How green is green? Anatomy of ESG funds' selection*

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Abstract

We systematically anatomize ESG funds' selection, by comparing them to an otherwise "optimal portfolio" benchmark rather than average non-ESG peers. We show that ESG funds "walk the talk" by selecting portfolios with a significant 36% less absolute emission, but with minimal outperformance in ESG scores and social measures: Over 90% of the emission reduction is achieved by excluding the 2% holdings of the top 25 highest-emitting companies, primarily at extensive margin; Excluding these top emitters, ESG funds fail to differ from their benchmarks. Perhaps surprisingly, ESG active funds select more by de-weighting the brownest industries whereas ESG index funds select more by de-weighting the brownest firms within each industry. As ESG funds tend to retain the primary components of the benchmark in their portfolios, the emission reduction is achieved without compromising risk profiles based on standard factors. However, ESG funds do not show significant differences in net-of-fee returns compared to their benchmarks, and demonstrate greater sensitivity to macroeconomic factors such as inflation and oil prices.

Keywords: ESG, Selection, Mutual funds, Benchmark, GHG emissions

JEL classification: G23; M14

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1 Introduction

Demand for ESG (Environmental, Social, and Governance) investments has surged over the past two decades, although recent years have been marked by periods of volatility. A wide variety of ESG mutual funds and ETFs have emerged to cater to investors' nonpecuniary preferences, with the assets under management (AUM) of these funds in the US reaching \$500 billion as of 2023; while at the same time, their growth has not been without challenges, as 2023 marked the first calendar year of outflows in over a decade.¹ Larry Fink, CEO of BlackRock, committed to "put sustainability at the center of investment approach" in his 2021 letter to CEOs, a move that was largely welcomed by many stakeholders at the time. Yet, by 2023, Fink faced criticism for his ESG-focused investment strategy, with detractors arguing that BlackRock's emphasis on ESG was either insufficient or misguided.² This duality highlights the complex and often contentious nature of ESG investing. Society demands to know whether and how ESG funds fulfill their promises.

Existing literature documents the phenomenon of "impact washing" among ESG funds: rather than attempting to fulfill their ESG goals through "treatments"—using their shareholder rights to encourage companies with weaker ESG performance to adopt more sustainable practices—ESG funds seem to engage in "selection" by choosing companies that have already established relatively strong ESG practices (Heath et al., 2023; Atta-Darkua et al., 2023). However, the exact manner and extent to which ESG funds "select" to advance their ESG goals remains ambiguous and merits further exploration, with the mixed evidence largely depending on the definition of ESG funds, the measures of ESG performance, etc.³

In this paper, we aim to anatomize and quantify ESG funds' selection in a systematic way, whilst taking into account the variation in their investment strategies and risk profiles. Current studies typically compare ESG funds to non-ESG ones, but this may be an inadequate comparison, as a growth ESG active fund can differ significantly from a non-ESG index fund. Consequently, we emphasize the importance of defining an appropriate risk-adjusted

¹See the Morningstar report "U.S. Sustainable Funds Register First Annual Outflows in 2023" in January 2024.

²Refer to the Financial Times article "The Real Impact of the ESG Backlash" in December 2023.

³Kim and Yoon (2023) find that PRI signatories do not necessarily construct portfolios with higher ESG score as compared to those of other. Gibson Brandon et al. (2022) show that higher ESG scores are evident in ESG funds in the global sample; however, this pattern is not present in the US sample.

benchmark tailored to each ESG fund for comparison.

Overall, we show that ESG funds "walk the talk" by selecting portfolios with less pollution, but only to a limited extent: They largely retain the primary components of benchmark indices in their portfolios, while eliminating the top-emitting companies through extensive margin, resulting in significantly lower emissions at the portfolio level compared to their benchmarks. Interestingly, ESG index funds achieve emission reductions primarily through stock-level selection, whereas ESG active funds accomplish this more through industry-level selection. The marginal deviations lead to minimal differences in other ESG metrics, alphas, and risk profiles between ESG funds and their benchmarks. Consequently, ESG funds have a limited impact on the cost of capital and ESG improvements for the vast majority of firms.

To arrive at these findings, a crucial aspect is to define the appropriate benchmark that factors in fund types, holdings, investment styles, and standard risks. We consider both subjective benchmarks, i.e., those employed by asset managers themselves (as stated in their prospectuses), and objective benchmarks, i.e., those used by rating agencies (e.g., Morningstar). In our primary analysis, we classify US equity ESG funds based on Morningstar Category classification and use the benchmark index Morningstar assigns to each category.⁴ Then we ask several important and unanswered questions about the strategies of ESG fund selection: To what extent do these funds deviate from their benchmarks? Is the selection carried out at the industry level (by merely avoiding brown industries) or at the firm level (by choosing the best ESG-performing candidates within each industry)? If it is the latter, is this achieved more through extensive margin (which stocks are held) or intensive margin (weights assigned to the held stocks)? Equally crucial is the specific types of ESG funds involved in the selection process, considering their asset types, investment disciplines, and any distinct strategies employed.

To begin with, we investigate the extent to which ESG funds deviate from their optimal portfolios by examining the average stock-level holding differences. This is calculated as the total absolute differences in their stock holdings, scaled by the number of stocks held. Since most funds in our sample, whether ESG or non-ESG, typically hold less than a quarter of

 $^{^{4}}$ We maintain the flexibility of using alternative benchmark choices, such as a subjective benchmark, the Primary Prospectus Benchmark index sourced from funds' prospectuses. Our main findings remain robust.

the individual stocks found in their benchmark indices, we use the whole group of non-ESG funds in the same Morningstar Category—matched by type (active or index), star rating, and AUM—as reference points for ESG funds. Results show that large-cap ESG funds, which make up over 80% of our sample, demonstrate significantly less deviation from their comparable funds compared to mid- and small-cap funds. Specifically, large blend ESG funds show an average holding difference of 0.01 percent per stock, while small value ESG funds exhibit around 1 percent deviation per stock.

A uniform observation from the holding deviations across all categories is that ESG funds tend to cut holdings of top-polluting profiles, mainly at *extensive margin* rather than intensive margin. Among the top 25 emitters, which account for over 50% of total emissions, 35% of ESG funds avoid holding any of them. As illustrated in Panel A of Figure 1, showing differences in holdings and emissions between ESG funds and their benchmark indices, ESG active funds hold the fewest top emitters, while non-ESG index funds hold the most. Additionally, these reduced holdings correspond to meaningfully lower emissions. In fact, Panel B shows that most of the emission reductions in ESG funds result from the 2% adjustment in holdings of top emitters; excluding these top emitters, ESG funds fail to differ from either their benchmark indices or similar non-ESG funds. Furthermore, we find that there is minimal overlap between the top 25 emitters and the top components in major benchmark indices. These results partly explains the minimal difference in return patterns between ESG funds and their benchmarks, which will be discussed in the sequel, suggesting that ESG funds' selection is relatively limited in scope.

Upon closer inspection of various types of ESG funds, we find that acive and index funds employ different strategies: For instance, when measured by emission intensity, 82% of the outperformance of ESG index funds stems from within-industry selection, whereas 57% of the outperformance of ESG active funds results from across-industry selection. At first glance, these differences in the strategies of ESG active and index funds may appear surprising, as passive funds actually perform selection in a more granular manner compared to active funds. However, this is precisely due to the diversification constraints placed on passive funds, which lead them to de-weight selected firms within each industry while still retaining the majority of industries in the benchmark.



Figure 1: ESG funds' strategy: avoiding top emitters.

The subsequent inquiry involves *quantifying* the greenness of ESG funds from multiple perspectives. Our framework considers various ESG metrics, including emissions, ESG ratings, board diversity, and ESG risk exposures. The most significant and meaningful outperformance is sourced from real environmental metrics. The portfolios held by ESG funds display a substantial 36% reduction in absolute GHG emissions and a 26% decrease in emission intensity when compared to their benchmark indices, with ESG active funds contributing more than ESG index funds. Non-ESG funds also have lower emissions relative to their benchmarks, though higher than ESG funds (the ranks can be found in Figure 1). These findings suggest that mutual funds (or institutional investors) generally maintain portfolios that are greener than the market, in line with the observations in Atta-Darkua et al. (2023) and Pastor et al. (2023).

Next, we examine the most visible and commonly used metrics—ESG scores. We aggregate firm-level ESG scores provided by third-party rating agencies including MSCI, Refinitiv, S&P, Sustainalytics, and KLD, to portfolio levels. Despite the significant reduction in portfolio emissions, we find minimal cross-sectional differences in portfolio ESG or E scores between funds and their benchmark indices, as well as between ESG and non-ESG funds (approximately 1%). This outcome becomes less surprising when noting the general characteristic of these scores: Many ratings employ industry adjustments and thus there is very small cross-sectional variation among the average scores of different industries (detailed in Table E.6 in Online Appendix Section E). This reconciles the differing results found between score measures and real unadjusted variables like emissions, indicating that assessing the greenness of ESG funds using only score measures is, at the very least, insufficient.

We also examine other impact metrics. When assessing ESG risk exposure using Sustainalytics risk scores and various RepRisk measures, we find that the portfolio companies of ESG funds have a significant 4% lower Sustainalytics risk score and a 19% smaller likelihood of ESG incidents compared to those in the benchmark. In terms of board diversity and employee safety, the outperformance of ESG funds is not substantial. If there are any differences, non-ESG active funds exhibit workplace incident rates that are over 1.5 times higher than the rest. Overall, these findings provide insight, in a stylized manner, into whether free capital market forces can influence social and environmental issues: ESG funds excel to some extent in selecting cleaner and more socially beneficial firms. The ESG performance discussed above is summarized in Table 1.

	ESG funds vs Benchmark	ESG funds vs Matched non-ESG funds
Emissions (absolute)	lower $(-35.9\%^{***})$	lower $(-25.0\%^{***})$
Emissions (intensity)	lower $(-25.6\%^{***})$	lower $(-16.7\%^{***})$
ESG scores	similar $(0.5\%^*)$	similar (0.4%)
ESG risk	lower $(-4.1\%^{***})$	lower $(-4.7\%^{***})$
Board diversity	similar (0.2%)	slightly higher $(4.0\%^{***})$
Incident rate	slightly lower (-3.1%)	lower (-44.6%)

Table 1: ESG funds' greenness (percentage difference).

Finally, we aim to determine if the selection of green stocks comes at the expense of funds' risk profiles and performances, such as their levels of diversification, financial returns, volatility, and other risk exposures. These findings contribute to an ex-post evaluation of the funds' performance in terms of both their ESG achievements and profit-maximizing objectives, thereby providing guidance to investors investing in ESG funds.

We begin by addressing concerns that the selection process compromises diversification requirements. We find that the portfolio return volatility of ESG funds is only marginally higher than that of their benchmark indices and non-ESG counterparts. This is despite ESG funds holding only 17% of the stocks (as measured by the number of stocks proposed by Pollet and Wilson, 2008) and having twice the industry concentration of their benchmarks (according to the industry concentration measure proposed by Kacperczyk et al., 2005). Additionally, index funds consistently exhibit lower volatility than active funds, whether they are ESG or non-ESG.

We then examine the financial performance of ESG funds, a topic of considerable debate in the literature.⁵ In general, net of fees, ESG funds (i) generate positive risk-adjusted abnormal returns (e.g., 6-factor alpha, CAPM alpha), and (ii) slightly outperform their benchmark indices under the same metrics. The outperformance is mostly driven by ESG index funds, which show a 34bps higher monthly 6-factor alpha and a 24bps higher monthly CAPM alpha. Minimal outperformance is observed for ESG active funds, partly due to the higher management fees they charged compared to both ESG index funds and non-ESG counterparts. Moreover, when compared to non-ESG funds within the same Morningstar Category, ESG funds consistently outperform across all risk premium and alpha measures. In fact, non-ESG funds, particularly non-ESG active funds, (iii) generate negative riskadjusted abnormal returns and (iv) significantly underperform their benchmark indices after fees. We also compare CAPM beta across different types of funds and, interestingly, ESG funds appear to be slightly less risky in this aspect, though significant, both in comparison to their benchmarks and non-ESG funds.

All the analysis of potential costs is summarized in Table 2. In essence, ESG funds can select stocks with lower environmental impact, but only to a limited degree, primarily by avoiding a small portion of the top-emitting profiles. The minimal deviation in holdings of the main index components results in negligible additional costs to investors' net returns and risks. It is important to note that different types of ESG funds adopt distinct selection strategies: Contrary to expectations, ESG index funds apply more granular selection criteria than ESG active funds. Understanding these nuances can help investors make better decisions when choosing funds that align with their values and financial objectives.

⁵The literature presents mixed conclusions about the relationship between ESG performance and financial performance due to the variety of measures used. For example, Eccles et al. (2014) and Friede et al. (2015) report a positive relationship, while Brammer et al. (2006) find the opposite. A comprehensive discussion of this strand of literature is provided in the literature review.

	ESG funds vs Benchmark	ESG funds vs Matched non-ESG funds
Alpha (6-factor)	slightly higher $(17bps^{***})$	slightly higher $(17bps^{***})$
Alpha (CAPM)	slightly higher $(3bps^*)$	slightly higher $(8bps^{***})$
Beta (CAPM)	lower (-0.10^{***})	lower (-0.05^{***})
Volatility (monthly)	slightly higher $(0.36\%^{***})$	slightly higher $(0.41\%^{***})$
Number of stocks held	lower (-654^{***})	slightly lower (-39^{***})
Industry concentration	less diversified $(1.51\%^{***})$	similar (-0.32%)

Table 2: Costs of greenness (net difference).

Literature

Our paper contributes to the literature on the role of institutional investors in enhancing corporate ESG performance. Most prior studies have documented a positive relationship between institutional ownership and ESG performance (Dyck et al., 2019; Chen et al., 2020; Azar et al., 2021; Pastor et al., 2023). Zooming in to the strategies employed by ESG funds, Heath et al. (2023) show that they mostly engage in selection but not much treatment. Similarly, Atta-Darkua et al. (2023) find that climate-conscious investors rebalance their portfolios towards firms with lower emissions, yet there is little evidence of active engagement. However, some studies suggest that even selection is limited. For example, Raghunandan and Rajgopal (2022) find that ESG funds select firms based solely on ESG scores rather than actual carbon emissions or compliance records.

In this paper, we take a step further to examine the strategies and extent of ESG funds' selection by comparing holding deviations, industry versus stock selection, holdings of top emitters, and the differences between various types of ESG funds. We find that one dominant strategy employed by ESG funds to achieve a significant reduction in portfolio emissions is divestment from the top 25 emitters. While this exclusion strategy may push down the stock price of the highest polluting profiles, Edmans et al. (2023) show that it fails to incentivize these companies to undertake corrective actions. Berk and van Binsbergen (2021) argue that even the impact on cost of capital is minimal, due to the presence of arbitrageurs.

Our study also contributes to the ongoing debate on the relationship between ESG per-

formance and financial performance. Using emissions as one measure, earlier research has documented a positive carbon premium (e.g., Bolton and Kacperczyk, 2021; Hsu et al., 2023; Bolton and Kacperczyk, 2023) and provided related theoretical frameworks (e.g., Pástor et al., 2021). However, more recent studies find no premium when using emissions intensity or disclosed emissions, or after accounting for data release lag (e.g., Zhang, 2024; Aswani et al., 2023; Atilgan et al., 2023). Using ESG scores as another measure, studies like Friede et al. (2015) identify a positive correlation between ESG performance and financial performance, while studies like Brammer et al. (2006) find the opposite. Our findings suggest that ESG funds do not sacrifice financial return for their ESG performance.

