prior 12-month average stock ESG, and we use the Refinitive ESG provided by Thomson Reuters to construct it in Appendix Table 4. The main results remain unchanged.

Secondly, we test the difference between institutional investors and retail investors. Keswani and Stolin (2008) find that net institutional inflows into UK domestic equity funds seem to be smarter than individual flows. Institutional investors may have sophisticated benchmarks to invest in funds. Edelen and Warner (2001) find that institutional trades significantly affect market returns. They may have more information advantages and use advanced benchmarks to evaluate fund performance. By contrast, individual investors are not able to effectively evaluate fund style, fund expense, market timing, and trading frequency (Bailey, Kumar, and Ng, 2011).¹¹

Table 3 Panel B Column 2 and Column 4, show insignificant coefficients of -0.02420 (t=-0.842) and 0.43291(t=1.482) for the institutional funds. For the retail funds, the coefficients of fund level MSCI ESG score in Column 6 and Column 8 are significant and negative at -0.09783 (t = -5.165) and -0.80864 (t = -4.225) at the 1% level. It indicates that retail investors are more actively valuing ESG investment in their fund selection, consistent with Pástor et al. (2023) document that green assets have low expected returns. Retail investors tend to tilt to stocks with relatively low ESG performance.

Overall, our results imply that unsophisticated investors may be more actively tilting away from ESG investment in their fund choice. These results also indicate that sophisticated investors may evaluate their financial returns in ESG investment as literature documents (Riedl and Smeets,

¹¹ Recent studies offer insights into retail investor behavior and its impact on stock returns. Kumar and Lee (2006) demonstrate that retail trading significantly influences return comovements in stocks with high retail investor concentration, such as small-cap and low-priced stocks with minimal institutional ownership. This effect is especially strong in stocks that are difficult to arbitrage. Barber et al. (2022) find that Robinhood appeals to relatively inexperienced retail investors by simplifying trading, which leads to more frequent attention-driven trading. This behavior often induces stock herding and results in negative stock returns, with top stocks procured by these investors showing a 20-day abnormal return of -4.7%. Boehmer et al. (2021) suggest that marketable retail order flow can predict stock returns, as it contains information not yet reflected in prices. This predictive capability is partly due to order flow persistence, although much remains unexplained by public news or contrarian liquidity trades. Barber, Lin, and Odean (2023) find that retail investors often target attention-grabbing stocks that subsequently underperform. Strategies based on extreme retail order imbalance show poor returns of -14.8% for high retail-traded investors, but 6.6% for others. They emphasize the poorer outcomes for smaller retail investors focusing on popular stocks. Together, these studies highlight the complexities and potential pitfalls of retail trading, particularly when influenced by attention-driven strategies and lacking broader market insights.

2017). They might consider all factors to evaluate whether funds are priced or unpriced (Barber, Huang, and Odean, 2016).

4.3 Calendar stock/fund portfolios sorted by ESG scores

In this section, we begin the analysis by investigating simple trading strategies by buying stocks with high ESG scores and selling stocks with low ESG scores. For each month from 1999 to 2021, stocks are sorted into five quintiles based on their MSCI ESG scores. Then, we construct the long-short stock portfolios and track the performance of these portfolios over the sample period to see if the long-short spread persistently produces significant risk-adjusted returns. We construct both equal-weighted and value-weighted portfolios and calculate risk-adjusted returns utilizing the CAPM, the Fama-French three-factor model, the Fama-French-Carhart model, and the Fama-French five-factor model by regressing the excess return of the monthly portfolio on the returns of risk factors.

<Insert Table 4>

In Table 4 Panel A, we report the stock portfolio returns using different risk models. For the stock returns, it shows a significant and negative long-short spread in the Fama-French 5-factor model. The long-short spreads are significantly negative in both equal-weight and value-weight portfolios. A long-short spread generates a significant and negative five-factor alpha of -0.24% ($t = 2.01$) at the 5% level per month (or -2.88% per year). It also shows a significant and negative spread using the DGTW stock returns of -0.25% ($t = 2.37$ at the 5% level). The results suggest that ESG scores tend to reversely predict future stock returns. This is consistent with Di Giuli and Kostovetsky(2014), Bolton and Kacperczyk (2020), and Hong and Kacperczyk (2009) that an increase in ESG investment can lead to a decrease in future stock returns.

We further check the return predictability of ESG scores at the fund level using the calendar portfolio approach. We sort funds by their monthly ESG scores and construct long-short fund portfolios. For each month from 1999 to 2021, we sorted sample funds into five portfolios based on fund-level ESG scores. Then, we track the performance of these portfolios over the sample period. Equal-weighted and value-weighted portfolio returns are computed for each portfolio; then we calculate risk-adjusted returns with the CAPM, the Fama-French three-factor model, the Fama-French-Carhart model, and the Fama-French five-factor model by regressing the excess return of the monthly portfolio on the returns of risk factors.

In Table 4 Panel B, we report risk-adjusted alphas from different risk factor models. For the fund returns, a long-short spread generates an insignificant five-factor alpha of 0.03% ($t = 0.59$) per month. It shows insignificant long-short spreads in the CAPM, Fama-French three-factor model, the Fama-French-Carhart model, and the Fama-French five-factor model of both equal-weighted portfolio and value-weight portfolio. Similarly, for the fund gross returns, the MSCI ESG scores also have insignificant long-short spreads across all risk models. The results suggest that although investing in stocks with high ESG scores tends to have lower risk-adjusted returns, fund managers demonstrate skills to alleviate the cost of ESG investments.

This spread maintains economic significance, given that the average stock delivers a yearly four-factor alpha of 2.88% (-0.0024×12) and a five-factor alpha of -3% (-0.0025×12). The magnitude is marginally less than several other recognized factors of stock returns. The long-short spread of socially responsible investment yields a four-factor alpha of 0.0032 in the good time defined by Shiller P/E (Bansal, Wu, and Yaron, 2022), while it yields 0.0011 in the good time based on GDP growth. The long-short spread of sin-stock analysis of a four-factor alpha of 0.0026 (Hong and Kacperczyk, 2009). However, these variables are indirect indicators of responsible

investment factors that are associated with stock returns. Our present MSCI measure is one direct indicator that anticipates the stock return outcomes from the perspective of the environmental, social, and governance side.

5. Robustness tests

We further conduct robustness tests to confirm our findings in these sections.

5.1 Fund Principles Responsible for Investment (PRI) signatories and fund-prospectus-identified ESG funds

In this section, we investigate if the signatories with Principles for Responsible Investment (PRI) affect our results. Liang, Sun, and Teo (2022) find that hedge funds that sign the Principles for Responsible Investment (PRI) exhibit inferior performance compared to other hedge funds. However, they attract higher investor inflows and generate increased fee income. They argue that the underperformance is attributed to PRI signatories with lower environmental, social, and governance (ESG) exposures, and this is more pronounced in hedge funds with inadequate incentive alignment. Utilizing an extensive sample of self-identified ESG mutual funds, as recognized by Morningstar, in the United States from 2010 to 2018, Raghunandan and Rajgopal (2022) observe that these funds possess portfolio companies with inferior compliance records regarding labour and environmental regulations, compared to the portfolio companies of non-ESG funds managed by the same financial institutions during the same period. These ESG funds contain stocks that are more inclined to voluntarily publish carbon emissions performance and have higher carbon emissions per unit of revenue. Based on the literature, we include the dummy of signatories with PRI funds in our baseline regression, and the ESG funds identified from fund prospectus in our regressions.

<Insert Table 5>

In Table 5, we find that fund-level MSCI ESG robustly exhibits significant and negative coefficients across regressions. In Column 3, the PRI funds exhibit a positive coefficient of 0.0815($t=2.462$) attracting fund flows. The coefficients of the ESG fund label are insignificant in columns 3 and 6. It suggests that

signing with principles for responsible investment does bring in more money inflows for financial institutions. The self-declared label shows a positive coefficient of 0.21906($t=2.794$) at the 1% level driving fund flows in Column 2, while the predictability appears to diminish when competing measures such as Morningstar rating are included in the regressions. Moreover, the research by Kim and Yoon (2023) indicates that funds committing PRI signatories are perceived more favourably by investors, further enhancing their money inflows, while the work of Joliet and Titova (2018) emphasizes that investors are becoming increasingly aware of the importance of ESG labels in their investment decisions, and they can be more effectively align their ethical expectations with the specific type of holdings and liquidation methods of socially responsible funds. Finally, findings by Riedl and Smeets (2017) suggest that despite the potential for lower returns, funds adhering to ESG principles often attract dedicated investors seeking intrinsic social preferences, which can offset their performance concerns. Consistent with our earlier findings in Table 2, the main results remain unchanged, demonstrating that fund-level ESG scores significantly negatively predict fund flows.

5.2 Crisis-period fund flows

In this section, we test the robustness of our results based on the crisis period of COVID-19, the financial crisis of 2008, and economic policy uncertainty. First, Pástor and Vorsatz(2020) find that the majority of active funds underperformed passive benchmarks during the crisis, defying a prevalent premise during the COVID-19 crisis of 2020. Fund outflows exceed pre-crisis levels, however not substantially. Investors prefer funds that implement exclusion criteria and those with elevated sustainability ratings, particularly in the environmental domain. They argue that investors regard sustainability as an essential rather than a luxury during the crisis. Following the discussion, Döttling and Kim (2024) find weak demand for socially responsible investments (SRIs) among retail mutual fund participants utilising COVID-19 as an economic perturbation. They demonstrate that funds with higher sustainability ratings had more pronounced reductions in money inflows during the pandemic. The decrease in retail SRI fund flows is

more substantial during severe economic impacts from COVID-19. They address the significant sensitivity of retail investors' demand for SRI in relation to income shocks. Second, Lins et al (2017) find that firms with strong social capital (measured by CSR intensity) enjoyed superior stock returns during the 2008 financial crisis period. They argue that trust from social capital between the firm and stakeholders pays off when the overall market drops. Third, economic policy uncertainty (EPU) significantly affects corporate financial policies and consumer expenditure. Corporations adopt a more conservative approach during periods of significant uncertainty, resulting in a deceleration of investments in production and employment. Beyond its local impact, EPU extends its influence to other nations (Baker, Bloom, and Davis, 2016; Al-Thaqeb and Algharabali, 2019) Based on the discussion, we investigate the Crisis period of our sample.

<Insert Table 6>

We follow Pástor et al. (2020) to define the crisis period (February 2020-April 2022), follow Lins et al. (2017) to define financial crisis (August 2008 to March 2009), and define the high EPU risk periods as the EPU exceeds the 75th percentile in the sample period (1999-2022) to test our results. In Table 6, we find that the negative predictability is mainly concentrated across crisis periods. For example, in Column 1, the fund level shows a significant and negative coefficient of -0.07892 ($t=-4.44$) at the 1% level. Different from the sustainability ratings, ESG ratings appear not to significantly affect the fund flows during the crisis periods.

This finding aligns with the research by Döttling and Kim (2024), which highlights that during times of extreme market conditions, investors may prioritize expense over adherence to ESG criteria. Furthermore, according to Pastor et al. (2021), the market dynamics during crises can lead to a re-evaluation of the influence of ESG factors on investment decisions, suggesting that investors might become more sensitive to ESG ratings when faced with economic downturns. These insights further reinforce our findings that fund-level ESG scores also significantly predict fund flows during times of crisis, highlighting the complexities of investor behaviour in such challenging environments.

5.3 Alternative measures: Fund flows and fund ESG

In this section, we examine the divergence of ESG rating on our results. Berg, Koelbel, and Rigobon (2020) examine the discrepancies in environmental, social, and governance (ESG) ratings derived from six leading ESG rating agencies: Kinder, Lydenberg, and Domini (KLD), Sustainalytics, Moody's ESG (Vigeo-Eiris), S&P Global (RobecoSAM), Refinitiv (Asset4), and MSCI. They record the discrepancies in ratings and align the various techniques with a unified taxonomy of categories. They find that the divergence in measurement accounts for 56% of the disparity, scope for 38%, and weight for 6%. The findings necessitate further scrutiny regarding the generation of data that underpins ESG ratings. Following the discussion, we introduce the Thomson Reuters Refinitive ESG score as an alternative score in our paper. Firstly, we use the current month of stock-level of MSCI ESG and Thomson Reuters ESG score to construct the fund-level ESG score. We also use the prior 12-month weighted average Thomson Reuters ESG score to construct the fund-level ESG score.

<Insert Table 7>

In Table 7, we find that alternative measures of fund-level ESG measures robustly exhibit significant and negative coefficients across regressions. In Column 5, fund-level Thomson Reuters ESG scores show a negative coefficient of -0.01005 ($t=-5.02$) at the 1% level in predicting mutual fund flows. The coefficients of MSCI/Thomson Reuters ESG at the current stock level also exhibit significant and negative coefficients across regressions. Consistent with Table 2, the main results remain unchanged for alternative fund-level ESG measures.

5.4 Fund strategies and ESG scores

To assess the source of the skills of funds with high sustainability, we first investigate from the perspective of fund strategies on multiple risk factors. Frazzini and Pedersen (2014) find that high beta assets have lower alpha and shape ratios than low beta assets. Also, Boguth and Simutin (2018) find that mutual funds are constrained to take leverage of their investment, so higher beta

stocks are the implicit leverage for them. Empirically, funds with lower beta outperform those funds with higher beta by 5% annually. We examine if ESG-focus funds would have different trading strategies on risk betas from the CAPM, the Fama-French 3-factor, the Fama-French 4-factor, the Fama-French 5-factor, the Hou, Xue, and Zhang's Q-factor, and Stambaugh-Yuan's (2017) mispricing models and conduct regression on the fund's betas.

<Insert Table 8>

In Table 8, first, for the market factor, ESG-focus funds show an insignificant coefficient on market beta¹². Second, for the size factor and value factor, the ESG-focus fund shows significant and negative coefficients at the 1% level across different risk models. Third, the ESG-focus fund exhibits a significant negative coefficient of -0.03203 ($t = -4.870$) at the 1% level on Hou, Xue, and Zhang's (2014) investment factor (I/A) and a significant negative coefficient of -0.02258 ($t = 4.084$) at the 1% level on the Fama-French investment factor (CMA). Finally, ESG-focus funds show a significant and positive coefficient of 0.02056 ($t = 7.168$) at the 1% level on the performance factor and a significant and negative coefficient of -0.01397 ($t = -2.210$) at the 1% level on the management factor.

Based on the regression results, we can detect that the ESG-focus fund managers place more bets on the performance factor, which measures the returns from five stock anomalies: financial distress, firm's bankrupt probability(O-scores), momentum, gross profitability, and return on assets. The ESG score tends to alleviate the negative shock from the market during the crisis period (Pástor et al., 2021) and it tends to reduce the undervaluation of firms (Bofinger, Heyden, and Rock, 2022; Lu et al., 2021). These fund managers may seek to use informational advantage and their experience to exploit the relevant stock returns resulting from the performance factor. On the

¹² It suggests that ESG-focused fund managers may not use market beta leverage, which has been shown to hurt fund performance (Boguth and Simutin, 2018).

contrary, they put less bet on the stock size, value, asset growth, or management factor, including the stock anomalies of net stock issues, net stock issues, composite equity issues, accruals, and net operating assets. This may add explanations for some institutional investors that consider ESG investment in their fund decisions since they employ fund strategies on different risk factors¹³ that may boost fund performance (Frazzini and Pedersen, 2014).

5.5 Portfolio diversification and fund ESG

In this section, we study how fund diversification and industry concentration are reflected in funds with more ESG investment. Kacperczyk, Sialm, and Zheng (2005) find that mutual fund managers could choose to stray from a well-diversified portfolio and concentrate their assets in sectors where they have informational advantages. More concentrated-invested funds exhibit superior performance, which indicates that investment skills are more pronounced among managers with portfolios concentrated in a limited number of industries. Also, Pollet and Wilson (2008) find that We discover that large and small-cap funds vary their investments in response to fund growth. Funds with more diversification or more stocks in the portfolio are associated with better performance. This effect is more pronounced for small-cap funds.

<Insert table 9>

In Table 9, we report the coefficients and their t-statistics of regressions. We find that the fund-level ESG score exhibits a positive and significant coefficient of 0.07679 ($t= 5.247$) in column 3 and of 0.05971($t=4.892$) in Column 6 at the 1% level. It shows positive and significant coefficients across all regressions. The results suggest that funds with high ESG scores may have

¹³ Our findings are consistent with view that “exotic beta is alpha” by Agarwal, Green, and Ren (2018). By interpreting exotic risk (e.g. performance risk factors) as alpha, investors may suboptimal pursue historical returns. Investors should use sophisticated models to account for unusual risks.

more private information in a small number of industries with ESG information advantages. For example, Studies by Cici et al. (2018) indicate that the unique working experience industries of fund managers contribute to fund outperformance, industry-specific human capital from outside the investment industry may be transferred and give fund managers an information edge, leading to better investment decisions. Furthermore, they appear to enhance portfolio diversification by increasing the number of stocks within these sectors, which is consistent with findings by Goetzmann and Kumar (2008), who argue that investors can achieve better risk-adjusted returns by diversifying their holdings. In sum, the results align with the notion that fund managers possess active skills to navigate the costs associated with ESG investments (Cremers et al., 2024; Ceccarelli et al., 2023).

5.6 Abnormal Cash and ESG funds

In this section, we apply the portfolio holding data to investigate potential explanations of the abnormal cash proposed by Simutin (2013). Equity mutual funds' cash holdings have a negative impact on their performance; however, the amount of cash also enables managers to promptly invest in appealing securities and address outflows without the need for expensive fire sales. Additionally, managers of high abnormal cash funds can wait to invest in better stock opportunities and are also adept at managing fund transaction costs and satisfying fund outflows. Chernenko and Sunderam (2020) also find that mutual funds that are more motivated to internally keep their price influence by managing their cash holdings rather than trading in the portfolio, which supports the idea that cash reserves provide managers with flexibility, enabling them to take advantage of favourable investment opportunities while minimizing transaction costs. Funds with high abnormal cash outperform their low abnormal cash peers by over 2% per year.

<Insert table 10>

Table 10 shows that the fund-level ESG positively predicts the abnormal cash of funds. In column 4, it shows a significant and positive coefficient of 0.09411 ($t= 2.355$) at the 5% level. Consistent with our expectations evidence of the money outflows in Table 2, our results suggest that fund managers may also consider remaining in high abnormal cash for better investment opportunities and may use it to accommodate fund outflows, as indicated by the works of Simutin (2013) and Chernenko and Sunderam (2020), who highlight the strategic advantage of liquidity management in fund performance. Additionally, the research by Jensen (2022) indicates that fund cash management can provide a competitive edge, allowing fund managers to respond swiftly to market conditions and capitalize on potential growth investment opportunities. Moreover, the study by Jiang et al., (2021) reveals that funds typically provide daily liquidity for investors which necessitates funds to have sufficient cash reserves and invest in securities with short-term trading capabilities. Funds trading in credit default swaps exhibit enhanced performance.

Collectively, these studies reinforce the notion that fund managers leverage abnormal cash levels not just for immediate liquidity needs but as a strategic asset for long-term performance enhancement. These fund managers strategically utilize high abnormal cash to navigate both investment opportunities and liquidity challenges while incorporating the information of ESG in shaping these decisions.

5.7 Test of Endogeneity: Do investors prefer sustainable funds?

In this section, we seek to use an instrumental variable approach to test the endogeneity of our baseline flow regressions. Following El Ghoul et al. (2011), Attig et al. (2013), Deng et al. (2013), Rakowski and Yamani (2021), we employ the industry-level MSCI ESG score as the instrumental variables for our fund-level ESG-metric.

<Insert table 11>

In Table 11, we utilize the instrumental variable approach to test the endogeneity issues of our main results in Table 2. Columns 1 to 6 present the findings from the two-stage least squares (2SLS) regressions. Columns 1, 3, and 4 present the findings of the first-stage regression, whereas Columns 2, 4, and 6 display the results of the second-stage regression. In the first stage regressions of Columns 1, 3, and 4, we use the industry-level MSCI ESG as the instrumental factors and control for fund style and month-fixed effects and regress the instrumental variable on the fund-level MSCI ESG in the regressions.

The regression results show that the coefficients of our instrumental variable, the industry-level MSCI ESG, are significant and positive. We reject the null hypothesis that the instrument is invalid, as the p-value for the Cragg and Donald (1993) weak identification test is less than 0.001. In the second stage regression of Columns 2, 4, and 6, we run the regression of the predicted fund-level MSCI ESG on the dependent variable fund flows, and the fund style and month-fixed effects are included. In Column 6, we find that the coefficient estimate for the predicted MSCI is both significant and negative at the 5% level (-0.2976 , $t = -2.30$). The Sargan (1958) overidentification test is passed by our instrumental variable, as indicated by the p-values that are smaller than 1% for the test of overidentifying restrictions.