Lastly, our study relates to the discussion on existing ESG score measures. Several studies documente the divergence of ESG scores and propose methods to reconcile these differences.⁶ However, to the best of our knowledge, our paper is the first to identify that there is limited cross-sectional variation across different industries for the commonly-used ESG scores themselves.

The remainder of the paper is organized as follows. Section 2 introduces our datasets, choice of benchmark and classification methods. Section 3 presents the definition of our empirical measures and how we use them to study the detailed ways ESG funds select. In Section 4, we quantify the level of greenness of ESG funds from different dimensions. Section 5 unpacks the cost of being green. Section 6 concludes.

2 Data and Sample

2.1 Benchmark

The primary dataset utilized for analyzing mutual fund holdings and related information is sourced from Morningstar. A key advantage of Morningstar data is that it provides benchmark index for each individual fund, determined by the fund's investment strategy.

⁶Notably, Berg et al. (2022a) analyze the divergence of ESG scores and map different methodologies onto a common taxonomy of categories. Billio et al. (2021) highlight the divergence of ESG scores in terms of their characteristics, attributes, and standards in defining E, S, and G components. Berg et al. (2022b) suggest a noise-correction procedure to combine all divergent scores, while Dimson et al. (2020) explore the extent of, and reasons for, disagreement among leading ESG rating suppliers.

There are three commonly used benchmarks in Morningstar data: (i) Morningstar Category index, (ii) Modern Portfolio Theory index, and (iii) Primary Prospectus Benchmark index.

The Primary Prospectus Benchmark index is gathered from a fund's prospectus. However, the investment objective outlined in the prospectus often fails to accurately reflect the fund's actual investment strategy. For instance, many funds claimed to pursue "growth," yet some invested in established blue-chip companies while others targeted growth by investing in small-cap companies. This inconsistency is addressed by the Morningstar Category classification, established in 1996, which is based precisely on the funds' holdings. Additionally, there is a notable number of missing values and a high concentration of uniform benchmarks in both the Modern Portfolio Theory index and the Primary Prospectus Benchmark index. Consequently, this paper utilizes the Morningstar Category index for the primary analysis. Nonetheless, the results are shown to be robust when using the other two benchmark indices, with robustness results available upon request.

Morningstar popularized the Morningstar Category classification tool by placing it alongside its mutual fund ratings system. uses an equity style box to categorize equity funds, based on market capitalization (large-cap, mid-cap, small-cap) and investment style (value, blend, growth). The term "blend" refers to funds that hold stocks with both growth and value characteristics. Thus this system classifies equity funds into nine distinct categories, as illustrated in Figure 2 below. The Morningstar Category index is the uniform benchmark assigned to all funds within a specific category, with nine distinct benchmark indices corresponding to the nine categories in the style box. The Morningstar Category classification is widely used by academia and investors to assess performance and potential risks (Sensoy, 2009; Ma et al., 2019; Mateus et al., 2019; Cohen et al., 2024).

2.2 Fund data

To construct our sample, we use quarter-end holding data of all mutual funds investing in US equity, both open-end and close-end, active and inactive, from 2010 to 2022, sourced from Morningstar. We require that the US equity holdings in our sample funds comprise at least 50% of the total fund holdings. We identify ESG funds using two variables from Morningstar: a fund being a sustainable investment product, or compliance with EU SFDR



Figure 2: The Morningstar Category style box.

Article 8 (light green) or Article 9 (dark green).⁷

Within the sample, there are index funds, passively managed, tracking the performance of an index rather than actively selecting individual securities. We identify a fund as index fund based on the "Index Fund" label from Morningstar. The rest would be identified as active funds.

2.3 ESG scores

ESG scores are used by practitioners and researchers to evaluate a company's ESG performance and to integrate this assessment into their investment decisions. The ESG scores we employ are divided into two categories. The first type is a general score, which primarily measures a firm's positive contributions to ESG; the second type is a risk score, which measures a firm's exposure to ESG-related risks.

⁷We necessitate that either the data item "Sustainable Investment Overall" is equal to "Yes," indicating that the fund focuses on sustainability, impact investing, or environmental, social, or governance factors in its prospectus or other regulatory filings, or the "EU SFDR Fund Type" is equal to "Article 8" or "Article 9." To comply with Article 8, funds should promote environmental or social characteristics and maintain good governance practices. To comply with Article 9, funds should have a positive impact on society or the environment through sustainable investment and possess a non-financial objective at the core of their offering.

ESG impact scores

The majority of current ESG scores can be classified as ESG impact scores, which primarily assess a company's positive contributions to E, S, and G factors. These contributions may include efforts to reduce carbon emissions, foster diversity and inclusion, or enhance labor standards within their supply chain. A higher score indicates better ESG performance. Our analysis incorporates ESG scores from five rating providers: MSCI, Refinitiv (formerly Asset4), KLD, S&P Global (formerly RobecoSAM), and Sustainalytics, which are the most popular ESG scores used in the literature, to account for potential discrepancies as shown by Berg et al. (2022a).

Refinitiv, S&P Global, and Sustainalytics offer separate ESG, E, S, and G scores, ranging from 0 (most negative) to 100 (most positive). MSCI provides pillar scores for E, S, and G aspects, respectively, each ranging from 0 to 10. These scores are aggregated into an ESG score based on the weights given according to each industry's materiality, then adjusted to a scale of 0 to 100 for comparison with other scores. KLD scores have the widest coverage in earlier years. As KLD only provides dummy indicators for strengths and concerns related to ESG categories, we first consolidate them into category scores by subtracting concerns from strengths, scaling strengths (concerns) by the maximum number of strengths (concerns) as per Lins et al. (2017).⁸ The original score ranges from -1 to 1; to make it comparable to other scores, we scale it to be ranging from 0 to 100.

Sample coverage varies across scores: MSCI and Refinitiv are available throughout our entire sample period, while KLD and (legacy) Sustainalytics scores are available until 2019, and S&P scores are available from 2013. To enhance the sample coverage and alleviate concerns on rating discrepancies, we use a combined ESG score by averaging all available ESG scores from the five rating providers in our main analysis. We also display the results of each individual ESG/E score in Online Appendix Section E.

⁸The E score is then defined as the environmental category score, the S score as the average of five category scores related to the social aspect (employee relations, diversity, human rights, community, product), and the G score as the corporate governance category score.

ESG risk scores

Another type of score is the ESG risk score, which primarily evaluates a company's exposure to ESG-related risks, such as climate change, social unrest, or governance failures. Higher scores indicate higher exposure to ESG risks. We include ESG risk scores from two data providers: Sustainalytics and RepRisk.

Sustainalytics introduced their ESG risk score in 2018, measuring the magnitude of a company's unmanaged ESG risk. The ratings range from 0 (negligible risk) to 100 (severe risk). RepRisk is a rich database, serving as a proxy of negative ESG incident and sentiment, and it is available throughout our sample period. It assesses ESG risk by screening various sources, including newsletters, social media, government bodies, regulators, think tanks, and other online sources. Among all the metrics, the RepRisk Index (RRI) is based on a proprietary algorithm that dynamically captures and quantifies a company's or project's reputational risk exposure to ESG issues, with scores ranging from 0 to 100. In addition, RepRisk provides detailed incident-level information, including the incident date and category. We aggregate it to get the number of negative ESG incidents per quarter.

2.4 Other data source

The greenhouse gas (GHG) emissions data is obtained from Trucost, which offers comprehensive coverage by incorporating self-disclosed information from annual reports, sustainability reports, filings with the U.S. Environmental Protection Agency (EPA), and other third-party datasets like the Carbon Disclosure Project (CDP). In cases where self-disclosed emission is not available, Trucost estimates emissions based on their proprietary model, taking into account the input and output of firms' economic activities, and industry characteristics. We analyze both the (Scope 1) absolute emission in CO2 equivalent, and emission intensity, which is the absolute emission level scaled by total revenues.

The board composition data is sourced from ISS directors. We calculate the proportion of female and non-white directors on the board to assess board diversity. The employee safety measure is derived from establishment-specific injury and illness data provided by the Occupational Safety and Health Administration (OSHA). The total case rate is computed as the sum of cases resulting in days away from work or transfers and other recordable cases in a given year, divided by the number of hours worked by all employees, and multiplied by 200,000, following Caskey and Ozel (2017). This measure has limited coverage, as OSHA only collects data from a portion of all private sector establishments in the U.S. and the data is available since 2016.

For industry classification, we resort to SASB's Sustainable Industry Classification System (SICS) in the main analysis, as used by, for instance, Grewal et al. (2021). SICS offers varying levels of granularity, including an 11-sector version, a 38-subsector version, and a 77industry classification version. It categorizes companies not only by their sources of revenue but also by intangibles such as shared resource intensity and sustainability risks and opportunities.⁹ Additionally, we incorporate the standard Fama-French 49 industries classification for a robustness check, and the primary results remain unchanged.

Other standard datasets include the quarterly return information from CRSP. We use Fama-French factors to calculate fund alphas. The alpha is the risk-adjusted excess return for which the beta is estimated based on previous 60-month returns, requiring at least 36 months of the return data available for estimation.

2.5 Summary statistics

We exclude fund-quarters with missing holding data, benchmark holding data, management firm information, or inconsistent benchmark across share classes.¹⁰ We aggregate funds with multiple share classes into a single fund. Additionally, we exclude 3,756 fund-quarter observations where either the fund's or the benchmark's US equity holding is less than 50% of the total fund holdings.¹¹ This results in a final dataset comprising 120,415 fund-quarter observations from 3,849 unique funds between 2010 and 2022. In our sample, 516 funds are classified as ESG funds, while 3,333 are non-ESG funds. Among the ESG funds, 88% are

⁹For more details on the SASB industry data, see https://sasb.org/find-your-industry.

¹⁰To obtain the holdings of benchmark indices, we initially extract their holdings using the benchmark ID. If the holdings are unavailable, typically due to inaccessible index constituents, we resort to using the holdings of ETFs that have the index as their primary prospectus index and contain the index name in their fund name. The chosen ETF must not be an inverse or leveraged ETF. If multiple ETFs meet these criteria, we use the holdings data of the one with the longest sample period and the largest total net assets, respectively.

¹¹The average holdings of US equity in our sample funds are 81.9%.

active funds. Further details on the sample composition are provided in Panel A of Table 1.

According to the Morningstar Category classification, the nine categories and their corresponding benchmark indices are outlined in Panel B of Table 1. In our sample, about 64% of the funds are classified as large-cap funds, with the "large blend" category being the largest among the nine, accounting for over 30% of the total funds (over 50% of the ESG funds) and using the Russell 1000 Total Return Index as their benchmark. 16% of the funds are classified as mid-cap funds, while 20% are small-cap funds.

3 The Ways ESG Funds Select

We strive to understand how ESG funds attempt to make their selections. To address this question, we must analyze their holding strategies in a systematic and rigorous manner. Hence, in this section, we investigate the holding deviations of ESG funds compared to a comparable group of funds without ESG investment mandates, the extent to which ESG funds shift their holdings towards "green" stocks and away from "brown" stocks, the extent to which their selection is done by stock or industry selection, whether stock-level selection occurs at intensive or extensive margins, by what types of funds the selection is being done, etc.

3.1 Measures

We need to formally investigate this question by, in the first step, defining clearly our mathematical measures. Denote the total numbers of stocks by K and the total numbers of industries by N in the market. Label the set of all the stocks as $\mathcal{K} = \{1, 2, ..., K\}$. Each stock belongs to an industry, which belongs to the set of all the industries, $\mathcal{I} = \{I_1, I_2, ..., I_N\}$.

For any fund j, its quarterly stock holdings at time t is denoted by a vector $\boldsymbol{w}_{jt} = (w_{jt}^1, w_{jt}^2, ..., w_{jt}^K)^T$, where $w_{jt}^k = 0$ means that fund j does not have holdings in stock k at time t. We aggregate holdings to the industry level by taking the sum of all the stock holdings within the same industry, i.e., for any industry $i \in \mathcal{I}$, the industry-level holdings of fund j is denoted by $W_{jt}^i = \sum_{k \in i} w_{jt}^k$. Then we denote the quarterly industry-level holdings of fund j at time t by a vector $\boldsymbol{W}_{jt} = (W_{jt}^{I_1}, W_{jt}^{I_2}, ..., W_{jt}^{I_N})^T$.

Correspondingly, we denote the stock-level holdings of the Morningstar Category benchmark index of fund j at time t by a vector $\overline{\boldsymbol{w}}_{jt} = (\overline{w}_{jt}^1, \overline{w}_{jt}^2, ..., \overline{w}_{jt}^K)^T$. Denote the industry-level holdings of the benchmark index at time t by a vector $\overline{\boldsymbol{W}}_{jt} = (\overline{W}_{jt}^{I_1}, \overline{W}_{jt}^{I_2}, ..., \overline{W}_{jt}^{I_N})^T$.

Holding deviation

Through this measure, we aim to understand the extent to which ESG funds deviate from their otherwise optimal portfolios. We compute the *holding deviation* as the average stock-level holding difference. For instance, for a fund j and its comparison fund/benchmark l, the holding deviation at time t is calculated as

$$\left(\sum_{k=1}^{K} \left| w_{jt}^{k} - w_{lt}^{k} \right| \right) / \sum_{k=1}^{K} \mathbb{1}_{\{w_{jt}^{k} \neq 0\} \cup \{w_{lt}^{k} \neq 0\}},$$
(1)

where the numerator is the sum of the absolute differences in each individual stock holding between fund j and l, and the denominator counts the total number of stocks that appear in either fund j's holdings or fund l's holdings.

ESG performance difference and decomposition

To measure any ESG performance, including but are not limited to, ESG scores, real outcomes such as GHG emissions, board diversity, and incident rate, we calculate the valueweighted average performance based on quarter-end holdings. Denote the stock-level ESG performance at time t by a vector $\mathbf{s}_t = (s_t^1, s_t^2, ..., s_t^K)^T$. This is shared by all the funds as well as the benchmark index. We also measure the industry-level ESG performance of fund j at time t by a vector of value-weighted average ESG performance of firms within the same industry, denoted by a vector $\mathbf{S}_{jt} = (S_{jt}^{I_1}, S_{jt}^{I_2}, ..., S_{jt}^{I_N})^T$, where $S_{jt}^i = \sum_{k \in i} s_t^k w_{jt}^k / W_{jt}^i$ for any industry $i \in \mathcal{I}$. Correspondingly, we denote the industry-level ESG performance of the benchmark of fund j at time t by $\overline{\mathbf{S}}_{jt} = (\overline{S}_{jt}^{I_1}, \overline{S}_{jt}^{I_2}, ..., \overline{S}_{jt}^{I_N})^T$, where $\overline{S}_{jt}^i = \sum_{k \in i} s_t^k \overline{w}_{jt}^k / \overline{W}_{jt}^i$. When calculating portfolio-level ESG performance, we always restrict the sample to fundquarter with at least 60% of the holdings data available.