The regression results of the instrumental variable models indicate that endogeneity does not influence our primary findings. These results are consistent with our main results in Table 2, and it shows robust evidence that higher ESG leads to lower fund flows. The results are consistent with the findings that high ESG indicates lower stock returns (Bolton and Kacperczyk, 2021; Pedersen, Fitzgibbons, and Pomorski, 2021).

6 Conclusion

In this paper, we examine how investors respond to funds' ESG investments and whether fund-level ESG affects the risk-adjusted performance of mutual funds. We utilize a novel metric, the ESG scores calculated from fund holdings, to measure environmental, social and governance investment at the fund level. Consistent with previous research addressing the expense of ESG investing (Hong and Kacperczyk, 2009; Bolton and Kacperczyk, 2020), our study shows that mutual fund investors prefer funds with low ESG investment (Pástor et al., 2021; Döttling and Kim, 2024, especially for unsophisticated investors. Besides, fund managers investing in ESG stocks process active skills to create value for fund investors, and they may find the optimal level of ESG investment frontier to cover the cost (Riedl and Smeets, 2017; Hartzmark and Smeets, 2019; Ferrell et al., 2016; Lins et al., 2017). By demonstrating the capital outflows associated with ESG investment for retail investors, I contribute to the expanding body of literature regarding the impact of fund investor sophistication in trading (Barber, Huang, and Odean, 2016; Boehmer et al., 2021; Barber, Lin, and Odean, 2023). In the meantime, I observe that active skills by ESG fund managers may serve a supplementary function in alleviating the adverse effects of money flows of investors with different sophistications (Kacperczyk et al., 2014; Cremers et al., 2023).

Our empirical results demonstrate that overall, fund investors are negatively responding to the fund-level ESG investment. Unsophisticated investors appear to avoid the cost of ESG investment in their fund selection, while institutional investors are more conservative in ESG investment, and they might utilize all factors, whether priced or unpriced, to maximize their wealth (Barber, Huang, and Odean, 2016). Next, on performance level. We find that stock ESG negatively predicts future performance, but fund-level ESG is not significantly informative to future fund performance.

Further, we seek to explain our findings and find that the skills of high ESG funds may be explained by different beta strategies (Frazzini and Pedersen, 2014; Boguth and Simutin, 2018) and cash holdings (Simutin, 2013) to accommodate outflows and hold for better stock opportunities, and these fund managers place more bet on the ESG-relevant stock anomalies, exhibit more concentrated investment in ESG industries, and hold ESG informational advantage in their stock pickings. They demonstrate skills to find the optimal level of ESG investing, not at the expense of fund returns. The results are consistent with the view that active skills exist in the fund portfolio management industry. Overall, our findings suggest that investors should be aware of fund-level ESG to evaluate funds in their investment. This study contributes to demonstrating that the information of ESG investment may cater for the institutional demand, not retail fund investors. The fund managers' skills in mitigating the cost of ESG investment consistently benefit investors, particularly if they process ESG-specified advantage information in improving portfolio returns.

The mechanism of funds with high ESG investment to trade and adjust their portfolios based on the upgrades or downgrades of ESG stock ratings, and to balance financial benefits and socially responsible purposes to attract money inflows could be an agenda for future research to explore. Future research can also extend this study to several interesting focuses. For example, it would be interesting to examine the ESG information supply channel of fund managers compared to traditional financial fundamentals from company financial reports. Moreover, the investment horizon of fund trading strategies relevant to the ESG information would be worthwhile to investigate as fund ESG holdings may contain some stock anomalies that experience a reversal in the long term. Lastly, it would be beneficial to extend the empirical application of this research to other nations with various institutional backgrounds.

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Figure 1 Aggregate Summary statistics

This figure reports the aggregate statistics of fund-level MSCI ESG, fund flows, and CAPM alpha by year in our sample from 1999 to 2022. We take the mean value by year of the whole sample.

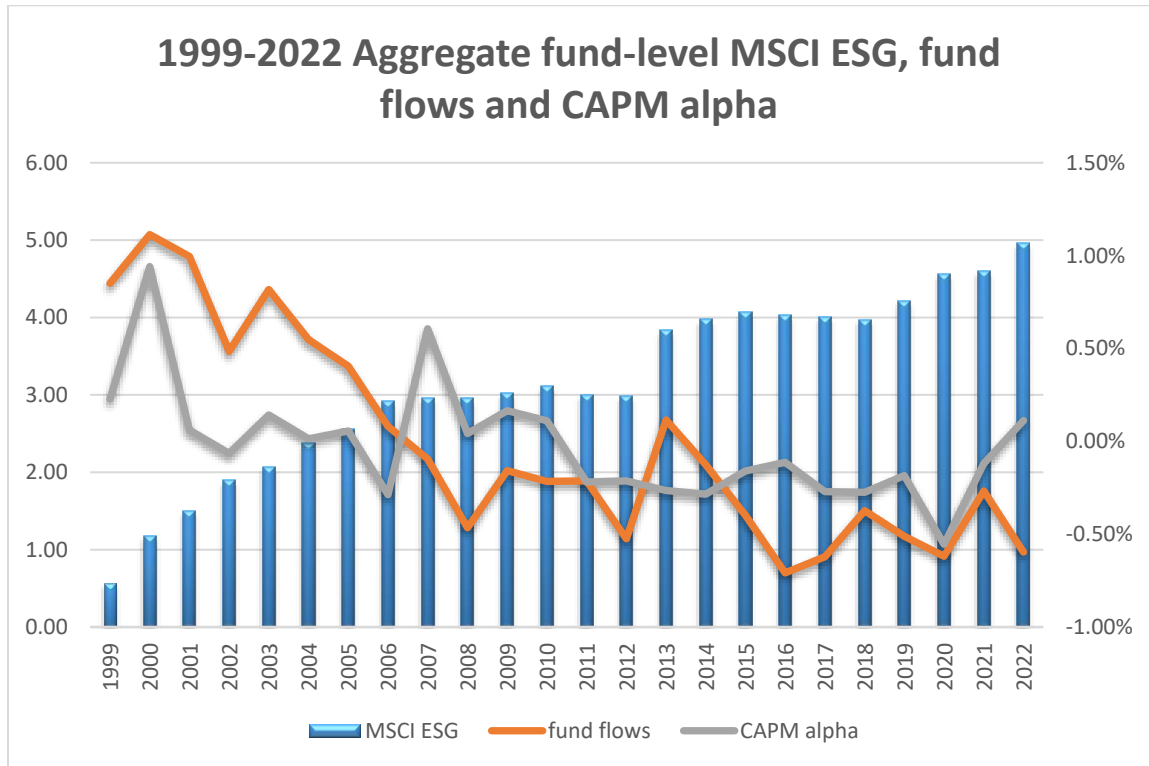


Table 1 Summary statistics

This table reports the summary statistics of all variables in our sample from 1999 to 2021. Panel A reports the mean of all variables by year. Panel B reports the statistics for the whole period. It includes the number of observations, mean, standard deviation, minimum, 25th percentile, median, 75th percentile and maximum value. Panel C presents the Pearson correlation matrix.

Panel A:

year	number of funds	MSCI ESG	fund flows	fund size(in millions)	fund return	CAPM alpha	FF4 alpha	FF5 alpha	Morningstar ratings	fund age(in months)	return volatility	fund expense(%)	fund turnover
1999	1642	0.56	0.85%	1479	4.17%	0.23%	-0.16%	-0.35%	3.19	4.92	4.84%	1.28	100.12%
2000	1845	1.18	1.11%	1554	0.04%	0.94%	0.35%	0.46%	3.22	5.34	6.28%	1.30	108.37%
2001	1924	1.50	1.00%	1250	-0.70%	0.06%	-0.32%	-0.18%	3.19	5.73	6.75%	1.34	103.62%
2002	1992	1.90	0.48%	1039	-1.94%	-0.07%	-0.08%	0.02%	3.13	6.23	5.99%	1.38	98.22%
2003	2071	2.07	0.82%	1027	2.47%	0.14%	-0.28%	-0.17%	3.08	6.82	5.55%	1.38	87.68%
2004	2100	2.37	0.55%	1248	1.02%	0.01%	-0.12%	-0.16%	3.06	7.23	3.23%	1.34	81.14%
2005	2098	2.56	0.40%	1387	0.60%	0.06%	0.08%	0.04%	3.05	7.79	3.30%	1.31	79.95%
2006	2018	2.92	0.08%	1567	1.02%	-0.29%	-0.18%	-0.25%	3.02	8.45	2.94%	1.26	81.92%
2007	2085	2.97	-0.10%	1777	0.55%	0.61%	0.63%	0.68%	3.03	8.86	2.55%	1.22	83.00%
2008	2119	2.96	-0.47%	1450	-3.74%	0.04%	-0.20%	-0.30%	3.04	9.45	4.61%	1.22	95.21%
2009	1978	3.02	-0.16%	1207	2.48%	0.16%	0.10%	0.04%	3.06	10.15	8.39%	1.21	87.16%
2010	1840	3.12	-0.22%	1512	1.59%	0.11%	-0.11%	-0.04%	3.04	10.96	5.43%	1.17	74.93%
2011	1838	3.01	-0.21%	1732	-0.06%	-0.22%	-0.10%	-0.11%	3.07	11.63	5.31%	1.15	69.28%
2012	1743	2.98	-0.53%	1865	1.22%	-0.21%	-0.01%	0.01%	3.08	12.47	5.47%	1.13	62.75%
2013	1702	3.84	0.12%	2334	2.54%	-0.26%	-0.19%	-0.18%	3.09	13.29	3.00%	1.10	61.58%
2014	1678	3.98	-0.13%	2759	0.71%	-0.28%	-0.11%	-0.19%	3.10	13.76	3.16%	1.09	60.01%
2015	1697	4.07	-0.40%	2850	-0.08%	-0.16%	-0.11%	-0.15%	3.11	14.32	3.37%	1.08	59.76%
2016	1696	4.03	-0.71%	2866	1.01%	-0.11%	-0.17%	-0.16%	3.13	14.90	4.25%	1.06	59.50%
2017	1912	4.01	-0.62%	3259	1.50%	-0.27%	-0.09%	-0.14%	3.14	15.11	2.67%	1.02	56.62%
2018	1890	3.97	-0.37%	3328	-0.57%	-0.27%	-0.18%	-0.20%	3.14	14.97	2.74%	0.99	57.21%
2019	1862	4.22	-0.51%	3560	2.16%	-0.18%	0.01%	0.01%	3.15	15.83	5.72%	0.97	57.19%
2020	1806	4.57	-0.62%	3782	1.71%	-0.55%	-0.50%	-0.39%	3.16	16.66	6.90%	0.95	58.61%
2021	1745	4.60	-0.27%	5112	1.79%	-0.12%	-0.29%	0.09%	3.17	17.63	5.73%	0.93	50.92%
2022	1667	4.96	-0.60%	4678	-1.48%	0.11%	0.02%	0.03%	3.16	18.79	5.25%	0.93	49.73%