Overall ESG performance difference between ESG fund j and its benchmark index can

be expressed as

$$\Delta_{jt} = \boldsymbol{s}_t^T(\boldsymbol{w}_{jt} - \overline{\boldsymbol{w}}_{jt}) \qquad \text{(stock-level expression)} \\ = \boldsymbol{S}_{jt}^T \boldsymbol{W}_{jt} - \overline{\boldsymbol{S}}_{jt}^T \overline{\boldsymbol{W}}_{jt} \qquad \text{(industry-level expression)}$$
(2)

The difference can be decomposed into *industry selection* and *stock selection*. Industry selection speaks for the ESG performance difference attributing to the holding difference between fund and its benchmark across industry, taken the industry average ESG performance as given. Stock selection speaks for the ESG performance difference attributing to the holding difference across stock within the same industry, taken the industry holding as given. Mathematically, performance difference in equation (2) can be decomposed as

$$\Delta_{jt} = \Delta_{jt}^{ind} + \Delta_{jt}^{stk}$$

= $\overline{\mathbf{S}}_{jt}^{T}(\mathbf{W}_{jt} - \overline{\mathbf{W}}_{jt}) + \mathbf{W}_{jt}^{T}(\mathbf{S}_{jt} - \overline{\mathbf{S}}_{jt})$ (3)

Another way of decomposition differentiates *extensive margin* and *intensive margin*. Extensive margin speaks for the decision of whether to hold the stock or not, while intensive margin speaks for the decision of whether to over-weight the out-performed stocks or underweight the under-performed stocks compared to the benchmark, conditional on holding the stock. Mathematically,

$$\Delta_{jt} = \Delta_{jt}^{ext} + \Delta_{jt}^{int}$$

$$= \left(\sum_{\substack{w_{jt}^k \neq 0, \\ \overline{w}_{jt}^k = 0}} s_t^k w_{jt}^k - \sum_{\substack{w_{jt}^k = 0, \\ \overline{w}_{jt}^k \neq 0}} s_t^k \overline{w}_{jt}^k\right) + \sum_{\substack{w_{jt}^k \neq 0, \\ \overline{w}_{jt}^k \neq 0}} s_t^k \left(w_{jt}^k - \overline{w}_{jt}^k\right) \tag{4}$$

3.2 Holding deviation

To begin with, we aim to determine the extent to which ESG funds deviate from their otherwise optimal portfolios. But what defines their comparable "optimal portfolios" without ESG investment mandates? Ideally, ESG funds should use their benchmark indices as reference points, either aiming to outperform them or to track them while minimizing tracking error. However, the data reveals the following patterns, as shown in Table 2: (i) Although benchmark indices are nominally composed of exactly 1,000 or 2,000 stocks, in practice, particularly when using ETFs with the same name to approximate the benchmark indices, the average number of stocks in the indices is generally lower, averaging 772 stocks across the nine indices.¹² (ii) Despite this, the number of stocks in the benchmark indices is significantly higher than in ESG funds, including ESG index funds. For instance, in the "large blend" category, where 48% of our ESG active funds and 83% of our ESG index funds are classified, the benchmark index contains six times more stocks than the active funds and twice as many as the index funds. (iii) However, the number of stocks in ESG funds is much more comparable to that in non-ESG funds within the same category.

Therefore, although benchmark indices are predominantly utilized for assessing tracking error in returns, the aforementioned insights suggest that comparing ESG funds to their corresponding benchmarks for stock-level holdings is misleading, as it is impractical for a fund to hold such a large number of stocks due to comlicated reasons such as transaction costs and stock-picking efforts. Consequently, we propose that the most reasonable definition of "optimal portfolios" should be "comparable" non-ESG funds. To achieve this, we match each ESG fund with a non-ESG fund that: (i) shares the same Morningstar Category, (ii) is of the same type (active or index fund) as the ESG fund, (iii) has the closest Morningstar star ratings, and (iv) has the closest AUM.¹³ The matching process is conducted on an exclusive basis. The results of this matching are presented in Table 2. For instance, within the "large blend" category, ESG active funds hold an average of 140 individual stocks, whilst the matched non-ESG active funds hold an average of 130 individual stocks.

Moreover, recognizing that significant discrepancies in stock holdings can exist even among funds within the same category, we recommend comparing the average stock holdings of all ESG funds in one category to the average holdings of all non-ESG funds in the same category. This approach helps to mitigate the impact of individual funds or extreme cases. The measures detailed in Section 3.2 can be readily extended to incorporate this comparison.

¹²The number of stocks can also vary due to periodic rebalancing and changes in market conditions.

¹³Each month, Morningstar ranks the universe of investment funds using a proprietary algorithm that evaluates funds based on their risk-adjusted returns within an investment category. The best-performing funds receive five stars, while the worst-performing funds receive one star. We use the star rating based on the three-year lagged return, and find non-ESG funds with the closest average star ratings over the sample period.

In Table 2, we present the total absolute differences in stock holdings between the average ESG funds and their matched non-ESG counterparts, along with the average absolute holding deviation, which is calculated by scaling the total deviation by the number of stocks (as detailed in equation (1)). The results clearly demonstrate that large-cap ESG funds exhibit significantly less deviation from their comparable funds compared to mid- and small-cap funds. Specifically, for example, large blend ESG funds, whether active or passive, show an average holding difference of only 1 bps per stock relative to their otherwise optimal portfolios. In contrast, small value ESG funds exhibit an average deviation of 99 bps, and small growth funds show a deviation of approximately 73 bps, both of which are substantially higher.

This variation in holding deviations can be attributed to the different strategies employed by various types of ESG funds. Large-cap ESG funds often focus on well-established companies with substantial market capitalizations, potentially resulting in minimal deviations from their non-ESG counterparts. In contrast, mid- and small-cap ESG funds typically target companies that may be in earlier stages of growth or operate in niche markets, leading them to engage in more selective stock-picking, emphasizing companies with strong ESG credentials that might not be as prevalent in standard indices. Consequently, the deviations in stock holdings are more pronounced as these funds diverge significantly from the broader market composition. Further results and intriguing insights will emerge when we combine the holding deviation findings with the analysis of the primary components in the benchmark indices and the returns of ESG funds across various categories.

3.3 Avoiding top emitters: Extensive vs intensive margin

Using our data, we uncover notable and statistically significant outperformance in the emissions of ESG funds: their portfolios emit approximately 36% less GHG emissions and have around 26% lower emission intensity compared to their benchmarks. Additionally, ESG funds have significantly lower emissions and emission intensity compared to their non-ESG peers within the same Morningstar Category. The specifics of the emission results will be detailed in Section 4.1. Here, we aim to answer a crucial question: How do ESG funds manage to select portfolios that achieve lower levels of emissions?

We show that such outperformance are primarily achieved by avoiding investments in top emitters. When examining the top 25 emitters portfolio, which comprises the 25 companies with the highest emission levels/intensities each quarter within our sample period, we find that 35% of ESG funds simply do not hold any of these companies when sorted by absolute emissions and 59% of ESG funds do not hold any of these companies when sorted by emission intensity, as intuitively shown in Figure 3. As illustrated in Panel B of Tables 3 (Table E.1 in the online appendix), ESG funds hold significantly fewer top emitters compared to their benchmarks, with an overall reduction of 38.4% (38.5%) in holdings when measured by absolute emissions (emission intensity). These top 25 emitters account for more than 50% of the total absolute emissions, and around one third of the emission intensity from 2010 to 2022. In fact, our findings show that more than 90% of the reduced emissions of ESG funds relative to their benchmarks result from this 2% adjustment in holdings of top emitters. Excluding these top emitters, ESG funds fail to differ from either their benchmark indices or similar non-ESG funds, as can be seen in Panel B of Figure 1.

We also examine the heterogeneity of this "top-emitters-avoidance" strategy across different types of funds. We observe that ESG active funds employ this strategy of avoiding top emitters more often than ESG index funds. Specifically, for top emitters by absolute emissions (emission intensity), 38.9% (64.6%) of ESG active funds do not hold any of these companies, compared to just 4.5% (19.8%) of ESG index funds. This discrepancy can be attributed to the investment principle of index funds, which typically have strict diversification requirements and cannot completely divest from some top emitters, especially when they belong to the same industry.¹⁴

Interestingly, non-ESG funds also tend to eliminate extremely polluting companies from their portfolios, albeit to a lesser extent compared to their ESG counterparts. For non-ESG funds, the proportion of funds avoiding top emitters is about 10% lower compared to ESG funds. However, unlike ESG funds, most of these reductions are achieved by non-ESG active funds, while non-ESG index funds make little effort to hold fewer top emitters.

¹⁴The differences between ESG active and index funds are not clearly visible in Panel A of Tables 3 and E.1 partly because the benchmark indices of index funds also generally hold more top emitters. Thus, the difference in benchmark-adjusted top-emitter holdings between ESG active and index funds, as represented by the variable $ESG fund \times Active$, becomes less apparent.

This is evident from the variable *Non-ESG fund* \times *Active* in Panel A of Tables 3 and E.1. This indicates that at least non-ESG active funds are also taking steps to reduce their environmental impact, although not as significantly as ESG funds.

Another important takeaway from Panel B of Table 3 is that, when funds avoid top emitters, the reduction in emissions and emission intensity predominantly stems from the extensive margin rather than the intensive margin. The measures are derived from equation (4), scaled by the total difference, and the combined contributions of extensive- and intensive-margin selection sum to 100%.¹⁵ Moreover, as can be seen from the numbers, the average contribution of intensive-margin selection of top emitters is actually negative, indicating that this strategy even leads to higher emissions compared to benchmarks. This observation supports the rationale behind ESG funds adopting relatively aggressive approaches to decrease their portfolio emissions by fully divesting from top-emitting firms in pursuit of their environmental objectives.

As the last step, we aim to identify which companies do ESG funds exactly avoid and the role these companies play in major indices. Thus, we display the firms that have ever been listed as top 25 emitters throughout our sample period in Figure 4, with Panel A identifying the top 25 emitters based on absolute emissions, and Panel B determining the top 25 emitters based on emission intensity.

The list of top emitters fluctuates on a quarterly basis, featuring in total 42 firms based on absolute emissions and 63 based on emission intensity. However, a handful of major emitting companies consistently appear on the list, such as ArcelorMittal, ExxonMobil, Southern Company, Berkshire Hathaway, etc, primarily energy and utility companies.¹⁶ Among the list measured by absolute emission, the majority are from polluting industries, with 45.2% from utilities, 19.0% from oil and gases, 11.9% from transportation, 4% from steel works, while the remaining 6% are from non-polluting industries including chips, chemicals, aircraft, and other industries.

¹⁵Some of the numbers are dramatically large, simply because the total differences are relatively small, for instance, in the case of non-ESG index funds. The discussion of top emitters by emission intensity can be found in Table E.1 in Online Appendix Section E.

¹⁶Berkshire Hathaway has high emissions primarily due to its subsidiaries, many of which operate in industries with significant carbon footprints, such as Berkshire Hathaway Energy (owning companies like PacifiCorp, BHE Pipeline Group, MidAmerican Energy, Nevada Utilities, etc) and BNSF Railway.

One potential concern is that if ESG funds tend to avoid these top emitters, it may (i) compromise their diversification and (ii) lead to a significant tracking error. Therefore, we further investigate the characteristics and importance of these emitters by assessing the overlap between the top-emitting companies and the primary components of major indices, focusing especially on the top 25 firms with the largest market capitalizations. The results can be found in Figure D.1 in Online Appendix Section D. Intriguingly, only four companies appear on both the top emitting list and the top market capitalization list when measured by absolute emissions: Berkshire Hathaway, ExxonMobil, Chevron, and ConocoPhillips. When assessed by emission intensity, none of the firms on the top emitting list are included in the top market capitalization list.

On one hand, this observation justifies the comparison of financial performance, average cost of capital, and risk between ESG funds and their benchmarks, as it is reasonable not to expect significant differences between them since the large components in both portfolios remain similar. A more in-depth discussion on this topic is deferred to Section 5. On the other hand, due to the fat-tail distribution of emissions, most of the emission reductions can be achieved by adjusting a very small portion of the holdings in these tail companies, rendering ESG funds' contribution to the entire stock pool somewhat limited.

3.4 Avoiding polluting industries: Across vs with-in industry selection

Another approach to achieving a greener investment portfolio is by generally avoiding investments in polluting industries. Compared to their benchmarks, ESG funds on average hold 14.8% less of such industries, including coal, oil and gas, mining, utilities, transportation, etc. The results are presented in Table 4.¹⁷ Typically, ESG active funds hold fewer polluting industries (16.1% less) compared to ESG index funds (5.9% less). As shown in Panel A, the benchmark-adjusted holdings of polluting industries are also significantly lower for ESG funds compared to their non-ESG counterparts.

¹⁷The industry classification used in this table is the SICS 77 Industry Classification for a more precise definition of polluting industries. However, the results remain robust when using the SICS 38 Industry Classification or the FF 49 Industry Classification.

Tables 5 and 6 present the emission results, showing that ESG funds significantly outperform their benchmarks in terms of both absolute emissions and emission intensity, part of which come from reducing holdings in polluting industries as discussed above. Further analysis of the results uncovers an intriguing finding about the distinct strategies employed by different types of ESG funds: For ESG active funds, 57.0% of the reduction in emission intensity comes from across-industry selection, whereas for ESG index funds, 82.2% of the reduction comes from within-industry stock selection, as can be seen from Panel B and C of Table 6, when we decompose the performance difference using equation (3) and scaled by the difference. Note that we zoom in to focus on the subsample of fund-quarter observations that achieve lower emissions compared to their benchmark, allowing us to identify the outperformance segment and clearly demonstrate the sources of this outperformance; while the results remain robust in the full sample analysis.¹⁸ The results are consistently statistically significant, and become even stronger when we add fixed effects or controls, with ESG index funds utilizing over 50% less industry-level selection compared to ESG active funds, as demonstrated by column (2) and (3) in Panel B of Table 6.¹⁹

The result that ESG index funds perform selection in a more granular way (de-weighting the brownest firm within each industry) than ESG active funds (simply de-weighting the brownest industries) seems, at first glance, counterintuitive. However, upon further reflection, this finding becomes less surprising. The difference in their strategies is partly consistent with the expectation that index funds are subject to stricter diversification requirements. As a result, they must maintain a more balanced portfolio than active funds and are less likely to completely eliminate entire polluting industries from their holdings. This explanation is further supported by observing a similar pattern among non-ESG funds: As non-ESG funds also tend to avoid polluting industries, resulting in lower portfolio-level emissions compared to their benchmark indices, likewise, non-ESG active funds engage in significantly more

¹⁸In the table, we show results for fund-quarter observations with lower emissions than their benchmarks to avoid abnormal values, such as negative or above 100% figures, in the across/within-industry selection metrics. In the full sample analysis, while the combined contributions of across- and within-industry selection still sum to 100%; some negative values appear, indicating that for certain funds, this selection type actually contributes negatively to their emissions.

¹⁹The results for absolute emissions follow a similar pattern, albeit less strongly: As shown in Table 5, for ESG active funds, 43.1% of the reduction in absolute emissions comes from across-industry selection, while for ESG index funds, 71.6% of the reduction is due to within-industry stock selection.

across-industry selection compared to non-ESG index funds.

Moreover, our results pattern persists across various definitions and granularities of industry classifications. The finer the industry classifications (e.g., transitioning from SICS 11-Sector, 38-Subsector, 77-Industry Classification), the greater the general level of withinindustry selection observed across all types of funds. Nevertheless, the relative distinction between active and index funds remains unchanged.

4 Quantifying ESG Funds' Greenness

In this section, we quantify the greenness of ESG funds compared to their otherwise "optimal portfolios" from various perspectives, including emissions (environmental impact), ESG ratings, ESG risk exposure, board diversity, and employee safety. We show that companies selected by ESG funds generally have lower emissions, less ESG-related risk exposure, and better employee safety. However, they do not differ much in terms of their ESG scores and board diversity.

4.1 Real environmental impact

In the previous section, we touched on the emissions of ESG funds, noting that they have significantly lower portfolio-level emissions compared to both their benchmark indices and their non-ESG peers within the same Morningstar Category. In this section, we will delve into the details of this first cause of climate change, part of the "E" in ESG.

Why are emissions important? As businesses are increasingly required to report their full environmental impact, funds' carbon footprints have come under intense scrutiny due to the advancements in measurability and mandatory disclosure. Typically, for green funds, in addition to the general ESG-focused requirements, they must specifically report the "weightedaverage carbon intensity" (WACI) of the portfolio (Robertson and Sanga, 2023).²⁰ In May 2022, the SEC requested ESG funds to enhance disclosure of carbon footprint (including Scopes 1, 2, and 3) and WACI within prospectuses, annual reports, and advisor brochures.²¹

 $^{^{20}}$ As the SEC explains: "WACI is the fund's exposure to carbon-intensive companies, expressed in tons of CO₂e per million dollars of the portfolio company's total revenue."

²¹Name That Boon: SEC Proposes Rules on ESG Fund Names & Disclosures.

For a detailed summary of disclosure requirements, see Online Appendix Section F.

Hence, in this section, we investigate whether ESG funds outperform their comparable funds in terms of GHG (Scope 1) emission, and to what extent. Table 5 presents the results for absolute emissions, while Table 6 focuses on emission intensity. ESG funds do live up to their claims of selecting less polluting portfolios than their benchmarks. The differences are both large and statistically significant: (i) absolute emissions are 35.9% lower for ESG funds compared to their benchmark indices, and (ii) emission intensity is 25.6% lower.

We find that ESG index funds exhibit higher emission levels and intensity compared to ESG active funds. The gap between ESG index funds and their benchmarks is also much smaller, though both types of funds outperform their respective benchmarks, as shown in Panel C of Table 5 and 6: ESG active funds have 38.5% (27.1%) lower absolute emission (emission intensity) than their benchmarks, whereas ESG index funds only have 21.1%(15.6%) lower absolute emission (emission intensity) than their benchmarks. One possible explanation for this, similar to what is discussed in the previous sections, is that ESG active funds have more flexibility in identifying and excluding highly polluting companies or industries.

We also compare ESG funds to their non-ESG peers within the same Morningstar Category, similar to the previous section. Non-ESG funds exhibit higher benchmark-adjusted emission levels and intensity than ESG funds, Whether or not we include fixed effects or controls (as seen in columns (1)-(3) in Panel A of Table 5 and 6). However, a somewhat counterintuitive finding is that non-ESG funds, particularly non-ESG active funds, show lower emission levels and intensity compared to their benchmarks.

In summary, ESG funds consistently choose firms with significantly lower emissions, regardless of the comparable benchmarks used for comparison. Our evidence also suggests that mutual funds (or institutional investors) in general tend to hold greener portfolios than the market, which is consistent with the findings of Atta-Darkua et al. (2023) and Pastor et al. (2023).

4.2 ESG scores

Firm-level ESG scores, also referred to as ESG impact scores, are frequently employed by both professionals and scholars to evaluate a company's positive contributions to E, S, and G aspects, despite ongoing controversies regarding how they are being measured. Hence, we have to examine whether ESG funds outperform their comparable funds in terms of ESG score measures, and to what extent. To make sure our results are robust and account for any discrepancies, we use the combined ESG score, i.e., the average of the existing ESG scores including MSCI, Refinitiv, KLD, S&P Global, and Sustainalytics.²² We aggregate firm-level ESG scores to the portfolio level using a weighted average.

In short, minimal differences are observed between ESG funds and their comparison groups, if anything, ESG index funds consistently achieve the highest scores among all the categories.

We begin by examining the overall score that integrates E, S, and G components. The detailed results are presented in Table 7. ESG funds tend to select stocks with slightly higher ESG scores compared to both their benchmark indices (Panel B) and non-ESG peers within the same Morningstar Category (Panel A), though the average percentage differences are mostly less than 1%.²³ This difference in scores between ESG and non-ESG funds is partly consistent with previous literature examining the US PRI signatories (e.g., Gibson Brandon et al., 2022; Kim and Yoon, 2023). The findings from various rating agencies provide consistent evidence, as detailed in Table E.2 in Online Appendix Section E, where we present ESG score comparisons for each of the five rating providers separately. Almost all scores indicate neither a distinct nor a significant ESG outperformance, if any, MSCI and S&P scores demonstrate an outperformance of over 1% relative to the benchmark indices.

However, surprisingly, ESG index funds exhibit consistently and significantly higher benchmark-adjusted ESG scores compared to ESG active funds, as shown in columns (4) and (5) of Panel A in Table 7. This difference becomes less pronounced in column (6) when

²²Note that different fund managers may rely on ESG scores provided by various data vendors and may utilize others beyond the five we have mentioned. For instance, the ISS ESG score is widely used among investors, but the data vendor no longer provides score data to academia.

 $^{^{23}}$ For the comparison between ESG and non-ESG funds within the same category, the net benchmarkadjusted difference is around 0.5 and the group average is around 50.

controls are added, particularly the management fees variable, since most ESG index funds charge much lower fees than active ones. Relative to their respective benchmarks, ESG index funds achieve approximately 3.3% higher scores, whereas ESG active funds barely match their benchmarks. Additionally, a similar pattern persists among different types of non-ESG funds: while non-ESG funds consistently underperform their benchmarks across all five rating agencies, this underperformance is primarily driven by non-ESG active funds. In contrast, non-ESG index funds manage to achieve scores comparable to their benchmarks. Therefore, when ranking the benchmark-adjusted ESG scores from highest to lowest, the order is as follows: ESG index funds, ESG active funds (\approx non-ESG index funds), and finally non-ESG active funds, although the differences are, overall, not large.

The minimal portfolio score difference between ESG funds and their benchmarks also extends to both pure Environmental (E) and pure Social (S) scores. The combined E score, which averages all available E scores, is detailed in Table 8. Overall, there is little difference between the average ESG funds and their benchmarks; however, ESG index funds achieve a 4.5% higher combined E score, mirroring the same pattern observed with the overall ESG scores. For a robustness check of the E score from each individual rating provider, refer to Table E.3 in Online Appendix Section E.

How should we assess whether a 1% lower score is negligible? If it is, why is there minimal outperformance measured by these scores? What causes the discrepancy between the emission results and the E score results? We briefly outline two primary reasons below.

Industry variation of impact scores

One intriguing observation is that, overall, these scores exhibit a lack of industry variation. As illustrated in Figure 3, the cross-sectional industry average ESG score variations are minimal.²⁴ For scores normalized to fall within the range of [0,100], the industry average KLD score varies between [48,53], the Sustainalytics score between [46,64], and the MSCI score between [26,52] (with the variation significantly decreasing when excluding the "FB.5: Tabacco" industry). If anything, Refinitiv and S&P scores display slightly larger variations,

 $^{^{24}}$ We use industries defined by SASB SICS 38 Subsectors. The results remain similar, if not worse, when using the Fama-French 49 Industry Classification.

ranging between [30,65] and [15,44], respectively. The variation in E/S scores is also limited, albeit slightly less severe. Therefore, given the cross-sectional variation of these scores, we believe the net difference of 0.5 (percentage difference of 1%) can still be regarded as negligible.

Moreover, among five ratings, four of them (Refinitiv, MSCI, S&P, and Sustainalytics) employ some industry adjustment: (i) all the four ratings apply different weights to sub-components in the metrics for different industries, (ii) Refinitiv and MSCI also apply industry-adjusted firm score, but among them, (iii) MSCI provides an unadjusted version, which is the one employed in this paper. For the details of industry adjustment, refer to Panel A of Table E.6 in Online Appendix Section E.

Consequently, it is unsurprising that there is no considerable difference in outperformance in scores between ESG funds and their benchmarks, given the source scores do not exhibit much variation. Furthermore, the minor outperformance in terms of scores, as indicated in Panel B of Table 7, primarily stems from within-industry selection rather than acrossindustry selection, which corroborates the observations in Panel A and B of Figure 3.

Components and weights in impact scores

Despite the emission results discussed in Section 4.1, that ESG funds have significantly lower emissions than their benchmarks, we find little evidence of higher E or ESG scores for ESG funds. Another reason for the lack of outperformance in scores is that the so-called ESG impact scores may not accurately measure real impact.

Based on the evidence from data vendors, these comprehensive scores typically factor in not only real outcomes but also aspects like disclosure, risk, opportunity, compensation, etc. For the E scores, in addition to emissions, components like waste management, green technologies, and biodiversity are also included. In Panel B of Table E.6 in Online Appendix Section E, we provide the detailed components considered by the data vendors when constructing the ratings and the associated weights for some main themes, nonetheless, the sub-scores of each detailed component are, in most of the cases, not provided. As a result, utility companies may be ranked higher than banks and technology companies, for example, by Sustainalytics ESG and E scores. In summary, if we agree that emissions are of paramount importance, then ESG impact scores are not perfect measures of climate risk. Consequently, existing studies that evaluate the greenness of ESG funds based solely on these scores are, at the very least, inadequate.

4.3 ESG risk exposure

In this section, we explore whether ESG funds have lower exposure to ESG-related risks compared to their benchmarks, including risks associated with climate change, social unrest, governance failures, and more. We utilize two primary sources of measures for this analysis: Morningstar Sustainalytics platform and RepRisk, both providing estimates of ESG risks.

Morningstar Sustainalytics offers a firm-level ESG risk score, which measures the magnitude of a company's unmanaged ESG risk. Sustainalytics develop a proprietary model to calculate the score, which assesses the "issue beta" for each predetermined material ESG issues of a company, with some additional exposure added when faced with the possibility of idiosyncratic risks. At the same time, Morningstar aggregates this ESG risk score to the fund level and provides a fund-level Morningstar Sustainability Rating on their platform. This rating is expressed as 1 to 5 "globes," and is widely used in existing ESG fund studies (e.g., Hartzmark and Sussman, 2019; Gantchev et al., 2024). A higher ESG risk score indicates higher exposure to ESG risks, while a higher Morningstar Sustainability Rating signifies that the fund portfolio has lower ESG risk. RepRisk, on the other hand, specifically measures negative ESG incidents and sentiment using textual analysis from newspapers and social media. The RepRisk Index (RRI) captures the firm-level reputational risk exposure to ESG issues, with a smaller number indicating lower risk. RepRisk also tracks the occurrence of incidents, which we aggregate to the quarterly number of ESG incidents.²⁵

The results of Sustainalytics risk score are provided in Table 9.²⁶ The RepRisk measures, including RRI and number of ESG incidents, can be found in Table E.4 and E.5 in Online Appendix Section E. Compared to the benchmark indices, ESG funds outperform in terms of both RepRisk RRI measure and Sustainalytics risk score, by having a significant 7.2%

²⁵Papers utilizing the RepRisk measures include Houston et al. (2022), Gantchev et al. (2022), Bonelli et al. (2022), Derrien et al. (2022), and Duan et al. (2023).

²⁶The scores have only been available since 2018, resulting in a smaller number of observations.

less RRI and a significant 4.1% lower risk score. Consistently, ESG funds experience a 19.2% smaller likelihood of ESG incidents per quarter. When examining the two RepRisk measures, the majority of these outperformances can be attributed to ESG active funds, which primarily achieve this through within-industry selection. This means that ESG active funds perform granular-level selection to hedge against ESG risks. Overall, non-ESG index funds underperform their benchmarks the most in terms of ESG risk exposure.

Moreover, ESG funds consistently and significantly exhibit lower benchmark-adjusted ESG risk exposure compared to their non-ESG peers within the same Morningstar Category, whether assessed by the Sustainalytics risk score or RepRisk measures. This is evident from Panel A of Tables 9, E.4, and E.5. When assessed using the Sustainalytics risk score, non-ESG funds display very similar ESG risk exposure compared to their benchmark indices. As anticipated, the widely-used fund-level Morningstar Sustainability Fund Rating, which aggregates Sustainalytics risk scores, also reveals a robust and notable difference, with ESG funds scoring 0.71 points higher than their non-ESG counterparts.

Industry variation of risk scores

The mitigation of ESG risk exposure for ESG funds is sizable and significant. This is also partly driven by the much larger cross-sectional variation of ESG risk scores (measures) compared to ESG impact scores. As detailed in Panel C of Figure 3, for scores normalized to fall within the range of [0,100], the industry average Sustainalytics risk score varies between [16,48], the RRI between [5,23].²⁷

To summarize, unlike ESG impact scores where we fail to identify significant outperformance of ESG funds, the findings on ESG risk scores in this section highlight the superior performance of ESG funds in managing ESG-related risks, both in comparison to their benchmark indices and their comparable non-ESG counterparts.

 $^{^{27}}$ Note that while Sustainalytics risk scores are intended to range from 0 to 100, a score of 40 or higher falls into the most severe category. In our sample, only 2% of firms have scores exceeding 50.

4.4 Board diversity and employee safety

To supplement our findings, we explore ESG funds along social dimensions considering two important aspects: (i) board diversity (measured as the average percentage of females and nonwhites on the board) and (ii) employee safety (measured using the number of workplace incidents). The board composition data is sourced from ISS directors, while the workplace incident data comes from OSHA. The coverage of OSHA dataset is rather limited: It is only available for 5.7% of our firm-quarter sample, leading to 43% of the fund-quarter observations lacking holdings with available incident data.²⁸ In terms of industry distribution, consumer goods retail (primarily from "Multiline and Specialty Retailers & Distributors"), food (mainly "Processed Foods"), and air transportation rank as the top three industries with the highest average incident rates.

The results are presented in Tables 10 and 11, respectively. Overall, ESG funds do not appear to select firms with more diversified boards compared to their benchmark indices. If anything, ESG index funds have performed slightly better in this regard. However, the extent of this outperformance is marginal, with average percentage differences around 2%, as shown in Panel B of Table 10. Similarly, non-ESG funds have less diversified boards compared to ESG funds within the same Morningstar Category, but this difference is again small, especially net of benchmark.

Regarding employee safety, non-ESG funds notably underperform, especially non-ESG active funds. This is evident from the variable Non-ESG fund \times Active in Panel A when compared to ESG funds within the same Morningstar Category, and in Panel B when compared to their benchmarks. Specifically, non-ESG active funds demonstrate a 1.5 times higher likelihood of incident rates than their benchmarks. Contrary to the emission results but consistent with the previously discussed ESG risk scores, for fund-quarters with better employee safety, the outperformance mainly stems from within-industry selection for active funds and across-industry selection for index funds.

In a nutshell, ESG funds select firms that exhibit significantly better employee safety, but not necessarily better board diversity.

 $^{^{28}}$ Hence we remove the restriction of having 60% holding data available in this specific analysis.

5 The Price ESG Funds Pay for Greenness

Acknowledging that ESG funds have lower harm to climate change and recognizing their environmentally conscious strategies, in this section, we delve into the potential trade-offs associated with their pursuit of ESG objectives. We examine the costs from various perspectives, including portfolio diversification, portfolio return volatility, fund alpha, fund beta, exposure to macro risks, etc. The overall costs appear to be negligible.

5.1 Diversification and portfolio return volatility

We begin by investigating how funds' ESG selection impacts their portfolio diversification. To measure portfolio diversification, we employ two metrics: (i) the number of stocks held by the fund, and (ii) industry concentration as defined in the study by Kacperczyk et al. (2005).²⁹ The results for both metrics are presented in Panel A of Table 12.