Table 1 (continued)**Panel B:**

VARIABLES	N	mean	median	Std.	min	p25	p75	max
Fund Characteristics								
Fund-level MSCI ESG	474,745	3.228	3.703	1.641	0	2.071	4.433	8.083
Fund size	495,953	2,254	302.9	14,109	0	82.00	1,182	1.074e+06
Fund size (log)	495,941	5.795	5.713	1.853	-2.303	4.407	7.075	13.89
Fund flows(%)	485,069	-0.0331	-0.412	4.105	-51.35	-1.417	0.773	90.08
Prior 12-month returns	469,863	0.722	0.899	1.893	-13.69	-0.0351	1.630	115.5
Morningstar rating	450,976	3.103	3	1.021	1	2.158	4	5
Return volatility	460,732	0.0470	0.0432	0.0213	0.00870	0.0311	0.0581	0.211
Expense ratio	401,514	1.165	1.119	0.427	-0.510	0.918	1.369	30.77
Fund turnover	399,701	0.747	0.560	0.794	0	0.300	0.940	45.50
Fund age(years)	495,840	11.32	9	12.63	-23	4	16	94
Fund age log (years)	445,222	2.213	2.303	0.899	0	1.609	2.833	4.543
Fund return	485,969	0.00628	0.0109	0.0525	-0.312	-0.0206	0.0368	0.395
CAPM alpha	441,626	-0.000314	-0.000945	0.171	-1.791	-0.0111	0.00913	109.8
FF4 alpha	441,626	-0.000806	-0.000959	0.171	-3.698	-0.00932	0.00702	109.8
FF5 alpha	441,626	-0.000580	-0.00101	0.171	-2.708	-0.00947	0.00716	109.8
Active Skill measures								
Abnormal cash holdings	202,162	-0.0320	-0.327	3.393	-29.30	-1.544	1.062	91.65
Active weight	428,263	0.370	0.361	0.110	0	0.296	0.434	0.974
Industry concentration	428,263	2.641	2.558	1.080	0.0437	1.857	3.336	8.118
Skill index	428,263	-0.00792	-0.000680	0.816	-28.02	-0.00784	0.00623	31.90
Inverse of diversification	429,231	-4.417	-4.331	0.771	-8.212	-4.779	-3.912	-2.303
Active Share	286,227	0.768	0.798	0.158	0.000768	0.673	0.893	1
Risk betas								
CAPM Market Beta	438,880	1.040	1.016	0.346	-42.07	0.920	1.151	12.98
FF3 Market Beta	438,880	0.995	0.994	0.290	-40.61	0.918	1.069	12.94
FF3 Size beta	438,880	0.222	0.116	0.490	-27.77	-0.0859	0.513	44.88
FF3 Value Beta	438,880	0.0386	0.0328	0.598	-49.02	-0.170	0.247	73.14
FF4 Market Beta	438,880	0.994	0.994	0.281	-31.86	0.916	1.070	12.93
FF4 Size beta	438,880	0.216	0.105	0.537	-28.06	-0.0866	0.497	56.34
FF4 Value Beta	438,880	0.0338	0.0255	0.677	-61.82	-0.166	0.228	79.39
FF4 Momentum beta	438,880	0.00829	0.00204	0.347	-55.40	-0.0740	0.0875	23.97
FF5 Market Beta	438,880	0.987	0.988	0.304	-45.57	0.912	1.059	14.06
FF5 Size beta	438,880	0.218	0.104	0.503	-36.00	-0.0831	0.500	51.30

Table 1
(continued)

FF5 Value Beta	438,880	0.0298	0.0272	0.603	-82.64	-0.156	0.210	79.11
FF5 Investment beta	438,880	-0.0847	-0.0691	0.617	-42.36	-0.284	0.102	60.93
FF5 Probability beta	438,880	-0.0175	0.00980	0.446	-29.92	-0.157	0.141	72.56
QF Market Beta	438,880	0.976	0.978	0.400	-48.62	0.895	1.047	32.75
QF Size beta	438,880	0.215	0.112	0.560	-54.79	-0.0775	0.483	57.22
QF Investment beta	438,880	-0.0699	-0.0211	0.504	-19.57	-0.289	0.169	53.93
QF Return-on-Equity beta	438,880	-0.0271	-0.00290	0.467	-71.54	-0.154	0.115	20.30
MP market beta	361,646	0.987	0.990	0.572	-44.82	0.897	1.070	33.23
MP Size beta	361,646	0.198	0.0936	0.804	-35.75	-0.0996	0.489	63.34
MP Management beta	361,646	-0.0844	-0.0533	0.465	-51.16	-0.267	0.0948	46.61
MP Performance beta	361,646	-0.00789	0.00358	0.452	-43.20	-0.0880	0.0972	8.982

Table 1 (continued)**Panel C: Matrix of correlations**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) MSCI ESG	1.000												
(2) Fund flows	-0.060	1.000											
(3) Fund size (log)	0.141	0.010	1.000										
(4) Fund return	0.008	0.048	0.022	1.000									
(5) Prior 12-month returns	0.067	0.114	0.086	0.026	1.000								
(6) CAPM alpha	-0.036	0.048	0.010	0.329	0.001	1.000							
(7) FF4 alpha	-0.011	0.025	0.007	0.191	0.008	0.521	1.000						
(8) FF5 alpha	-0.010	0.024	0.011	0.150	0.032	0.513	0.777	1.000					
(9) Morningstar rating	-0.012	0.260	0.284	0.032	0.134	0.075	0.067	0.065	1.000				
(10) Fund age (log)	0.261	-0.085	0.256	0.010	0.057	-0.014	-0.000	0.000	-0.062	1.000			
(11) Return volatility	-0.223	-0.005	-0.063	0.075	-0.325	0.015	-0.020	0.024	-0.043	-0.037	1.000		
(12) Expense ratio	-0.357	-0.002	-0.404	-0.021	-0.098	0.001	-0.008	-0.005	-0.234	-0.131	0.077	1.000	
(13) Fund turnover	-0.223	-0.026	-0.171	-0.028	-0.102	0.003	-0.016	-0.002	-0.116	-0.111	0.132	0.199	1.000

Table 2 Do investors prefer sustainable funds?

This table reports regression results of fund flows on portfolio MSCI ESG scores. The dependent variable is the monthly fund flow on month t. The main independent variable of interest is the ESG score which measures the level of funds' investment based on environmental, social and governance rules. The control variables include fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fixed effects of month and styles are included in all regressions. Standard errors are clustered at the fund and month level. The ***, **, and * denote the significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Fund flows/inflows in month t						
VARIABLES	(1) Flow	(2) Flow	(3) Flow	(4) Percentile flow	(5) Percentile flow	(6) Percentile flow
Fund-level MSCI ESG	-0.24656*** (-8.998)	-0.12224*** (-6.837)	-0.08014*** (-4.518)	-1.51434*** (-6.710)	-0.74589*** (-4.327)	-0.56006*** (-3.233)
Fund flows		0.36648*** (35.510)	0.31023*** (30.018)		2.65808*** (37.113)	2.30209*** (35.683)
Fund size (log)		-0.02890*** (-4.210)	-0.08870*** (-10.958)		0.03446 (0.418)	-1.12564*** (-12.234)
Prior 12-month returns		0.15860*** (3.779)	0.22502*** (10.663)		1.54754*** (4.111)	2.13981*** (12.083)
Morningstar rating			0.62703*** (32.016)			6.93852*** (39.641)
Fund age (log)			-0.09798*** (-6.155)			-1.36713*** (-7.473)
Return volatility			4.16486*** (3.196)			21.89998** (2.031)
Expense ratio			0.17227*** (4.355)			-0.83336* (-1.692)
Fund turnover			-0.03264* (-1.781)			-0.93033*** (-5.222)
Constant	0.71981*** (7.322)	0.32953*** (3.899)	-1.68664*** (-11.547)	52.49719*** (66.518)	48.46004*** (65.003)	35.57037*** (24.879)
Observations	461,642	433,834	305,964	470,423	439,778	309,429
R-squared	0.0315	0.1690	0.1981	0.0398	0.1866	0.2637
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.0280	0.166	0.194	0.0364	0.184	0.260

Table 3 Which investors prefer sustainable funds?

This table reports regression results of fund flows on MSCI ESG scores on subsamples. It partitions sample funds if the fund is an institutional fund or a retail fund and if the fund is broker-sold or direct-sold to investors. The dependent variable is the monthly fund flow on month t. The main independent variable of interest is the ESG scores that measure the level of funds' investing based on environmental, social and governance rules. The control variables include fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fixed effects of months and fund styles are included in all regressions. Standard errors are clustered at both the fund and month level. The ***, **, and * denote the significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Dependent variable: Fund flows in month t								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Direct-sold funds				Broker-sold funds			
VARIABLES	Flow	Flow	Percentile flow	Percentile flow	Flow	Flow	Percentile flow	Percentile flow
Fund-level MSCI ESG	0.01334 (0.307)	-0.00109 (-0.022)	0.60277 (1.161)	0.19271 (0.335)	-0.12672*** (-6.967)	-0.08224*** (-4.555)	-0.80176*** (-4.579)	-0.58814*** (-3.336)
Fund flows	0.31331*** (12.322)	0.26697*** (9.719)	2.56469*** (15.656)	2.28101*** (13.213)	0.36862*** (35.327)	0.31249*** (29.754)	2.66083*** (36.786)	2.29999*** (35.511)
Fund size (log)	-0.02784 (-1.536)	-0.12748*** (-4.663)	-0.30239 (-1.142)	-1.78203*** (-5.318)	-0.02862*** (-4.023)	-0.08724*** (-10.652)	0.05369 (0.629)	-1.08384*** (-11.762)
Prior 12-month returns	0.28672*** (6.594)	0.24301*** (6.349)	3.40153*** (9.422)	2.65011*** (7.522)	0.15527*** (3.686)	0.22437*** (10.528)	1.50159*** (4.016)	2.11615*** (11.878)
Morningstar rating		0.50283*** (9.931)		6.20713*** (11.424)		0.63459*** (31.849)		6.98336*** (39.073)
Fund age (log)		0.03498 (0.638)		0.11329 (0.149)		-0.10666*** (-6.524)		-1.48429*** (-8.077)
Return volatility		7.29958*** (2.873)		47.84572 (1.541)		4.04522*** (3.065)		21.31460** (1.975)
Expense ratio		-0.40389** (-2.201)		-5.75810*** (-2.741)		0.17990*** (4.492)		-0.73113 (-1.454)
Fund turnover		-0.09670 (-1.336)		-1.65158** (-2.523)		-0.02713 (-1.459)		-0.87001*** (-4.837)
Constant	-0.39615** (-1.984)	-1.35852*** (-3.208)	43.68109*** (16.945)	38.59534*** (8.201)	0.35062*** (4.093)	-1.69048*** (-11.406)	48.58861*** (64.060)	35.46914*** (24.351)
Observations	21,589	18,415	21,848	18,633	412,215	287,461	417,900	290,709
R-squared	0.2066	0.2184	0.2442	0.2905	0.1704	0.2016	0.1870	0.2664
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.143	0.148	0.185	0.228	0.167	0.197	0.184	0.262