Firstly, as mentioned in Section 3.2, although benchmark indices such as the Russell 1000 or the Russell 1000 Growth/Value are, according to their names, designed to contain exactly 1,000 stocks, in practice, they usually include fewer than 1,000 stocks, averaging around 800 across all benchmark indices, as shown in the table. In comparison to these benchmark indices, ESG funds demonstrate significantly more concentrated portfolio holdings, with the number of stocks held by ESG funds amounting to only 17% of those held by their benchmarks. Certainly, this concentration is primarily driven by the sub-sample of ESG active funds; but even for ESG index funds who are supposed to track some indices, minimize tracking error, and maintain good diversification, the number of stocks held by them are less than 50% of that in the benchmarks. Additionally, the average industry concentration of ESG funds is twice as large as that of their benchmarks.

Non-ESG funds, on the other hand, hold a slightly larger number of stocks, especially non-ESG index funds, which tend to hold about 70% of the benchmark portfolio. However, on average, non-ESG funds also hold fewer than their benchmark indices. Additionally,

²⁹In the paper, the authors assign each stock held by a mutual fund to one of 10 industries. They define a measure of industry concentration, named the Industry Concentration Index, as the sum of the squared deviations of the value weights for each of the 10 different industries held by a mutual fund relative to the industry weights of the total stock market.

non-ESG funds exhibit higher industry concentration in their stock selection compared to ESG funds, even when excluding extremely concentrated outlier funds (the median industry concentration for non-ESG funds is 1.51% higher than that for ESG funds). At the same time, the benchmarks for non-ESG funds also show higher industry concentration compared to the benchmarks for ESG funds.

Then we compare the portfolio return volatility of ESG funds, non-ESG funds, and their benchmarks, as shown in Panel B of Table 12. Interestingly, even though ESG funds hold much less diversified portfolios compared to their benchmark indices, their portfolio return volatility is only marginally higher than that of their benchmarks (4.87% compared to 4.51% monthly, and 9.09% compared to 8.55% quarterly). These results suggest that the impact of portfolio concentration on return volatility is relatively limited. As expected, the portfolio return volatility of non-ESG funds is even less affected, showing very similar volatility to their benchmarks, both monthly and quarterly. Furthermore, index funds consistently exhibit lower portfolio return volatility compared to active funds, regardless of whether they are ESG or non-ESG funds. This suggests that the broader diversification of index funds contributes to more stable performance over time, compared to their active counterparts.

Overall, ESG funds hold significantly less diversified portfolios compared to both their benchmark indices and non-ESG counterparts. However, this reduced diversification does not necessarily lead to increased return volatility. All the findings in this section remain robust when comparing matched samples of ESG and non-ESG funds, with detailed results available upon request.

5.2 Alpha and fees

In this section, we investigate how does funds' ESG preference affect their financial returns. The relationship between ESG performance and financial performance has been extensively examined in existing literature, but the results remain largely inconclusive. This can be partly attributed to the discrepancy in measuring ESG performance and financial performance. While we do not aim to establish a causal relationship between these two aspects, we are interested in determining whether funds compromise their financial returns in order to achieve a higher level of greenness. We consider various measures of risk premium (Morningstar definition) and abnormal returns (CAPM alpha and 6-factor alpha).

We examine net of fee return, i.e., the net return after accounting for operating expenses and management fees that investors have to pay. We follow Morningstar's definitions for these calculations, where, taking the risk premium defined by Morningstar as an example, net return is determined by taking the change in accumulation unit value (AUV) during the period and dividing it by the starting AUV, minus risk-free rate.³⁰ The results are presented in Table 13.

As can be seen from Panel E of Table 13, on average, ESG funds exhibit a slight underperformance compared to their benchmark indices in terms of monthly risk premium (-5bps/month), while outperform their benchmarks with respect to both 6-factor alpha (17bps/month) and CAPM alpha (3bps/month). When comparing benchmark-adjusted returns, ESG funds consistently outperform their non-ESG peers within the same Morningstar Category across all alpha measures: (i) When measured by risk premium (Panel A of Table 13), ESG funds show a persistently significant outperformance of 3–4bps/month; (ii) When measured by 6-factor alpha (Panel B of Table 13), the magnitude of outperformance is the largest at a significant 17bps/month, although this advantage disappears when adding controls and quarter, fund family, and Morningstar Category×active fixed effects. In fact, non-ESG active funds consistently underperform their benchmarks after fees, regardless of the alpha measure employed.

Within ESG funds, we further break down the fund types to identify by whom the net return difference is generated. The overall underperformance in net-of-fee risk premium stems from ESG active funds (-7bps/month). In contrast, ESG index funds exhibit significantly higher risk premium and alphas (both CAPM and 6-factor alpha) compared to the comparable non-ESG peers, as evident from the interaction term $ESG fund \times Active$ in Panel A, B, C of Table 13. In fact, if we zoom in to compare ESG index funds to their benchmarks, ESG index funds notably outperform, with a 34bps higher monthly 6-factor alpha and a 24bps higher monthly CAPM alpha, as detailed in Panel E of Table 13. This distinction between index and active funds also extends to non-ESG fund samples, as can be seen from

³⁰AUVs are recommended to be used instead of net asset values (NAVs) because the AUV more accurately reflects the actual returns passed on to an investor. AUV takes into account a subaccount's fund expense ratio and all insurance expenses.

the interaction term non-ESG fund \times Active.

The underperformance of ESG active funds can partly be attributed to the higher management fees they charge in comparison to both ESG index funds and non-ESG active funds. Detailed information on management fees and expense ratios is provided in Table 14. ESG active funds tend to have average management fees that are 0.50% higher than those of ESG index funds and 0.16% higher than those of non-ESG active funds.

These results suggest that, on average, ESG funds can select green portfolios without compromising their financial returns for being environmentally friendly. This is particularly true for ESG index funds, as they outperform their benchmarks in terms of all return measures.

Not all ESG funds are born equal

It is also likely that ESG funds employing different strategies exhibit varying financial performance. Therefore, focusing solely on average returns might be of concern, as some features could cancel each other out. In this section, we aim to isolate the ESG funds that specifically employ divestment strategies, meaning those that consistently avoid top-emitting profiles at extensive margin.

One important aspect of ESG funds' strategies is that over 90% of their emission reductions come from adjusting about 2% of their holdings, precisely, the holdings of the top 25 emitters. Within our sample, approximately 36.5% of fund-quarter observations do not include any of these top emitters (ranked by absolute emissions), corresponding to 299 ESG funds. If we define funds with more than 80% of fund-quarters holding zero top emitters as consistent users of divestment strategies, then 136 out of these 299 ESG funds (45.5%) consistently divest, with 133 of these being ESG active funds.³¹

We present the comparison results between ESG funds that employ divestment strategies and those that do not in Table E.7 in Online Appendix Section E. As expected, ESG funds that consistently adopt divestment strategies achieve significantly lower emissions than those that do not: As can be seen in Panel A, consistent users of divestment strategies are able

 $^{^{31}\}text{If}$ we consider the full ESG fund sample, $136/516\approx 26/4\%$ of ESG funds consistently divest from top emitters.

to achieve a significant 86.2% lower absolute emission (3343 metric tons CO2 less) and 57.5% lower emission intensity (70 metric tons CO2 per total revenues in million USD less). Among these 136 funds, both ESG active and index funds achieve emission reduction more by within-industry selection compared to across-industry selection.

Interestingly, this subsample of divestment ESG funds exhibits different return patterns compared to ESG funds that do not use divestment strategies. As shown in Panel B, divestment ESG funds significantly and consistently underperform after fees in terms of risk premium measure (-0.001%***), CAPM alpha measure (-0.172%***), and 6-factor alpha measure (-0.118%***); though the results become insignificant after adding fixed effects like MS category × Active fund. Additionally, these divestment funds appear to be somewhat less diversified, exhibiting slightly higher volatility and greater industry concentration compared to other ESG funds (Panel C).

5.3 Beta

We further examine the CAPM beta of ESG funds, with the results presented in Panel D and E of Table 13. As shown in Panel E, ESG funds exhibit an average beta of 0.906 post fees, while their benchmarks have a beta of 1.004 post fees. ESG funds also appear to have significantly lower benchmark-adjusted beta than their comparable non-ESG funds, irrespective of whether we look at the full sample or the subsample of active or index funds, although the results disappear when adding controls and quarter, fund family, and Morningstar Category×active fixed effects, as detailed in Panel D.

These findings at least indicate that ESG funds are consistently less exposed to systematic risk than their comparable funds or indices. Instead, they appear less sensitive to market fluctuations, potentially providing a more stable investment option for investors seeking exposure to sustainable and environmentally responsible assets without incurring excessive risk.

5.4 Macro risk exposure

[This section is being prepared.]
6 Conclusions

Conditional on the fact that ESG mutual funds mostly do selection rather than treatment, in this paper, we conduct a systematic analysis of ESG funds' strategies, green performance, and risks through the lens of stock selection. To assess their greenness, we argue that the most appropriate benchmark would be their otherwise optimal portfolio that rating agencies and asset managers themselves use for comparison. In the main body of the paper, we use (i) the benchmark indices suggested by the Morningstar Category classification and (ii) non-ESG funds within the same Morningstar Category as our reference points.

Upon quantifying the methods, outcomes, and costs, we conclude that, overall, ESG funds are not engaging in "green-washing" when it comes to stock selection: They are able to choose stocks with 36% less absolute emissions and 26% lower emission intensity compared to their benchmarks, while imposing minimal additional costs on investors' net returns and volatility. Moreover, the firms in ESG funds' portfolios are less exposed to ESG-related risks compared to both their benchmarks and comparable non-ESG funds.

However, their selection process is relatively superficial and limited in scope. First, over 90% of this environmental performance is achieved by avoiding top emitters. On average, 35% of ESG funds do not hold any companies that fall within the top 25 emitters, that is to say, ESG funds mainly attain tangible outcomes through selection at extensive margin rather than intensive margin. This aspect of their strategy only involves about a 2% holding adjustment in their portfolio. Second, for the large-cap categories where more than 80% of our ESG funds are classified, the average stock-level holding deviation is fairly small (less than 10 basis point). Third, although ESG funds do not sacrifice financial returns for their ESG performance, their outperformance is marginal. Fourth, ESG funds do not outperform in terms of primary ESG scores and charge relatively higher management fees. Finally, exposure to macro risks is a potential downside of ESG funds' selection strategies.

We can further categorize ESG funds into sub-samples of ESG active and ESG index funds to explore their distinct performances and strategies. Overall, ESG active funds tend to hold fewer stocks in their portfolios compared to ESG index funds. Specifically, they hold fewer stocks in polluting industries or those with high emissions. Interestingly, to achieve their green objectives, ESG active and ESG index funds adopt different strategies: ESG active funds focus more on industry selection, i.e., de-weighting the brownest industries, whereas ESG index funds focus more by stock selection, i.e., de-weighting the brownest firms within each industry. Contrary to expectations, ESG index funds execute the selection in a more granular and rigorous manner, likely due to their diversification requirements. Furthermore, ESG active funds, on average, underperform ESG index funds in terms of main ESG scores, alphas, and diversification within our sample period.

Therefore, although ESG funds are making strides in creating greener portfolios, their efforts are regrettably limited. If anything, ESG index equity funds appear to perform slightly better both financially and environmentally compared to other types of equity funds, making them a reasonable choice for sustainable investors. Nonetheless, we cannot definitively state whether these mutual funds are contributing to greening the planet. After all, these funds do not significantly engage in reducing firms' carbon footprints, and it remains unclear whether other types of equity-holding market participants are becoming more environmentally harmful due to market-clearing conditions. Consequently, an avenue for future theoretical and empirical research is to investigate the broader societal impact of mutual funds' actions in relation to environmental sustainability.

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A Figures

Figure 3: *Holdings of top 25 emitters.* This figure shows the distributions of the holdings of top 25 emitters for ESG funds and their benchmark. The green bar represents ESG funds, and the blue bar represents their benchmark. Panel A considers top 25 emitters by absolute GHG (Scope 1) emissions, and Panel B considers top 25 emitters by emission intensity.





Figure 4: Firms ever listed as top 25 emitters. This visual representation displays the top 25 emitters for each quarter. The vertical axis represents all the companies that have ever been among the top 25 emitters at any quarter between 2010 and 2022. Each cell in the figure represents the status of a specific company for a particular quarter. The color of the cell indicates the emissions level, with the lightest shades indicating that the company was not among the top 25 emitters in that quarter (accounting for zero emission in the total emission of that quarter), and darker shades representing higher emissions (the value in each cell represents the proportion of the company's emissions compared to the total emissions of the top 25 emitters in that particular quarter). The vertical axis is arranged according to the frequency with which companies appear in the top 25 emitters throughout the sample period. Panel A focuses on the top 25 emitters based on emission intensity.³²



³²In Panel A, ExxonMobil's emission level in 2016 is abnormally high, which can be partly due to the November 2016 fire at Baton Rouge Refinery. The fire was caused by an explosion on a sulfuric-acid alkylation unit that made octane-boosting components of gasoline in the sprawling Baton Rouge refinery and chemical plant.



SOUTHERN CO ALES CORP (THE) ALES CORP (THE) OGE ENERGY CORP OGE ENERGY CORP OGE ENERGY CORP AMERICAN ELECTRIC POWER CO DUKE ENERGY CORP ALLETRIC POWER CO DUKE ENERGY INC NR ENERGY INC PINNACLE WEST CAPITAL CORP PPL CORP PL CORP PL CORP OPL CAPITAL CORP PL CORP OPL CAPITAL CORP PL CORP CREATE AND COLONGS ITD AMERER VINC GREAT PLAIMS ENERGY INC CALPINE CORP KENON HOLDINGS ITD DYNEGY INC CLEOC CORP CONSOL ENERGY INC COSTAMARE INC CLEVERANC-(LIFF) INC SEANERGY INC SEANERGY INC CLEVERANC-(LIFF) INC SEANERGY INC CLEVERANC-(LIFF) INC SEANERGY INC SCANA CORP CLEVERANC-(LIFF) INC SEANERGY INC SCANA CORP CLEVERANC-(LIFF) INC SCANA CORP CLEVERANC-(LIFF) INC SCANA CORP CLEVERANC-(LIFF) INC SCANA CORP OD NISTOURCE INC NATIONAL FALLE ASC INC CLEVERANC-(LIFF) INC SCANA CORP OD SCANA Figure 3: Industry variation of ESG scores and emissions. This figure shows the average ESG scores and emission across SICS 38 subsectors over the sample period from 2010 to 2022. Panel A shows the distribution of industry average (equal-weighted) ESG scores from the five rating agencies. Panel B and D are based on the overlapping sample of E score and Trucost GHG emission data. Panel C displays the distribution of industry average ESG risk measures.³³



 $^{^{33}}$ As discussed in the main body of the paper, we present the Sustainalytics risk scores within the range of [0, 50] in Panel C. Since a score above 40 indicates the most severe category, only 2% of the fund-quarter observations exceed a score of 50, and none of the industry averages surpass this threshold.





(C) ESG risk scores across industry



(D) GHG (Scope 1) emissions across industry

B Tables

Table 1: Sample composition. This table presents a sample breakdown of our fund and fund holding data, sourced from Morningstar, covering the period from 2010 to 2022. In cases where funds have multiple share classes, their holdings are aggregated into a single entity. For funds with multiple share classes, their holdings are consolidated into a single entity. Panel A outlines the criteria used to construct our sample. Panel B decomposes our sample according to different Morningstar Categories.

		-	Fund-quarter	Number		
			observations	of funds		
US equity funds fr	rom MorningStar (2010-2022)		988,260	19,005		
minus missing h	olding data		(360, 177)	(1, 822)		
minus missing b	enchmark holding data		(38,559)	(157)		
minus inconsiste	ent benchmark across share classes		(8,664)	(254)		
minus missing n	nanagement firm		(644)	(14)		
US equity funds w	with benchmark information		580,216	16,758		
Aggregate share c	lasses to fund level		124,171	3,914		
minus US equity	minus US equity holding comprises less than 50% of fund holdings					
US equity fund-qu		120,415	3,849			
ESG funds		14,932	516			
ESG active fu	inds		$13,\!080$	452		
ESG index fu	nds		1852	64		
Non-ESG funds			$105,\!483$	3,333		
Non-ESG act	ive funds		$94,\!903$	$3,\!014$		
Non-ESG ind	ex funds		$10,\!580$	319		
Panel B. Category	benchmark					
Catamany	Indee	Fund-quarte	er Number	Percent		
Category	Index	observation	s of funds	(funds)		
Large Value	Russell 1000 Value TR USD	18,215	558	14.5%		
Large Blend	Russell 1000 TR USD	$34,\!425$	1,209	31.4%		
Large Growth	Russell 1000 Growth TR USD	$22,\!943$	683	17.7%		
Mid-Cap Value	Russell Mid Cap Value TR USD	1,244	102	2.7%		

Panel A. Sample selection

Mid-Cap Blend

Small Value

Small Blend

Total

Small Growth

Mid-Cap Growth

7,782

9,322

5,309

12,069

9,106

120,415

6.5%

6.6%

4.1%

9.7%

6.8%

100.0%

250

253

156

375

263

3.849

Russell Mid Cap TR USD

Russell 2000 Value TR USD

Russell 2000 Growth TR USD

Russell 2000 TR USD

Russell Mid Cap Growth TR USD

Table 2: *Holdings deviation*. This table presents (i) the holding deviations between ESG funds and their matched non-ESG counterparts within the same Morningstar Category, and (ii) the average number of stocks held by ESG funds, non-ESG funds, and their respective benchmark index within the same Morningstar Category. The sum of absolute holding deviation is calculated as the total of absolute differences in stock holdings between the average ESG funds and their matched non-ESG peers within the same Morningstar Category. The average absolute holding deviation is obtained by scaling this sum by the total number of distinct stocks held by either the ESG or non-ESG funds. The table presents the average values across different category-quarter observations. For a comprehensive description of the variables, please refer to Appendix C.

(Category	Holding deviation (Sum)	Holding deviation (Average)	No. of stocks (ESG)	No. of stocks (Non-ESG)	No. of stocks (Benchmark)	No. of ESG funds
	Large value	56.69%	0.08%	73	76	567	50
	Large blend	34.34%	0.01%	140	130	802	217
	Large growth	48.84%	0.05%	48	83	481	96
	Mid value	182.44%	0.58%	62	59	565	4
Active	Mid blend	126.77%	0.05%	70	445	620	30
	Mid growth	151.67%	0.29%	55	62	365	12
	Small value	194.62%	0.99%	254	97	1,060	2
	Small blend	106.71%	0.06%	115	107	1,558	39
	Small growth	188.55%	0.72%	83	195	934	2
	Large value	71.05%	0.09%	217	389	567	4
	Large blend	27.83%	0.01%	380	548	802	53
T., J.,	Large growth	53.28%	0.07%	361	264	481	4
Index	Mid blend	93.16%	0.15%	559	300	647	1
	Small blend	150.81%	0.09%	433	$1,\!612$	$1,\!627$	1
	Small growth	158.72%	0.73%	210	119	952	1

Table 3: Holdings of top 25 emitters by absolute emission. This table shows the holdings of top emitters by Scope 1 GHG emission of ESG funds. The sample is restricted to fund-quarters with at least 60% of holdings having available GHG emission data. In Panel A, the dependent variable is the difference in holdings of top emitters between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted holdings of top emitters. "Diff%" is calculated by scaling the "Diff" using the benchmarks' holdings of top emitters. These differences are further broken down into extensive margin and intensive margin. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

		Holdings of	f top 25 emi	tters (fund-b	enchmark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	-0.005***	-0.010***	-0.010***	-0.015***	-0.021***	-0.025***
	(-2.770)	(-4.878)	(-4.771)	(-3.994)	(-4.472)	(-5.131)
ESG fund \times Active				-0.002	0.001	0.008*
				(-0.632)	(0.222)	(1.739)
Non-ESG fund \times Active				-0.013***	-0.012***	-0.008***
				(-9.544)	(-6.313)	(-3.528)
Ln(TNA)			-0.001***			-0.001***
			(-3.048)			(-2.934)
Quarterly return			-0.015***			-0.015***
			(-5.349)			(-5.418)
Management fee			-0.010***			-0.011***
			(-3.944)			(-3.967)
Constant	-0.016***	-0.015***	0.008	-0.004***	-0.005***	0.015^{***}
	(-22.847)	(-34.901)	(1.359)	(-3.143)	(-2.818)	(2.703)
Quarter FE	No	Yes	Yes	No	Yes	Yes
Fund family FE	No	Yes	Yes	No	Yes	Yes
MS category FE	No	No	No	No	Yes	Yes
MS category \times Active fund FE	No	Yes	Yes	No	No	No
Ν	$108,\!385$	$108,\!352$	$104,\!952$	$108,\!385$	$108,\!352$	104,952
Adj. R^2	0.002	0.480	0.483	0.010	0.471	0.475

Panel A. ESG funds vs non-ESG funds

Panel B. Descriptive statistics

	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Extensive margin	Intensive margin	Obs
ESG (all)	3.3%	5.4%	-2.1%	-38.4%	150.3%	-50.3%	$14,\!364$
ESG (active)	3.1%	5.2%	-2.1%	-40.3%	152.3%	-52.3%	$12,\!552$
ESG (index)	4.8%	6.6%	-1.8%	-28.0%	134.9%	-34.9%	$1,\!812$
Non-ESG (all)	3.7%	5.2%	-1.6%	-30.2%	170.2%	-70.2%	$94,\!021$
Non-ESG (active)	3.5%	5.2%	-1.7%	-33.3%	168.2%	-68.2%	84,160
Non-ESG (index)	5.4%	5.8%	-0.4%	-6.5%	247.5%	-147.5%	9,861

Table 4: Holdings of polluting industries. This table shows the holdings of polluting industries of ESG funds, according to SASB SICS 77-Industry Classification. In Panel A, the dependent variable is the difference in holdings of polluting industries between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted holdings of polluting industries. "Diff%" is calculated by scaling the "Diff" using the benchmarks' holdings of polluting industry. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. All the variables are computed using the quarter-end holdings data from Morningstar. For a comprehensive description of the variables, please refer to Appendix C.

	Holdings of SICS polluting industries (fund-benchmark)								
	(1)	(2)	(3)	(4)	(5)	(6)			
ESG fund	-0.004**	-0.009***	-0.009***	-0.007*	-0.015**	-0.021***			
	(-2.008)	(-2.690)	(-2.749)	(-1.752)	(-2.236)	(-2.970)			
ESG fund \times Active	· · · ·		× ,	-0.012***	-0.004	0.010			
				(-2.901)	(-0.607)	(1.429)			
Non-ESG fund \times Active				-0.015***	-0.010***	-0.003			
				(-7.282)	(-4.181)	(-0.921)			
Ln(TNA)			-0.001**	()	()	-0.001**			
			(-2.255)			(-2.277)			
Quarterly return			0.001			0.001			
•			(0.203)			(0.193)			
Management fee			-0.018***			-0.020***			
0			(-4.033)			(-4.293)			
Constant	-0.014***	-0.014***	0.019*	-0.001	-0.004**	0.023**			
	(-14.974)	(-17.641)	(1.864)	(-0.438)	(-1.974)	(2.418)			
Quarter FE	No	Yes	Yes	No	Yes	Yes			
Fund family FE	No	Yes	Yes	No	Yes	Yes			
MS category FE	No	No	No	No	Yes	Yes			
MS category \times Active fund FE	No	Yes	Yes	No	No	No			
N	108,385	108,352	104,952	108,385	108,352	104,952			
Adj. R^2	0.001	0.355	0.354	0.006	0.353	0.351			
Panel B. Descriptive statistics									
]	Fund	Benchmark	Diff	Di	ff%	Obs			
ESG (all) 1	0.9%	12.8%	-1.9%	-14	.8%	14,364			
ESG (active) 1	0.7%	12.7%	-2.0%	-16	.1%	$12,\!552$			
ESG (index) 1	2.7%	13.5%	-0.8%	-5.	9%	1,812			
Non-ESG (all) 1	2.3%	13.7%	-1.4%	-10	.5%	94,021			

Panel A. Polluting industries

Non-ESG (active)

Non-ESG (index)

13.7%

14.2%

-1.6%

-0.1%

-11.7%

-0.6%

84,160

9,861

12.1%

14.2%

Table 5: GHG (Scope 1) absolute emission. This table shows the portfolio-level Scope 1 GHG absolute emission of ESG funds. The sample is restricted to fund-quarters with at least 60% of holdings having available GHG emission data. In Panel A, the dependent variable is the difference of portfolio-level value-weighted absolute emission between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, the dependent variable is the proportion of emission difference that is attributed to across-industry selection. The analysis is based on the subsample of fund-quarters with lower portfolio-level emission than their benchmarks. "Index fund" is a dummy variable that equals one if the fund is an index fund, and zero otherwise. In Panel C, "Diff" is the same as the dependent variable in Panel A-the benchmark-adjusted absolute emission. "Diff%" is calculated by scaling the "Diff" using the benchmarks' absolute emission. For the subsample of fund-quarters with lower portfolio-level emissions than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

	Absolute emission (fund-benchmark)										
	(1)	(2)	(3)	(4)	(5)	(6)					
ESG fund	-368**	-846***	-801***	-1034***	-1634***	-1953***					
	(-2.564)	(-4.986)	(-4.716)	(-3.137)	(-3.808)	(-4.456)					
ESG fund \times Active				-605*	-264	451					
				(-1.753)	(-0.685)	(1.025)					
Non-ESG fund \times Active				-1336***	-1139***	-810***					
				(-11.448)	(-6.929)	(-3.873)					
Ln(TNA)			-72***			-69***					
			(-3.438)			(-3.277)					
Quarterly return			-1419***			-1443***					
			(-5.641)			(-5.686)					
Management fee			-969***			-1002***					
			(-4.116)			(-4.072)					
Constant	-1466***	-1403***	826	-271***	-383***	1525***					
	(-25.222)	(-38.196)	(1.616)	(-2.761)	(-2.596)	(3.114)					
Quarter FE	No	Yes	Yes	No	Yes	Yes					
Fund family FE	No	Yes	Yes	No	Yes	Yes					
MS category FE	No	No	No	No	Yes	Yes					
MS category \times Active fund FE	No	Yes	Yes	No	No	No					
Ν	$108,\!385$	$108,\!352$	$104,\!952$	$108,\!385$	$108,\!352$	104,952					
Adj. R^2	0.001	0.440	0.443	0.013	0.430	0.434					

Panel A. ESG funds vs non-ESG funds

	Across-industry selection									
		ESG funds		Non-ESG funds						
Index fund	-0.147*	-0.179	-0.159	-0.201***	-0.254***	-0.300***				
	(-1.8026)	(-1.3854)	(-0.8379)	(-3.1839)	(-3.0704)	(-3.1425)				
Ln(TNA)			0.004			0.012				
			(0.1591)			(1.2617)				
Quarterly return			-0.865			-0.017				
			(-1.6102)			(-0.0771)				
Management fee			0.065			-0.099				
			(0.3897)			(-0.9343)				
Constant	0.431***	0.434^{***}	0.301	0.572***	0.576^{***}	0.397^{*}				
	(10.0457)	(14.5720)	(0.5026)	(34.6239)	(40.7859)	(1.7337)				
Quarter FE	No	Yes	Yes	No	Yes	Yes				
Fund family FE	No	Yes	Yes	No	Yes	Yes				
MS category FE	No	Yes	Yes	No	Yes	Yes				
Ν	$11,\!049$	11,038	$10,\!443$	$63,\!958$	$63,\!930$	62,236				
Adj. R^2	0.001	0.141	0.141	0.001	0.086	0.088				

Panel B. Across-industry selection

Panel C. Descriptive statistics

		Ful	ll sample			Sample emissior	e with lower fu n than benchm	ınd nark
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs
ESG (all)	3,277	$5,\!111$	-1,834	-35.9%	$14,\!364$	41.4%	58.6%	11,049
ESG (active)	3,046	$4,\!956$	-1,910	-38.5%	$12,\!552$	43.1%	56.9%	9,746
ESG (index)	4,880	$6,\!185$	-1,305	-21.1%	1,812	28.4%	71.6%	1,303
Non-ESG (all)	$3,\!477$	4,944	-1,466	-29.7%	94,021	55.8%	44.2%	$63,\!958$
Non-ESG (active)	$3,\!287$	$4,\!894$	-1,606	-32.8%	84,160	57.2%	42.8%	59,505
Non-ESG (index)	$5,\!098$	5,369	-271	-5.0%	9,861	37.2%	62.8%	$4,\!453$

Table 6: GHG (Scope 1) emission intensity. This table shows the portfolio-level Scope 1 GHG emission intensity of ESG funds. The sample is restricted to fund-quarters with at least 60% of holdings having available GHG emission data. In Panel A, the dependent variable is the difference of portfolio-level value-weighted emission intensity between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, the dependent variable is the proportion of emission intensity difference that is attributed to across-industry selection. The analysis is based on the subsample of fund-quarters with lower portfolio-level emission intensity than their benchmarks. "Index fund" is a dummy variable that equals one if the fund is an index fund, and zero otherwise. In Panel C, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted emission intensity. "Diff%" is calculated by scaling the "Diff" using the benchmarks' emission intensity. For the subsample of fund-quarters with lower portfolio-level emission intensity than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

	Emission intensity (fund-benchmark)									
	(1)	(2)	(3)	(4)	(5)	(6)				
ESG fund	-6	-18***	-18***	-18***	-28***	-32***				
	(-1.408)	(-3.598)	(-3.440)	(-2.790)	(-2.664)	(-2.930)				
ESG fund \times Active				-14**	-9	1				
				(-2.130)	(-0.912)	(0.069)				
Non-ESG fund \times Active				-28***	-19***	-15***				
				(-6.040)	(-4.607)	(-2.887)				
Ln(TNA)			-3***			-2***				
			(-3.128)			(-2.982)				
Quarterly return			-2			-2				
			(-0.162)			(-0.180)				
Management fee			-13*			-14**				
			(-1.813)			(-1.980)				
Constant	-30***	-28***	33^{*}	-5	-11***	45**				
	(-16.206)	(-21.591)	(1.896)	(-1.240)	(-2.891)	(2.544)				
Quarter FE	No	Yes	Yes	No	Yes	Yes				
Fund family FE	No	Yes	Yes	No	Yes	Yes				
MS category FE	No	No	No	No	Yes	Yes				
MS category \times Active fund FE	No	Yes	Yes	No	No	No				
Ν	$108,\!385$	$108,\!352$	$104,\!952$	$108,\!385$	$108,\!352$	$104,\!952$				
Adj. R^2	0.000	0.328	0.328	0.005	0.326	0.326				