Table 3 Continued

Panel B: Dependent variable: Fund flows in month t

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Institutional funds				Retail funds			
VARIABLES	Flow	Flow	Percentile flow	Percentile flow	Flow	Flow	Percentile flow	Percentile flow
Fund-level MSCI ESG(12m)	-0.08346*** (-2.923)	0.02420 (0.842)	-0.45352* (-1.658)	0.43291 (1.482)	-0.12413*** (-6.552)	-0.09783*** (-5.165)	-0.85116*** (-4.508)	-0.80864*** (-4.225)
Fund flows	0.30469*** (24.860)	0.24432*** (19.343)	2.36104*** (29.955)	2.00641*** (24.495)	0.37914*** (32.417)	0.33121*** (27.324)	2.70173*** (33.359)	2.38288*** (32.216)
Fund size (log)	-0.01829 (-1.312)	-0.05085*** (-3.182)	-0.13168 (-0.901)	-0.59786*** (-3.563)	-0.03312*** (-4.478)	-0.10671*** (-11.802)	0.09387 (1.031)	-1.26248*** (-12.048)
Prior 12-month returns	0.04116* (1.663)	0.18821*** (8.679)	0.46265** (1.991)	2.02538*** (10.110)	0.24645*** (5.221)	0.23026*** (9.967)	2.35972*** (5.597)	2.14763*** (10.946)
Morningstar rating		0.55010*** (16.674)		5.36616*** (19.092)		0.64388*** (30.649)		7.38204*** (38.421)
Fund age (log)		-0.24251*** (-7.212)		-2.77901*** (-7.717)		-0.08222*** (-4.664)		-1.04307*** (-5.040)
Return volatility		7.60449*** (4.371)		59.75482*** (3.764)		3.26542** (2.295)		11.40351 (0.960)
Expense ratio		0.29256*** (2.651)		1.97360* (1.701)		0.07543* (1.788)		-1.20044** (-2.023)
Fund turnover		-0.05507 (-1.410)		-0.54797 (-1.466)		-0.02384 (-1.177)		-0.94613*** (-4.902)
Constant	0.17837 (1.356)	-2.09775*** (-8.890)	50.39253*** (40.933)	32.14924*** (14.211)	0.31081*** (3.502)	-1.41661*** (-8.781)	47.57061*** (58.386)	36.10276*** (21.372)
Observations	87,689	70,443	89,269	71,603	346,145	235,517	350,509	237,822
R-squared	0.1282	0.1402	0.1484	0.1830	0.1885	0.2285	0.2065	0.2999
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.112	0.120	0.132	0.164	0.185	0.223	0.203	0.295

Table 4 (To-be-confirmed) Calendar stock/fund portfolio returns sorted by ESG scores

This table reports the average monthly performance of stock/fund portfolios sorted by ESG scores. To calculate risk-adjust performance, we use stock returns and DGTW returns at the stock level in Panel A and use the fund returns and fund gross returns at the fund level in Panel B. We consider all ESG data starting from their launch. Stocks are classified into subsamples based on their ESG scores from 5 (high) to 1(Low) for MSCI ESG scores. For each month, funds are sorted into five portfolios based on their portfolio ESG scores. For each portfolio, the equal-weighted and value-weighted average performance of the average return, the CAPM model Fama-French model (FF3), the Fama-French-Carhart model (FF4), and the Fama-French five-factor model (FF5) are reported respectively. T-statistics are reported in brackets and computed with standard errors corrected in the Newey-West method with twelve lags. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Panel A: Stock-level portfolio sorts

Stock returns											
MSCI ESG quintiles	Return	CAPM	Equal-weighted				Value-weighted				
			FF3	FF4	FF5		Return	CAPM	FF3	FF4	FF5
5	0.82%	0.06%	0.08%	0.13%	0.02%	5	1.07%	0.59%	0.60%	0.59%	0.44%
	(2.66)	(0.52)	(1.29)	(2.14)	(0.33)		(4.32)	(6.33)	(6.1)	(5.96)	(5.01)
1	1.08%	0.22%	0.25%	0.30%	0.37%	1	1.39%	0.82%	0.79%	0.81%	0.68%
	(2.78)	(1.58)	(2.48)	(2.88)	(3.55)		(5.19)	(5.15)	(6.83)	(6.96)	(7.47)
(5-1)	-0.25%	-0.17%	-0.16%	-0.17%	-0.34%	(5-1)	-0.32%	-0.23%	-0.19%	-0.22%	-0.24%
	(-1.51)	(-1.03)	(-1.22)	(-1.28)	(-2.61)***		(-2.29)***	(-1.55)	(-1.7)	(-1.92)**	(-2.01)**
Stock DGTW returns											
MSCI ESG quintiles	Return	CAPM	Equal-weighted				Value-weighted				
			FF3	FF4	FF5		Return	CAPM	FF3	FF4	FF5
5	0.20%	0.22%	0.20%	0.20%	0.11%	5	0.31%	0.37%	0.37%	0.35%	0.29%
	(2.44)	(2.73)	(2.9)	(2.99)	(1.85)		(3.91)	(5.89)	(5.67)	(5.02)	(3.94)
1	0.27%	0.28%	0.25%	0.25%	0.10%	1	0.64%	0.66%	0.65%	0.65%	0.53%
	(2.51)	(2.22)	(2.64)	(2.73)	(1.1)		(6.7)	(6.47)	(7.31)	(7.24)	(8.46)
(5-1)	-0.07%	-0.06%	-0.05%	-0.05%	0.01%	(5-1)	-0.33%	-0.28%	-0.27%	-0.30%	-0.25%
	(-0.72)	(-0.52)	(-0.46)	(-0.44)	(0.08)		(-3.13)***	(-2.46)**	(-2.55)***	(-2.6)***	(-2.37)**

Panel B: Fund-level Portfolio sorts

Fund returns											
MSCI ESG quintiles	Return	CAPM	Equal-weighted				Value-weighted				
			FF3	FF4	FF5		Return	CAPM	FF3	FF4	FF5
5	0.52%	-0.02%	-0.01%	-0.02%	-0.07%	5	0.54%	0.00%	0.01%	0.01%	-0.04%
	(1.76)	(-0.73)	(-0.49)	(-0.51)	(-2.63)		(1.83)	(0.04)	(0.41)	(0.38)	(-2.13)
1	0.67%	0.03%	-0.04%	-0.06%	-0.02%	1	0.62%	-0.02%	-0.08%	-0.09%	-0.07%
	(2.1)	(0.21)	(-0.3)	(-0.57)	(-0.2)		(1.84)	(-0.23)	(-1.97)	(-2.17)	(-2.02)
(5-1)	-0.16%	-0.06%	0.02%	0.05%	-0.04%	(5-1)	-0.08%	0.03%	0.09%	0.11%	0.03%
	(-1)	(-0.34)	(0.17)	(0.41)	(-0.35)		(-0.64)	(0.2)	(1.53)	(1.68)	(0.59)
Fund gross returns											
MSCI ESG quintiles	Return	CAPM	Equal-weighted				Value-weighted				
			FF3	FF4	FF5		Return	CAPM	FF3	FF4	FF5
5	0.57%	0.03%	0.04%	0.04%	-0.01%	5	0.58%	0.04%	0.05%	0.05%	0.01%
	(1.94)	(0.92)	(1.44)	(1.42)	(-0.55)		(1.98)	(1.39)	(1.96)	(1.98)	(0.3)
1	0.67%	0.03%	-0.04%	-0.05%	-0.04%	1	0.68%	0.04%	-0.02%	-0.03%	0.00%
	(2)	(0.27)	(-0.94)	(-1.23)	(-1.16)		(2.04)	(0.38)	(-0.39)	(-0.65)	(0.09)
(5-1)	-0.10%	0.00%	0.08%	0.09%	0.03%	(5-1)	-0.10%	0.00%	0.07%	0.08%	0.00%
	(-0.79)	(-0.03)	(1.47)	(1.69)	(0.73)		(-0.8)	(0.02)	(1.11)	(1.27)	(0.06)

Table 5 Fund Principles Responsible for Investment(PRI) signatories and fund-prospectus-identified ESG funds

This table reports regression results of fund flows on portfolio MSCI ESG scores. We include two dummy variables: 1) the fund that belongs to the fund family that signs with the Principles for Responsible Investment (PRI) and 2) the fund states as an ESG fund in their fund prospectus from Morningstar's annual sustainable reports. The dependent variable is the monthly fund flow on month t. The main independent variable of interest is the ESG score which measures the level of funds' investment based on environmental, social and governance rules. The control variables include fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fixed effects of month and styles are included in all regressions. Standard errors are clustered at the fund and month level. The ***, **, and * denote the significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Fund flows/inflows in month t

VARIABLES	Flow	Flow	Flow	Percentile flow	Percentile flow	Percentile flow
Fund-level MSCI ESG	-0.24847*** (-9.104)	-0.12296*** (-6.907)	-0.07918*** (-4.463)	-1.53157*** (-6.826)	-0.75857*** (-4.427)	-0.54207*** (-3.126)
Funds with PRI signatories	0.09317** (2.179)	0.06610** (2.462)	0.08150*** (2.962)	0.82054* (1.865)	0.37031 (1.018)	0.61793* (1.814)
ESG Fund(fund prospectus)	0.37314*** (2.883)	0.21906*** (2.794)	0.06069 (0.887)	3.34062** (2.461)	2.26472** (2.147)	-0.53208 (-0.704)
Fund flows		0.36626*** (35.488)	0.31013*** (30.003)		2.65607*** (37.128)	2.30156*** (35.683)
Fund size (log)		-0.03154*** (-4.407)	-0.09366*** (-11.286)		0.02461 (0.284)	-1.16501*** (-12.305)
Prior 12-month returns		0.15834*** (3.770)	0.22454*** (10.644)		1.54549*** (4.104)	2.13553*** (12.067)
Morningstar rating			0.62822*** (32.045)			6.94712*** (39.621)
Fund age (log)			-0.09938*** (-6.196)			-1.39331*** (-7.601)
Return volatility			4.11961*** (3.160)			21.55033** (2.000)
Expense ratio			0.17332*** (4.356)			-0.81012 (-1.640)
Fund turnover			-0.03287* (-1.800)			-0.93236*** (-5.225)
Constant	0.69344*** (7.052)	0.32578*** (3.848)	-1.68011*** (-11.491)	52.26580*** (66.540)	48.40792*** (64.630)	35.64070*** (24.958)
Observations	461,642	433,834	305,964	470,423	439,778	309,429
R-squared	0.0318	0.1692	0.1982	0.0404	0.1868	0.2638
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.0284	0.166	0.194	0.0370	0.184	0.260

Table 6 Crisis-period fund flows.

This table reports regression results of fund flows on ESG scores during the crisis period. It follows Pástor et al. (2020) to define the crisis period (February 2020-April 2022), and follow Lins et al (2017) to define financial crisis (August 2008 to March 2009), and define the high EPU risk periods as the EPU exceeds the 75th percentile in the sample period(1999-2022). The dependent variable is the monthly fund flow on month t. The main independent variable of interest is the ESG scores that measure the level of funds' investing based on environmental, social and governance rules. The control variables include fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fixed effects of months and fund styles are included in all regressions. Standard errors are clustered at both the fund and month level. The ***, **, and * denote the significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Fund flows in month t						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Flow	Percentile flow	Flow	Percentile flow	Flow	Percentile flow
Fund-level MSCI ESG	-0.07892*** (-4.440)	-0.53765*** (-3.108)	-0.08255*** (-4.557)	-0.57199*** (-3.260)	-0.08137*** (-4.125)	-0.56322*** (-2.983)
COVID Period	-0.88423 (-1.426)	-6.59636** (-1.982)				
Fund-level MSCI ESG*COVID Period	0.12388 (0.956)	0.44119 (0.714)				
Financial Crisis 2008			0.14003 (0.707)	1.55842 (0.850)		
Fund-level MSCI ESG*Financial Crisis 2008			0.10158** (2.398)	0.59838 (1.620)		
High EPU Risk period					-0.34630** (-2.372)	-2.94964** (-2.333)
Fund-level MSCI ESG*High EPU risk period					0.04917 (1.541)	0.40137 (1.446)
Fund flows	0.31015*** (30.011)	2.30107*** (35.674)	0.31001*** (29.995)	2.30055*** (35.657)	0.30982*** (29.990)	2.29868*** (35.648)
Fund size (log)	-0.08886*** (-10.980)	-1.12756*** (-12.261)	-0.08835*** (-10.915)	-1.12273*** (-12.211)	-0.08998*** (-11.090)	-1.13682*** (-12.354)
Prior 12-month returns	0.22604*** (10.576)	2.15457*** (12.019)	0.23860*** (10.179)	2.24304*** (11.252)	0.22439*** (10.766)	2.13527*** (12.195)
Morningstar rating	0.62709*** (31.975)	6.94051*** (39.634)	0.62450*** (31.912)	6.91878*** (39.357)	0.62863*** (32.040)	6.95283*** (39.658)
Fund age (log)	-0.09736*** (-6.136)	-1.36056*** (-7.449)	-0.09799*** (-6.157)	-1.36808*** (-7.481)	-0.09440*** (-5.935)	-1.33593*** (-7.287)
Return volatility	4.20596*** (3.210)	22.50504** (2.079)	4.04904*** (3.079)	21.02315* (1.922)	5.00011*** (3.581)	29.39109*** (2.601)
Expense ratio	0.17159*** (4.335)	-0.84093* (-1.706)	0.17171*** (4.341)	-0.83690* (-1.699)	0.16704*** (4.214)	-0.87936* (-1.781)
Fund turnover	-0.03273* (-1.786)	-0.93040*** (-5.221)	-0.03273* (-1.790)	-0.93057*** (-5.219)	-0.03516* (-1.924)	-0.95213*** (-5.325)
Constant	-1.68930*** (-11.520)	35.51103*** (24.838)	-1.69015*** (-11.455)	35.52402*** (24.759)	-1.67766*** (-11.067)	35.62264*** (24.350)
Observations	305,964	309,429	305,964	309,429	305,964	309,429
R-squared	0.1981	0.2638	0.1982	0.2638	0.1983	0.2639
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.194	0.260	0.194	0.260	0.194	0.260

Table 7 Alternative measures: Fund flows and fund ESG

This table reports regression results of fund flows on alternative portfolio ESG scores. We use the Refinitive ESG scores provided by Thomson Reuters, and we also use the current stock level ESG score to compute the fund level ESG measure compared to the prior 12-month average ESG metric. The dependent variable is the monthly fund flow on month t. The main independent variable of interest is the ESG score which measures the level of funds' investment based on environmental, social and governance rules. The control variables include fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fixed effects of month and styles are included in all regressions. Standard errors are clustered at the fund and month level. The ***, **, and * denote the significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Fund flows in month t						
VARIABLES	(1) Flow	(2) Percentile flow	(3) Flow	(4) Percentile flow	(5) Flow	(6) Percentile flow
Fund-level MSCI ESG(current)	-0.07938*** (-4.679)	-0.56618*** (-3.394)				
Fund-level TR ESG(current)			-0.00961*** (-4.992)	-0.09469*** (-4.777)		
Fund-level TR ESG(12m)					-0.01005*** (-5.020)	-0.09455*** (-4.626)
Fund flows	0.30959*** (29.991)	2.30046*** (35.704)	0.31172*** (30.236)	2.37896*** (36.763)	0.31166*** (30.147)	2.38260*** (36.713)
Fund size (log)	-0.08847*** (-10.911)	-1.12409*** (-12.205)	-0.08839*** (-10.919)	-1.16665*** (-12.454)	-0.08868*** (-10.946)	-1.17273*** (-12.529)
Prior 12-month returns	0.22589*** (10.732)	2.13278*** (12.073)	0.22701*** (10.234)	2.30071*** (11.786)	0.22934*** (10.244)	2.32759*** (11.777)
Morningstar rating	0.62767*** (32.032)	6.93698*** (39.653)	0.61704*** (31.113)	6.84675*** (38.547)	0.61688*** (31.108)	6.85298*** (38.576)
Fund age (log)	-0.09757*** (-6.124)	-1.35926*** (-7.435)	-0.09925*** (-5.976)	-1.40899*** (-7.486)	-0.09813*** (-5.909)	-1.40659*** (-7.466)
Return volatility	4.16681*** (3.195)	21.65328** (2.014)	3.98118*** (3.144)	23.04078* (1.962)	3.99318*** (3.149)	23.15365* (1.967)
Expense ratio	0.17292*** (4.351)	-0.85839* (-1.738)	0.13860*** (3.547)	-1.21430** (-2.407)	0.13325*** (3.396)	-1.23582** (-2.434)
Fund turnover	-0.03205* (-1.751)	-0.92868*** (-5.227)	-0.03539** (-2.039)	-0.90092*** (-4.947)	-0.03841** (-2.206)	-0.91734*** (-5.006)
Constant	-1.68460*** (-11.517)	35.68584*** (24.938)	-1.61251*** (-11.224)	37.23303*** (25.812)	-1.60398*** (-11.244)	37.16706*** (25.849)
Observations	306,167	309,637	298,731	302,150	297,668	301,079
R-squared	0.1976	0.2637	0.1964	0.2640	0.1963	0.2642
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.193	0.260	0.192	0.260	0.192	0.260

Table 8 Fund strategies and ESG scores

This table reports the coefficients of fund betas for ESG scores from regression approaches. The dependent variable is the risk beta calculated from the CAPM with 24-month rolling-window regressions on month t. The main independent variable is the monthly ESG score in month t. The control variables include fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fix month and fund style effects are controlled in regressions. Standard errors are clustered at the fund and month level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variables: Risk Exposure in month t									
No.	Risk Model	Risk Exposure (beta)	Fund-level MSCI ESG		Constant		Observations	Controls	Adjusted R-squared
			Coefficient	t-statistics	Coefficient	t-statistics			
1	CAPM	Market Factor (MKT)	-0.00603	(-1.269)	0.78316***	(25.868)	301,739	Yes	0.300
2	FF3	Market Factor (MKT)	0.00042	(0.202)	0.82054***	(44.670)	301,739	Yes	0.151
3	FF3	Size Factor (SMB)	-0.03683***	(-6.796)	0.13438***	(4.473)	301,739	Yes	0.446
4	FF3	Value Factor (HML)	-0.05922***	(-9.996)	0.55538***	(12.046)	301,739	Yes	0.161
5	FF4	Market Factor (MKT)	-0.00097	(-0.464)	0.84078***	(50.441)	301,739	Yes	0.160
6	FF4	Size Factor (SMB)	-0.03195***	(-5.947)	0.12748***	(4.079)	301,739	Yes	0.423
7	FF4	Value Factor (HML)	-0.04657***	(-7.756)	0.42814***	(10.780)	301,739	Yes	0.130
8	FF4	Momentum Factor (UMD)	-0.00126	(-0.560)	-0.08088***	(-4.033)	301,739	Yes	0.129
9	FF5	Market Factor (MKT)	-0.00278	(-1.330)	0.87480***	(48.802)	301,739	Yes	0.114
10	FF5	Size Factor (SMB)	-0.04169***	(-7.381)	0.24405***	(8.755)	301,739	Yes	0.404
11	FF5	Value Factor (HML)	-0.03709***	(-7.320)	0.34953***	(9.864)	301,739	Yes	0.145
12	FF5	Investment Factor (CMA)	-0.02258***	(-4.084)	0.26659***	(7.234)	301,739	Yes	0.123
13	FF5	Probability Factor (RMW)	-0.00148	(-0.428)	0.28019***	(9.504)	301,739	Yes	0.118
14	QF	Market Factor (MKT)	0.00468	(1.486)	0.86123***	(40.476)	301,739	Yes	0.0811
15	QF	Size Factor (Q-SIZE)	-0.03382***	(-5.974)	0.15319***	(4.906)	301,739	Yes	0.322
16	QF	Investment Factor (I/A)	-0.03203***	(-4.870)	0.53367***	(11.487)	301,739	Yes	0.268
17	QF	Return on Equity Factor (ROE)	0.00462	(1.222)	0.15418***	(5.032)	301,739	Yes	0.0991
18	QF	Market Factor (MKT)	0.02232***	(5.148)	0.83366***	(27.869)	243,291	Yes	0.182
19	MS	Size Factor (SMB)	-0.05865***	(-8.007)	0.19499***	(4.868)	243,291	Yes	0.252
20	MS	Management Factor (MGMT)	-0.01397**	(-2.210)	0.33632***	(7.146)	243,291	Yes	0.206
21	MS	Performance Factor (PERF)	0.02056***	(7.168)	-0.12534***	(-5.032)	243,291	Yes	0.115