Panel A. ESG funds vs non-ESG funds

	Across-industry selection									
		ESG funds		Non-ESG funds						
Index fund	-0.392***	-0.537***	-0.511***	-0.383***	-0.510***	-0.437***				
	(-4.2753)	(-4.1660)	(-2.8899)	(-7.1137)	(-7.6140)	(-5.4791)				
Ln(TNA)			-0.026			-0.005				
			(-1.0350)			(-0.5385)				
Quarterly return			-0.472			0.381^{*}				
			(-0.8369)			(1.6907)				
Management fee			0.007			0.214^{**}				
			(0.0454)			(2.4045)				
Constant	0.570^{***}	0.590^{***}	1.127^{**}	0.799^{***}	0.810***	0.743^{***}				
	(13.6181)	(20.8154)	(2.0553)	(48.7358)	(57.8980)	(3.5933)				
Quarter FE	No	Yes	Yes	No	Yes	Yes				
Fund family FE	No	Yes	Yes	No	Yes	Yes				
MS category FE	No	Yes	Yes	No	Yes	Yes				
Ν	$10,\!378$	10,367	9,779	$61,\!206$	$61,\!167$	$59,\!396$				
Adj. R^2	0.005	0.147	0.149	0.003	0.072	0.072				

Panel B. Across-industry selection

Panel C. Descriptive statistics

		Full	sample	9	Sample with lower fund emission than benchmark			
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs
ESG (all)	104	139	-36	-25.6%	14,364	52.0%	48.0%	10,378
ESG (active)	100	138	-37	-27.1%	$12,\!552$	57.0%	43.0%	9,068
ESG (index)	126	149	-23	-15.6%	1,812	17.8%	82.2%	$1,\!310$
Non-ESG (all)	127	156	-30	-19.0%	$94,\!021$	76.6%	23.4%	61,206
Non-ESG (active)	123	155	-33	-21.0%	84,160	79.9%	20.1%	$55,\!975$
Non-ESG $(index)$	160	166	-5	-3.1%	9,861	41.6%	58.4%	$5,\!231$

Table 7: *ESG scores.* This table shows the portfolio-level combined ESG scores. The sample is restricted to fund-quarters with at least 60% of holdings having available ESG scores from at least one of the raters, including KLD, MSCI, Refinitiv, S&P, and Sustainalytics. In Panel A, the dependent variable is the difference of portfolio-level value-weighted ESG scores between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted ESG scores. "Diff%" is calculated by scaling the "Diff" using the benchmarks' ESG score. For the subsample of fund-quarters with higher portfolio-level ESG scores than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

Panel A. ESG funds vs non-ESG funds

	ESG score (fund-benchmark)								
	(1)	(2)	(3)	(4)	(5)	(6)			
ESG fund	0.573***	0.508***	0.544***	1.790***	1.196***	0.969***			
	(4.203)	(2.847)	(2.972)	(5.082)	(3.656)	(2.726)			
ESG fund \times Active				-1.741^{***}	-0.831***	-0.140			
				(-4.873)	(-2.686)	(-0.393)			
Non-ESG fund \times Active				-0.343***	-0.052	0.346^{**}			
				(-2.622)	(-0.368)	(2.094)			
Ln(TNA)			0.031			0.030			
			(1.623)			(1.541)			
Quarterly return			0.280			0.276			
			(1.171)			(1.148)			
Management fee			-1.168^{***}			-1.036^{***}			
			(-5.996)			(-5.279)			
Constant	-0.328***	-0.320***	-0.108	-0.020	-0.274^{**}	-0.491			
	(-7.639)	(-9.170)	(-0.252)	(-0.163)	(-2.111)	(-1.131)			
Quarter FE	No	Yes	Yes	No	Yes	Yes			
Fund family FE	No	Yes	Yes	No	Yes	Yes			
MS category FE	No	No	No	No	Yes	Yes			
MS category \times Active fund FE	No	Yes	Yes	No	No	No			
N	$120,\!134$	$120,\!103$	$116,\!474$	$120,\!134$	120,103	$116,\!474$			
Adj. R^2	0.005	0.373	0.377	0.011	0.364	0.368			
Panel B. Descriptive statistics									
				C		C 1			

		Full	sample		Sample with higher fund				
		I un	sampt	,		ESG score than benchmark			
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs	
ESG (all)	51.96	51.72	0.25	0.5%	$14,\!929$	-15.8%	115.8%	8,919	
ESG (active)	51.59	51.56	0.03	0.1%	$13,\!077$	-20.5%	120.5%	7,222	
ESG (index)	54.62	52.85	1.77	3.3%	1,852	3.9%	96.1%	$1,\!697$	
Non-ESG (all)	49.35	49.68	-0.33	-0.7%	$105,\!205$	-10.5%	110.5%	$51,\!368$	
Non-ESG (active)	49.20	49.57	-0.36	-0.7%	$94,\!625$	-12.6%	112.6%	44,881	
Non-ESG (index)	50.68	50.70	-0.02	0.0%	$10,\!580$	4.2%	95.8%	$6,\!487$	

Table 8: *E scores.* This table shows the portfolio-level combined E scores. The sample is restricted to fund-quarters with at least 60% of holdings having emission data and available E scores from at least one of the rating agencies, including KLD, MSCI, Refinitiv, S&P, and Sustainalytics. In Panel A, the dependent variable is the difference of portfolio-level value-weighted E scores between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted E scores. "Diff%" is calculated by scaling the "Diff" using the benchmarks? E score. For the subsample of fund-quarters with higher portfolio-level E scores than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

		E score (fund-benchmark)									
	(1)	(2)	(3)	(4)	(5)	(6)					
ESG fund	0.872***	0.644**	0.676**	2.703***	2.009***	1.706***					
	(4.183)	(2.318)	(2.353)	(5.667)	(4.116)	(3.173)					
ESG fund \times Active				-2.532^{***}	-1.556^{***}	-0.631					
				(-5.380)	(-3.396)	(-1.160)					
Non-ESG fund \times Active				-0.427^{*}	-0.019	0.526^{*}					
				(-1.808)	(-0.074)	(1.809)					
Ln(TNA)			0.083^{**}			0.080^{**}					
			(2.555)			(2.411)					
Quarterly return			0.389			0.393					
			(0.930)			(0.933)					
Management fee			-1.673^{***}			-1.424^{***}					
			(-5.126)			(-4.301)					
Constant	-0.530***	-0.500***	-1.017	-0.149	-0.486**	-1.596^{**}					
	(-7.152)	(-8.305)	(-1.400)	(-0.667)	(-2.114)	(-2.140)					
Quarter FE	No	Yes	Yes	No	Yes	Yes					
Fund family FE	No	Yes	Yes	No	Yes	Yes					
MS category FE	No	No	No	No	Yes	Yes					
MS category \times Active fund FE	No	Yes	Yes	No	No	No					
Ν	$108,\!130$	108,096	104,701	$108,\!130$	$108,\!096$	104,701					
Adj. R^2	0.004	0.359	0.362	0.009	0.347	0.350					

Panel B. Descriptive statistics

		Full	sample			Sample with higher fund			
		1 un	sampic			E score than benchmark			
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs	
ESG (all)	54.52	54.18	0.34	0.6%	14,346	-12.9%	112.9%	8,624	
ESG (active)	53.90	53.88	0.02	0.0%	$12,\!537$	-18.5%	118.5%	6,959	
ESG (index)	58.80	56.25	2.55	4.5%	$1,\!809$	10.6%	89.4%	$1,\!665$	
Non-ESG (all)	50.04	50.57	-0.53	-1.0%	93,784	-10.9%	110.9%	$45,\!405$	
Non-ESG (active)	49.80	50.37	-0.58	-1.1%	$83,\!932$	-13.5%	113.5%	$39,\!380$	
Non-ESG $(index)$	52.12	52.27	-0.15	-0.3%	9,852	6.2%	93.8%	6,025	

Table 9: Sustainalytics risk score. This table shows the portfolio-level Sustainalytics risk score. The sample is restricted to fund-quarters with at least 60% of holdings having available Sustainalytics risk score. In Panel A, the dependent variable is the difference of portfolio-level value-weighted Sustainalytics risk score between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted Sustainalytics risk score. "Diff%" is calculated by scaling the "Diff" using the benchmarks' Sustainalytics risk score than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

		Sustainal	ytics risk sc	ore (fund-be	nchmark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	-0.741***	-0.989***	-0.945***	-1.276***	-1.112***	-1.091***
	(-8.696)	(-8.522)	(-8.284)	(-8.373)	(-5.042)	(-4.628)
ESG fund \times Active				0.301^{*}	-0.045	0.003
				(1.905)	(-0.212)	(0.013)
Non-ESG fund \times Active				-0.309***	-0.191^{**}	-0.168*
				(-3.621)	(-2.261)	(-1.709)
Ln(TNA)			0.004			0.005
			(0.294)			(0.322)
Quarterly return			-0.383**			-0.410^{**}
			(-2.271)			(-2.427)
Management fee			0.045			-0.015
			(0.353)			(-0.115)
Constant	-0.226***	-0.187^{***}	-0.321	0.048	-0.019	-0.137
	(-6.338)	(-6.729)	(-0.983)	(0.629)	(-0.243)	(-0.407)
Quarter FE	No	Yes	Yes	No	Yes	Yes
Fund family FE	No	Yes	Yes	No	Yes	Yes
MS category FE	No	No	No	No	Yes	Yes
MS category \times Active fund FE	No	Yes	Yes	No	No	No
Ν	$41,\!404$	$41,\!379$	40,167	$41,\!404$	$41,\!379$	40,167
Adj. R^2	0.020	0.501	0.501	0.023	0.497	0.497

Panel A. ESG funds vs non-ESG funds

Panel B. Descriptive statistics

		Full	sample			Sample with lower fund			
		1 un	Sampie			Sustainalytics risk score than benchmark			
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs	
ESG (all)	22.34	23.31	-0.97	-4.1%	$6,\!643$	31.9%	68.1%	5,017	
ESG (active)	22.40	23.33	-0.93	-4.0%	5,783	30.3%	69.7%	$4,\!197$	
ESG (index)	21.91	23.14	-1.23	-5.3%	860	39.9%	60.1%	820	
Non-ESG (all)	24.37	24.59	-0.23	-0.9%	34,761	56.4%	43.6%	20,036	
Non-ESG (active)	24.40	24.66	-0.26	-1.1%	30,775	58.8%	41.2%	$17,\!525$	
Non-ESG (index)	24.12	24.08	0.05	0.2%	$3,\!986$	39.7%	60.3%	2,511	

Table 10: *Board diversity.* This table shows the portfolio-level board diversity. The sample is restricted to fund-quarters with at least 60% of holdings having available board diversity data from ISS. In Panel A, the dependent variable is the difference of portfolio-level value-weighted board diversity between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted board diversity. "Diff%" is calculated by scaling the "Diff" using the benchmarks' board diversity. For the subsample of fund-quarters with lower portfolio-level board diversity than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

			Board diversity (fund-benchmark)								
		(1)	(2	2)	(3)	(4)	(5)	(6)			
ESG fund		0.002***	0.0	001	0.001	0.007***	0.005***	0.004**			
		(2.758)	(1.0	046)	(1.100)	(6.480)	(3.215)	(2.324)			
ESG fund \times Active	Э	· · · ·		,	· /	-0.006***	-0.003**	-0.001			
						(-5.160)	(-2.169)	(-0.344)			
Non-ESG fund $\times A$	Active					0.000	0.001^{**}	0.003^{***}			
						(0.745)	(2.025)	(3.699)			
Ln(TNA)					-0.000			-0.000			
					(-0.650)			(-0.662)			
Quarterly return					0.002			0.002			
					(1.557)			(1.504)			
Management fee					-0.005***			-0.004***			
					(-5.030)			(-4.329)			
Constant		-0.001***	-0.00)1***	0.004^{*}	-0.002***	-0.002***	0.001			
		(-5.138)	(-5.3)	850)	(1.674)	(-2.823)	(-3.753)	(0.262)			
Quarter FE		No	Υ	es	Yes	No	Yes	Yes			
Fund family FE		No	Υ	es	Yes	No	Yes	Yes			
MS category FE		No	N	lo	No	No	Yes	Yes			
MS category \times Act	tive fund F	FE No	Υ	es	Yes	No	No	No			
Ν		104,725	104	,693	$101,\!385$	104,725	$104,\!693$	$101,\!385$			
Adj. R^2		0.001	0.2	276	0.278	0.003	0.274	0.275			
Panel B. Descripti	ve statistic	CS									
		E .11	annala			Sample	e with higher	fund			
		гuш	sampie			board dive	rsity than be	enchmark			
	Fund	Benchmark	Diff	Diff%	Obs	Across ind	Within ind	l Obs			
ESG (all)	24.1%	24.0%	0.0%	0.2%	14,021	4.5%	95.5%	8,127			
ESG (active)	23.9%	24.0%	0.0%	-0.1%	12,172	-5.0%	105.0%	6,462			
ESG (index)	25.0%	24.4%	0.6%	2.3%	1,849	41.3%	58.7%	1,665			

Panel A. ESG funds vs non-ESG funds

Non-ESG (all)

Non-ESG (active)

Non-ESG (index)

22.3%

22.2%

22.9%

22.4%

22.3%

23.0%

-0.5%

-0.5%

-0.7%

90,704

80,929

9,775

-26.2%

-32.1%

14.6%

126.2%

132.1%

85.4%

45,752

39,885

5,867

-0.1%

-0.1%

-0.2%

Table 11: Incident rate. This table shows the portfolio-level incident rate. The sample is restricted to fund-quarters with holdings having available incident rate data from OSHA. In Panel A, the dependent variable is the difference of portfolio-level value-weighted incident rate between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted incident rate. "Diff%" is calculated by scaling the "Diff" using the benchmarks' incident rate. For the subsample of fund-quarters with lower portfolio-level incident rate than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

		Incid	ent rate (fu	nd-benchma	ark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	-1.364***	-0.344	-0.452	0.007	0.585	1.460
	(-3.506)	(-0.937)	(-1.196)	(0.088)	(1.092)	(1.601)
ESG fund \times Active	· /		· · · ·	0.040	-0.377	-2.921
				(0.325)	(-0.665)	(-1.511)
Non-ESG fund \times Active				1.580***	0.687^{**}	-0.769
				(3.693)	(2.129)	(-0.650)
Ln(TNA)			-0.375**		· /	-0.350**
			(-2.425)			(-2.371)
Quarterly return			16.376**			16.374**
•			(2.524)			(2.526)
Management fee			3.292			3.511
0			(1.244)			(1.335)
Constant	1.287***	1.140***	6.234**	-0.119*	0.530	6.222**
	(3.417)	(4.531)	(2.249)	(-1.846)	(1.482)	(2.218)
Quarter FE	No	Yes	Yes	No	Yes	Yes
Fund family FE	No	Yes	Yes	No	Yes	Yes
MS category FE	No	No	No	No	Yes	Yes
MS category \times Active fund FE	No	Yes	Yes	No	No	No
N	68.515	68,484	66.397	68.515	68,484	66.397
Adj. R^2	0.000	0.035	0.035	0.000	0.035	0.035
Panel B. Descriptive statistics						

Panel A. ESG funds vs non-ESG funds

		Eull	complo			Sample with lower fund			
		Full	sample		incident rate than benchmark				
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs	
ESG (all)	2.41	2.49	-0.08	-3.1%	10,009	38.3%	61.7%	$5,\!803$	
ESG (active)	2.45	2.52	-0.07	-2.8%	$8,\!691$	29.0%	71.0%	$4,\!998$	
ESG (index)	2.16	2.28	-0.11	-4.9%	1,318	96.5%	3.5%	805	
Non-ESG (all)	4.16	2.88	1.29	44.8%	58,506	25.9%	74.1%	32,228	
Non-ESG (active)	4.37	2.91	1.46	50.2%	$52,\!093$	21.9%	78.1%	$28,\!938$	
Non-ESG (index)	2.47	2.59	-0.12	-4.6%	6,413	61.2%	38.8%	$3,\!290$	

Table 12: *Portfolio diversification and return volatility.* This table shows the funds' portfolio diversification and return volatility. In Panel A, portfolio diversification is measured using both the average number of stocks held at each quarter-end and industry concentration index as per Kacperczyk et al. (2005). In Panel B, monthly portfolio return volatility is measured using the standard deviation of a fund's monthly net returns across the sample period. Quarterly portfolio return volatility is measured using the standard deviation of a fund's monthly net returns across the sample period. Quarterly portfolio return volatility is measured using the standard deviation of a fund's US equity holding return based on its quarter-end holdings. The sample for return volatility is limited to funds with at least 12 monthly return observations and 4 quarterly return observations to compute standard deviation. Average values across funds observations are presented. For a comprehensive description of the variables, please refer to Appendix C.