Table 9 Portfolio Diversification and Fund ESG

This table reports the coefficients of Industry concentration (ICI) (Kacperczyk, Sialm, and Zheng, 2005) and fund diversification (Pollet and Wilson, 2008) for ESG scores from regression approaches. The dependent variables are the industry concentration to measure the extent that which fund managers trade on specified industries and the number of stocks to measure portfolio diversification. The main independent variable is the monthly ESG scores in month t . The control variables include fund flows, log of fund size, log of fund age, fund turnover, prior 12-month return, and prior 12-month return volatility on month $t-1$. Fix month and fund style effects are controlled in regressions. Standard errors are clustered at the fund and month level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

VARIABLES	(1) Industry concentration	(2) Industry concentration	(3) Industry concentration	(4) number of stock(log)	(5) number of stock(log)	(6) number of stock(log)
Fund-level MSCI ESG	0.04642*** (3.396)	0.05730*** (4.265)	0.07679*** (5.247)	0.02597** (2.213)	0.03787*** (3.307)	0.05917*** (4.892)
Fund flows		0.00090 (0.667)	0.00016 (0.105)		0.00060 (0.611)	-0.00032 (-0.289)
Fund size (log)		-0.09681*** (-11.846)	-0.08450*** (-9.234)		-0.11051*** (-14.524)	-0.09522*** (-12.360)
Prior 12-month returns		0.00744* (1.935)	0.00348 (0.424)		0.00427* (1.754)	-0.00269 (-0.520)
Morningstar rating			0.02864** (2.527)			0.03707*** (4.066)
Fund age (log)			0.01515 (0.870)			0.01002 (0.698)
Return volatility			2.21717*** (3.569)			1.18597** (2.377)
Expense ratio			0.41408*** (8.226)			0.44168*** (10.109)
Fund turnover			-0.12785*** (-6.201)			-0.12197*** (-6.128)
Constant	2.50193*** (52.833)	3.03539*** (48.572)	2.30980*** (20.705)	-4.50858*** (-110.052)	-3.89331*** (-71.418)	-4.63913*** (-48.488)
Observations	407,904	383,107	303,043	407,905	383,108	303,044
R-squared	0.0669	0.0909	0.1186	0.0658	0.1268	0.1942
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.0631	0.0869	0.114	0.0620	0.123	0.190

Table 10 Abnormal Cash and Fund ESG

This table reports the coefficients of abnormal cash (Simutin, 2013.) for ESG scores from regression approaches. The dependent variable is the abnormal cash to measure the unusual cash holdings kept by fund managers for stock opportunities or accommodating fund outflows. The main independent variable is the monthly ESG scores in month t. The control variables include fund flows, log of fund size, log of fund age, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fix month and fund style effects are controlled in regressions. Standard errors are clustered at the fund and month level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variable: Abnormal cash in month t				
VARIABLES	(1)	(2)	(3)	(4)
Fund-level MSCI ESG	0.12163*** (2.694)	0.13140*** (2.909)	0.13383*** (2.940)	0.09411** (2.355)
Fund flows		0.05382*** (8.748)	0.05411*** (8.857)	0.04278*** (7.881)
Fund size (log)			0.00491 (0.228)	-0.00762 (-0.326)
Prior 12-month returns			-0.02865** (-2.101)	-0.02208 (-0.948)
Morningstar rating				0.08684*** (2.690)
Fund age (log)				-0.09060* (-1.920)
Return volatility				3.15978 (1.473)
Expense ratio				0.02345 (0.197)
Fund turnover				-0.12662** (-2.312)
Constant	-0.44281*** (-2.858)	-0.46042*** (-2.973)	-0.47391** (-2.511)	-0.42170 (-1.324)
Observations	196,786	194,418	192,840	180,266
R-squared	0.0079	0.0109	0.0112	0.0136
Month x Style Fix effect	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes
Adjusted R-squared	-0.000109	0.00280	0.00300	0.00484

Table 11 Test of Endogeneity: Do investors prefer sustainable funds?

This table reports the two-stage least squares (2SLS) regression results of fund flows on portfolio MSCI ESG scores to address the endogeneity issue. The dependent variable is the monthly fund flow on month t+1. We use the industry level as the instrumental variable for our 2SLS regression. The main independent variable of interest is the ESG score which measures the level of funds' investment based on environmental, social and governance rules. The control variables include fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fixed effects of month and styles are included in all regressions. Standard errors are clustered at the fund and month level. The ***, **, and * denote the significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	first stage Fund-level MSCI ESG	second stage Fund flows	first stage Fund-level MSCI ESG	second stage Fund flows	first stage Fund-level MSCI ESG	second stage Fund flows
Industry average MSCI ESG	0.1151*** (7.19)		0.1126*** (6.88)		0.1089*** (6.21)	
Fund-level MSCI ESG		-0.5752*** (-3.22)		-0.2765** (-2.39)		-0.2976** (-2.30)
Fund flows			-0.0116*** (-8.10)	0.3646*** (35.67)	-0.0075*** (-4.96)	0.3085*** (30.05)
Fund size (log)			0.0250*** (4.84)	-0.0250*** (-3.33)	-0.0247*** (-3.61)	-0.0940*** (-10.46)
Prior 12-month returns			0.0003 (0.03)	0.1584*** (3.81)	-0.0232 (-1.29)	0.2191*** (10.53)
Morningstar rating					-0.0113 (-1.06)	0.6245*** (32.24)
Fund age (log)					0.1137*** (7.55)	-0.0743*** (-3.41)
Return volatility					-6.1576*** (-4.36)	2.8129* (1.92)
Expense ratio					-0.3852*** (-8.20)	0.0884 (1.36)
Fund turnover					-0.1093*** (-6.50)	-0.0586** (-2.44)
Constant	1.7693*** (8.62)		1.6814*** (8.05)		2.6923*** (11.32)	
Observations	471,262	461,622	440,071	433,818	309,621	305,963
R-squared	0.729	-0.002	0.731	0.144	0.741	0.172
Adjusted R-squared	0.728	-0.00583	0.730	0.141	0.740	0.168
First stage Cragg and Donald Underidentification test		0		0		3.75e-10
Second stage Sargan Underidentification test		1.55e-09		5.78e-09		3.39e-07

Online Appendix

OA1. Fund performance and ESG scores- Regression approach

In this appendix section, based on our results that sophisticated investors tend to invest with ESG scores, we further examine if SR predicts fund performance. We run regressions of fund performance on SR and control variables as follows:

$$Performance_{i,t+1} = \alpha + \beta_1 ESG_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}$$

Where $Performance_{i,t+1}$ is the risk-adjusted performance for fund i in month t+1, $ESG_{i,t}$ is the ESG score of fund i in month t; $X_{i,t}$ is a vector of control variables including fund flows, the log of fund size, the log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility.

<insert appendix table 1>

In Appendix 1, we report the coefficients and their t-statistics. We find that ESG does not exhibit return predictability for risk-adjusted performance. For instance, in Column 3, for the Fama-French-Carhart model, the fund-level MSCI ESG score has an insignificant coefficient of -0.00018 (t=-0.805). It also shows insignificant coefficients for the Fama-French three-factor model. This is consistent with the idea that fund managers may have the skills to deal with the cost of ESG investments (Fatemi et al., 2015; Albuquerque et al., 2019). Overall, the results suggest that active skills exist for fund managers investing in better ESG stocks with control of fund characteristics and several risk models.

OA2. Skill index and ESG funds

To further examine the stock picking and timing skills of ESG-focus fund managers, we use the skill index proposed by Kacperczyk., Nieuwerburgh, and Veldkamp (2014). They use the skill index as an indication of superior fund managers who exhibit better skills in stock selections during economic expansions and demonstrate adept market timing during recessions. It demonstrates

greater persistence than market timing or stock selection independently and forecasts fund performance.

<insert appendix table 2>

Appendix Table 2 shows that the fund-level ESG positively predicts the skill index of funds. In column 4, it shows a significant and positive coefficient of 0.01013 ($t= 2.042$) at the 5% level. Consistent with our expectations, it suggests that ESG-focus fund managers can prioritize a fund's market timing during recessions and emphasize asset selection during economic expansions. These fund managers can utilize their information advantage to cover the cost of ESG investment and exhibit better management skills. Supporting this perspective, the research by Lins et al. (2017) indicates that high CSR firms are more likely to adapt their strategies effectively to changing market conditions, thereby enhancing performance. Further, research by Duuren et al. (2016) highlights that ESG-conscious managers can better navigate risks, that attract ESG-oriented investors. Together, these findings reinforce the notion that ESG-focused fund managers possess enhanced stock picking and market timing skills, contributing positively to fund performance.

OA3. Active shares and fund ESG

In this section, we investigate whether two active skill factors are reflected in funds with more ESG investment. First, Cremers and Petajisto (2009) find that mutual fund performance in comparison to their benchmark is substantially predicted by Active Shares. Funds with a high active share show superior performance than their peers with a low active share and exhibit better performance persistence. From an investor's perspective, funds exhibiting the highest active share, smallest in assets, and superior prior one-year performance are highly appealing, surpassing their benchmarks by 6.5% annually after accounting for fees and expenses. Second, as the benchmark index's weight is not available for all funds, by using the market portfolio weight as a benchmark,

Doshi et al. (2015) find that funds with active weight exceed the performance of passive funds with low active weight by 2.5% per year.

<Insert table 7>

In Table 7, we report the coefficients and their t-statistics of regressions. We find that the fund-level ESG score exhibits a negative and significant coefficient of -0.02272 ($t = -9.237$) in Column 3 and of -0.02721 ($t = -14.927$) in Column 6. It shows negative and significant coefficients across all regressions. The results suggest that funds with high ESG scores tend to have lower active shares and active weight. Compared to their benchmarks, these funds are more passive in-stock selection. ESG Fund managers are not significantly putting more weight on the active bet, but they may focus more on the stock timing and on the ESG stocks that they have past working experience (Ceccarelli et al., 2023; Pool et al., 2012). This also aligns with the argument by Jin (2022) that fund managers with a focus on ESG considerations can use an ESG integration framework for portfolio optimization that addresses systematic ESG risk and its impact on security prices, relying instead on their specialized knowledge for stock selection. Furthermore, research by Amon et al. (2022) suggests that conventional investors may favour ESG-based portfolios as a passively managed alternative to a value-weighted index.

Thus, our findings corroborate the perspective that fund managers leverage their expertise in ESG-related information to navigate the complexities and costs associated with ESG investing, positioning them more as informed stewards rather than aggressive active investors. In sum, our results are consistent with the point that fund managers have active fund skills in specialized ESG information on stocks, not in active bets, to deal with the cost of ESG investment.

Appendix Table 1 Fund performance and ESG scores-Fama-Macbeth regression approach

This table reports the coefficients of fund-level ESG scores for monthly fund performance from Fama-Macbeth regressions. The main independent variable is the monthly ESG scores in month t. The dependent variables include average fund returns and risk-adjusted alphas using a 5-year rolling window. Risk-adjusted alphas are calculated from the Fama-French-Carhart model (FF4) and the Fama-French five-factor model (FF5). The control variables include fund flows, log of fund size, log of fund age, total expense ratio, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fix style and month effects are controlled in regressions. Standard errors are clustered at the fund and month level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variable: fund performance in month t							
VARIABLES	(1) Return 1m	(2) CAPM alpha 24m	(3) FF3 alpha 24m	(4) FF4 alpha 24m	(5) FF5 alpha 24m	(6) QF alpha 24m	(7) MS alpha 24m
Fund-level MSCI ESG	-0.00087** (-2.216)	-0.00090** (-2.095)	-0.00018 (-0.805)	-0.00024 (-1.105)	-0.00033 (-1.409)	-0.00051* (-1.736)	-0.00062 (-1.362)
Fund flows	-0.00001 (-0.252)	-0.00014 (-1.456)	-0.00012 (-1.263)	-0.00013 (-1.293)	-0.00012 (-1.244)	-0.00018 (-1.212)	-0.00023 (-1.261)
Fund size (log)	-0.00002 (-0.489)	-0.00064 (-1.169)	-0.00067 (-1.224)	-0.00071 (-1.276)	-0.00063 (-1.136)	-0.00055 (-1.037)	-0.00084 (-1.162)
Prior 12-month returns	0.20590*** (2.637)	0.00341 (0.016)	-0.12157 (-0.606)	-0.14715 (-0.709)	-0.10181 (-0.501)	0.04901 (0.988)	-0.02353 (-0.336)
Fund flows	-0.00015 (-0.960)	0.00129 (1.070)	0.00166 (1.382)	0.00164 (1.361)	0.00170 (1.400)	0.00092 (1.294)	0.00109 (1.131)
Fund age (log)	0.00007 (1.277)	0.00059* (1.945)	0.00063** (2.124)	0.00071** (2.274)	0.00061** (1.998)	0.00056** (2.034)	0.00083** (2.048)
Return volatility	-0.02609 (-0.521)	0.06716 (0.375)	0.09696 (0.540)	0.09961 (0.551)	0.13436 (0.752)	-0.04604 (-1.095)	-0.11329* (-1.828)
Expense ratio	-0.06571*** (-3.304)	-0.04542 (-1.077)	-0.03073 (-0.720)	-0.03112 (-0.730)	-0.01214 (-0.289)	-0.03058 (-0.415)	-0.04687 (-0.526)
Fund turnover	0.00019 (0.866)	-0.00000 (-0.009)	-0.00028 (-1.160)	-0.00042** (-2.092)	-0.00019 (-0.812)	-0.00058* (-1.654)	-0.00110*** (-2.840)
Constant	0.00683** (2.128)	0.00014 (0.038)	-0.00162 (-0.571)	-0.00141 (-0.525)	-0.00316 (-1.102)	0.00315 (0.863)	0.00806 (1.627)
Observations	304,792	299,671	299,671	299,671	299,671	299,670	215,627
R-squared	0.3495	0.2954	0.1354	0.1215	0.1146	0.0138	0.0128
Adjusted R-squared	0.344	0.289	0.128	0.113	0.107	0.00833	0.00677

Appendix Table 2 Skill Index and Fund ESG

This table reports the coefficients of the skill index (Kacperczyk., Nieuwerburgh, and Veldkamp, 2014.) for ESG scores from regression approaches. The dependent variable is the skill index to measure the marking timing and stock selection skills of fund managers. The main independent variable is the monthly ESG scores in month t. The control variables include fund flows, log of fund size, log of fund age, fund turnover, prior 12-month return, and prior 12-month return volatility on month t-1. Fix month and fund style effects are controlled in regressions. Standard errors are clustered at the fund and month level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variable: Skill index in month t				
VARIABLES	(1)	(2)	(3)	(4)
Fund-level MSCI ESG	0.00794*	0.00868*	0.01030**	0.01013**
	(1.700)	(1.894)	(2.251)	(2.042)
Fund flows		0.00037	-0.00059	-0.00124
		(0.549)	(-0.903)	(-1.584)
Fund size (log)			-0.00033	-0.00219
			(-0.282)	(-1.214)
Prior 12-month returns			0.02295**	0.05221***
			(2.259)	(3.070)
Morningstar rating				-0.00905**
				(-2.287)
Fund age (log)				0.00605
				(1.464)
Return volatility				0.82725
				(1.622)
Expense ratio				-0.01626*
				(-1.669)
Fund turnover				-0.00347
				(-0.559)
Constant	-0.03394**	-0.03627**	-0.05692***	-0.06747*
	(-2.153)	(-2.310)	(-2.868)	(-1.863)
Observations	407,904	400,483	383,107	303,043
R-squared	0.1653	0.1670	0.1733	0.1915
Month x Style Fix effect	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes
Adjusted R-squared	0.162	0.164	0.170	0.187

Appendix Table 3 Active Investment and Fund ESG

This table reports the coefficients of active shares (Cremer and Petajisto, 2009) and active weight (Doshi et al., 2015) for ESG scores from regression approaches. The dependent variables are to measure the extent to which fund managers invest exceeding their benchmarks. The main independent variable is the monthly ESG scores in month t . The control variables include fund flows, log of fund size, log of fund age, fund turnover, prior 12-month return, and prior 12-month return volatility on month $t-1$. Fix month and fund style effects are controlled in regressions. Standard errors are clustered at the fund and month level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

VARIABLES	(1) active share	(2) active share	(3) active share	(4) active weight	(5) active weight	(6) active weight
Fund-level MSCI ESG	-0.02706*** (-10.440)	-0.02612*** (-10.282)	-0.02272*** (-9.237)	-0.03066*** (-17.650)	-0.03026*** (-17.454)	-0.02721*** (-14.927)
Fund flows		-0.00012 (-0.556)	-0.00046** (-2.159)		0.00052*** (4.118)	0.00061*** (4.416)
Fund size (log)		-0.00910*** (-6.827)	-0.00702*** (-5.367)		-0.00517*** (-5.263)	-0.00145 (-1.390)
Prior 12-month returns		0.00739*** (3.656)	0.01638*** (7.666)		-0.00054 (-1.328)	-0.00056 (-0.663)
Morningstar rating			0.00603*** (3.428)			-0.00010 (-0.076)
Fund age (log)			0.00569** (2.161)			-0.00365* (-1.889)
Return volatility			0.67743*** (5.033)			0.23803*** (3.216)
Expense ratio			0.06790*** (9.617)			0.03494*** (7.056)
Fund turnover			-0.01346*** (-3.979)			0.00014 (0.074)
Constant	0.84637*** (105.090)	0.89303*** (85.467)	0.73518*** (41.362)	0.47000*** (76.717)	0.50047*** (63.747)	0.42877*** (35.387)
Observations	272,175	256,630	205,415	407,904	383,107	303,043
R-squared	0.2482	0.2715	0.3498	0.1369	0.1479	0.1850
Month x Style Fix effect	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Month Cluster effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.244	0.267	0.345	0.133	0.144	0.181

Appendix Table 4 Variable definition list

Stock-level MSCI ESG	It is the stock-level ESG score provided by MSCI. Higher ESG scores indicate better performance in the fields of environmental issues, social impact, and corporate governance.
Fund-level MSCI ESG	It is a fund-level ESG score calculated as the market capitalization-weighted average of stock-level MSCI ESG scores in the prior 12 months across all stocks in a fund's portfolio.
Fund-level MSCI ESG(current)	It is a fund-level ESG score calculated as the market capitalization-weighted average of stock-level MSCI ESG scores across all stocks in a fund's portfolio.
Fund-level TR ESG(12m)	It is a fund-level ESG score calculated as the market capitalization-weighted average of stock-level Refinitive ESG scores in the prior 12 months across all stocks in a fund's portfolio.
Fund-level TR ESG(current)	It is a fund-level ESG score calculated as the market capitalization-weighted average of stock-level Refinitive ESG scores across all stocks in a fund's portfolio.
Fund flows	It is the percentage of increase of the fund's net assets from the previous month net the percentage of fund return in the current month.
Fund size	It is the sum of the total net assets of the fund from all share classes.
Fund age	It measures the number of months (or years) since funds were launched in the market.
Expense ratio	The annualized expense ratio is the cost to pay for the operating expenses and management fees, including 12b-1 fees, administrative fees, and all other asset-based costs. The brokerage cost and sales charges are not included in it.
Turnover	It is a measure of how frequently that funds trade, which is calculated by taking the lesser of purchases or sales that exclude all securities with maturities of less than one year and dividing by average monthly net assets.
Prior 12-month return	It takes the mean return of funds from the previous 12 months.
Return volatility	It measures the previous twelve-month standard deviation of funds returns. It is the risk exposure by running the 24-month rolling regressions of fund returns on risk factors (such as the market factor, size factor, and value factor in the Fama-French 3-factor model)
Beta	
Fund styles	It refers to the nine Morningstar category boxes that sort funds by size and value.
Abnormal cash holdings	It takes the residuals by regressing cash on multi-factors including basic fund characteristics, fund performance, and holding characteristics.
Active shares	It is the difference between shares held by funds and shares held by the most relevant benchmark index.
Active weight	It is the weight difference between stock weights held by funds and stock weights of the market portfolio.

Direct-sold	A dummy variable to define if the funds are sold directly to investors or sold through financial brokers.
Diversifications	The number of stocks in fund portfolios is used to measure fund diversification.
Skill index	It measures the combination of stock picking skills and market timing skills of fund managers based on the weight difference between the funds' stock portfolio and the whole market portfolio.
Fund PRI signatories (dummy)	The signatory's institutional list is provided by PRI.(https://www.unpri.org/signatories/signatory-resources/signatory-directory)
ESG fund	We use fund prospectuses to identify the fund as an ESG fund. The historical data of the ESG fund prospectus identifier is retrieved from the Morningstar Sustainable Funds Report.