	Number of stocks held			Ine	Industry concentration			
	Fund	Benchmark	Difference	Fund	Benchmark	Difference	Obs	
ESG (all)	130	784	-654	3.05%	1.54%	1.51%	516	
ESG (active)	98	780	-682	3.32%	1.67%	1.65%	452	
ESG (index)	359	814	-454	1.09%	0.58%	0.50%	64	
Non-ESG (all)	156	761	-605	4.49%	2.29%	2.20%	3,333	
Non-ESG (active)	113	756	-643	4.73%	2.40%	2.33%	$3,\!014$	
Non-ESG (index)	570	815	-245	2.26%	1.30%	0.95%	319	

Panel A. Portfolio diversification

Panel B. Return volatility

	Mo	Monthly return volatility			Quarterly return volatility			
	Fund	Benchmark	Difference	Fund	Benchmark	Difference	Obs	
ESG (all)	4.87%	4.51%	0.36%	9.09%	8.55%	0.54%	460	
ESG (active)	4.92%	4.53%	0.39%	9.21%	8.60%	0.61%	405	
ESG (index)	4.51%	4.35%	0.16%	8.20%	8.17%	0.03%	55	
Non-ESG (all)	4.80%	4.79%	0.01%	9.12%	9.19%	-0.08%	$3,\!197$	
Non-ESG (active)	4.80%	4.81%	-0.01%	9.14%	9.24%	-0.10%	$2,\!886$	
Non-ESG $(index)$	4.75%	4.60%	0.16%	8.90%	8.76%	0.15%	311	

Table 13: Fund return and risk exposure. This table shows the funds' return and risk exposure. In Panel A/B/C/D, the dependent variable is the difference of risk premium/6-factor alpha/CAPMalpha/CAPM-beta between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel E, "Diff" is the same as the dependent variable in Panel A, B, C, or D. Average values of fund-months are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

	Risk preimum (fund-benchmark)								
	(1)	(2)	(3)	(4)	(5)	(6)			
ESG fund	0.034***	0.041***	0.038***	0.084***	0.067***	0.039^{*}			
	(3.6726)	(3.3267)	(3.0817)	(4.5081)	(3.3953)	(1.8093)			
ESG fund \times Active				-0.146^{***}	-0.088***	-0.027			
				(-7.4024)	(-4.8804)	(-1.2004)			
Non-ESG fund \times Active				-0.086***	-0.058***	-0.025**			
				(-11.0691)	(-7.0226)	(-2.3285)			
Ln(TNA)			-0.004**			-0.004**			
			(-2.4382)			(-2.2657)			
Management fee			-0.087***			-0.083***			
			(-5.4385)			(-5.1222)			
Constant	-0.088***	-0.088***	0.061^{*}	-0.010	-0.036***	0.074^{**}			
	(-25.1535)	(-34.9219)	(1.6710)	(-1.4618)	(-4.6679)	(2.0553)			
Quarter FE	No	Yes	Yes	No	Yes	Yes			
Fund family FE	No	Yes	Yes	No	Yes	Yes			
MS category FE	No	No	No	No	Yes	Yes			
MS category \times Active fund FE	No	Yes	Yes	No	No	No			
Ν	$351,\!605$	$351,\!602$	346,703	$351,\!605$	$351,\!602$	346,703			
Adj. R^2	0.000	0.054	0.052	0.000	0.054	0.052			

Panel A. Risk premium

Panel B. 6-factor alpha

		6-fac	ctor alpha (fi	und-benchma	urk)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	0.174***	-0.004	-0.001	0.316***	-0.068	-0.055
	(9.4114)	(-0.2311)	(-0.0605)	(6.9569)	(-1.4801)	(-1.1714)
ESG fund \times Active				-0.192^{***}	0.063	0.035
				(-3.9798)	(1.3757)	(0.7243)
Non-ESG fund \times Active				-0.028**	-0.007	-0.024*
				(-2.5286)	(-0.7858)	(-1.9049)
Ln(TNA)			-0.010***			-0.010***
			(-4.5144)			(-4.4428)
Management fee			0.032			0.031
			(1.3649)			(1.3373)
Constant	-0.003	0.018^{***}	0.199^{***}	0.022^{**}	0.025^{***}	0.217^{***}
	(-0.8345)	(5.6089)	(3.8767)	(2.1342)	(2.9237)	(4.3578)
Quarter FE	No	Yes	Yes	No	Yes	Yes
Fund family FE	No	Yes	Yes	No	Yes	Yes
MS category FE	No	No	No	No	Yes	Yes
MS category \times Active fund FE	No	Yes	Yes	No	No	No
Ν	230,034	$230,\!034$	$227,\!624$	$230,\!034$	230,034	$227,\!624$
Adj. R^2	0.001	0.047	0.046	0.001	0.047	0.046

		CAI	PM alpha (fu	und-benchma	rk)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	0.079***	0.010	0.010	0.233***	-0.004	-0.016
	(4.7987)	(0.5190)	(0.5135)	(6.4066)	(-0.0976)	(-0.3546)
ESG fund \times Active	. ,	. ,	. ,	-0.245***	-0.056	-0.022
				(-6.4081)	(-1.3833)	(-0.4909)
Non-ESG fund \times Active				-0.067***	-0.069***	-0.047***
				(-5.4814)	(-5.9113)	(-3.0584)
Ln(TNA)			0.002			0.003
			(0.8289)			(1.0353)
Management fee			-0.054**			-0.049**
			(-2.2337)			(-2.0057)
Constant	-0.049***	-0.040***	-0.044	0.012	0.022^{**}	-0.017
	(-10.1511)	(-11.5540)	(-0.7860)	(1.0623)	(1.9735)	(-0.2939)
Quarter FE	No	Yes	Yes	No	Yes	Yes
Fund family FE	No	Yes	Yes	No	Yes	Yes
MS category FE	No	No	No	No	Yes	Yes
MS category \times Active fund FE	No	Yes	Yes	No	No	No
Ν	230,034	230,034	$227,\!624$	230,034	230,034	$227,\!624$
Adj. R^2	0.000	0.048	0.047	0.001	0.047	0.047

Panel C. CAPM alpha

Panel D.	CAPM	beta
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		CA	PM beta (fu	nd-benchma	rk)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	-0.060***	0.010	0.010	-0.131***	0.033^{*}	0.036^{*}
	(-8.0014)	(1.1477)	(1.1891)	(-7.2298)	(1.7616)	(1.8668)
ESG fund \times Active				0.068^{***}	-0.021	-0.024
				(3.6282)	(-1.1240)	(-1.2386)
Non-ESG fund \times Active				-0.014**	0.004	0.003
				(-1.9757)	(0.6610)	(0.4233)
Ln(TNA)			-0.001			-0.001
			(-0.6413)			(-0.6820)
Management fee			0.000			0.001
			(0.0007)			(0.0674)
Constant	-0.038***	-0.046^{***}	-0.031	-0.026***	-0.050***	-0.033
	(-15.1543)	(-26.6679)	(-1.3287)	(-4.0446)	(-9.9033)	(-1.4216)
Quarter FE	No	Yes	Yes	No	Yes	Yes
Fund family FE	No	Yes	Yes	No	Yes	Yes
MS category FE	No	No	No	No	Yes	Yes
MS category \times Active fund FE	No	Yes	Yes	No	No	No
Ν	230,034	$230,\!034$	$227,\!624$	$230,\!034$	$230,\!034$	$227,\!624$
Adj. R^2	0.021	0.549	0.543	0.025	0.547	0.542

		Risk prei	mium		6-factor alpha			
	Fund	Benchmark	Diff	Obs	Fund	Benchmark	Diff	Obs
ESG (all)	0.862%	0.915%	-0.053%	43,052	0.168%	-0.003%	0.170%	27,731
ESG (active)	0.847%	0.918%	-0.071%	$37,\!651$	0.144%	-0.002%	0.146%	$24,\!275$
ESG (index)	0.967%	0.893%	0.074%	$5,\!401$	0.331%	-0.008%	0.338%	$3,\!456$
Non-ESG (all)	0.842%	0.930%	-0.088%	$308,\!553$	-0.007%	-0.004%	-0.003%	$202,\!303$
Non-ESG (active)	0.834%	0.930%	-0.096%	$277,\!811$	-0.009%	-0.003%	-0.006%	181,718
Non-ESG (index)	0.916%	0.926%	-0.010%	30,742	0.010%	-0.012%	0.022%	20,585
		CAPM a	alpha		CAPM beta			
	Fund	Benchmark	Diff	Obs	Fund	Benchmark	Diff	Obs
ESG (all)	0.023%	-0.007%	0.030%	27,731	0.906	1.004	-0.098	27,731
ESG (active)	-0.010%	-0.010%	-0.001%	$24,\!275$	0.916	1.006	-0.089	$24,\!275$
ESG (index)	0.256%	0.011%	0.244%	$3,\!456$	0.831	0.988	-0.157	$3,\!456$
Non-ESG (all)	-0.150%	-0.101%	-0.049%	$202,\!303$	1.000	1.037	-0.038	$202,\!303$
Non-ESG (active)	-0.160%	-0.105%	-0.056%	181,718	1.000	1.040	-0.039	181,718
Non-ESG (index)	-0.056%	-0.068%	0.012%	$20,\!585$	0.992	1.017	-0.026	$20,\!585$

Panel E. Descriptive statistics

Table 14: *Fund fees.* This table shows a comparison between the management fees and net expense ratios of ESG/non-ESG funds and their benchmarks. Management fee refers to the most recently reported actual percentage deducted from a fund's average net assets to cover the investment's management costs. Net expense ratio is the percentage of fund assets allocated for operating expenses and management fees, as stated in the fund's audited annual report. It typically includes fees for accounting, administration, advising, auditing, board of directors, custodial, distribution (12b-1), legal, organizational, professional, registration, shareholder reporting, sub-advising, and transfer agency. However, it does not account for the fund's brokerage costs or any investor sales charges. Turnover ratio is calculated by taking the lesser value of purchases or sales (excluding securities with maturities of less than one year) and dividing it by the average monthly net assets. This figure is derived directly from the financial highlights in the fund's annual report. The management fee is summarized at the fund level, while the net expense ratio and turnover ratio are summarized at the fund level. For a comprehensive description of the variables, please refer to Appendix C.

	Manager	ment fees	Expens	se ratio
	Mean	Obs	Mean	Obs
ESG (all)	0.91	508	1.20	9,181
ESG (active)	0.97	446	1.26	8,350
ESG (index)	0.47	62	0.59	831
Non-ESG (all)	0.76	3,320	1.09	$90,\!145$
Non-ESG (active)	0.81	3,004	1.16	81,129
Non-ESG (index)	0.29	316	0.46	9,016

C Variable Definition

This table shows the definitions of all variables and their sources. CS stands for Compustat, MS stands for MorningStar, TR stands for Thomson Reuters. KLD stands for KLD stats (acquired by MSCI), REF stands for Refinitiv, SP stands for S&P Global, SUS stands for Sustainalytics, RR stands for RepRisk, TC stands for Trucost, ISS stands for Institutional Shareholder Services, OSHA stands for Occupational Safety and Health Administration.

Variable	Definition	Source
KLD score	KLD ESG score is calculated as the average of the KLD environment cate- gory score, social category score and governance category score. While KLD has separate category for environment and corporate governance, the social category score is the average of the five KLD category scores that are related to S (employee relations, diversity, human right, community, product). The score for each category is computed as net score by subtracting concerns from strengths, where the strengths (concerns) is scaled by the maximum number of strengths (concerns) following Lins et al. (2017). The original score for each category ranges from -1 to 1, to make it comparable to other scores, we mul- tiply it by 50 and plus 50. The adjusted score ranges from 0 to 100. Data available until 2019.	KLD
MSCI score	MSCI ESG score is the weighted average of the MSCI environmental pillar score, social pillar score, and governance pillar score. The weighting factor is provided by MSCI and indicates the relative importance of E, S and G for the firm (considering, for instance, its industry). The original value ranges from 0 to 10, to make it comparable to other scores, we multiply it by 10. Data available across all sample period.	MSCI
Refinitiv score	Refinitiv provides ESG score, environmental pillar score, social pillar score, and governance pillar score. The value ranges from 0 to 100. Data available across all sample period.	REF
S&P score	S&P provides ESG score, environmental score, social score and economic gov- ernance score. The value ranges from 0 to 100. Data available from 2013.	SP
Sustainalytics score	Sustainalytics provides ESG score, environment score, social score and gover- nance score. The value ranges from 0 to 100. Data available until 2019. ³⁴	SUS
Sustainalytics risk score	Sustainalytics provides ESG risk score, and environmental, social, governance risk scores respectively. The value ranges from 0 (negligible risk) to 100 (severe risk). Data available from 2018.	SUS
RepRisk index	RepRisk index (RRI) is constructed based on a proprietary algorithm that quantifies a company's reputational risk exposure to ESG issues. The value ranges from 0 to 100. Data available across all sample period .	RR
RepRisk incident	The total number of ESG incidents the firm experienced in each quarter.	\mathbf{RR}
GHG1 emission	Greenhouse gas emission from sources that are owned or controlled by the firm (Scope 1) in 1,000 metric tons CO2 equivalent.	ТС

 34 Since 2018, Sustainalytics has altered its methodology to adopt a new ESG risk score.

GHG1 intensity	Greenhouse gas emission from sources that are owned or controlled by the firm (Scope 1) in metric tons CO2 equivalent, scaled by total revenues in million USD.	ТС
Board diversity	The average of the percentage of female directors on broad and the percentage of non-white directors on broad.	ISS
Incident rate	The sum of cases that result in days away from work or transfers and other recordable cases in a given year, divided by the number of hours worked by all employees, multiplied by 200,000 (Caskey and Ozel, 2017).	OSHA
Monthly net re- turn	The change in accumulation unit value (AUV) during the period and divid- ing by the starting AUV. AUV takes into account fund expense ratio and all insurance expenses.	MS
Monthly return volatility	The standard deviation of a fund's monthly net returns over the sample period.	MS
Quarterly return	The standard deviation of a fund's US equity holding return based on its	MS,
	quarter-end noidings and quarterly stock return.	CRSP
Number of stocks held	The average number of US stocks held by the funds at each quarter-end over the sample period.	MS
Industry concen- tration	The sum of the squared deviations of the value weights for each of the 10 industries held by the fund, relative to the industry weights of the total stock market, following Kacperczyk et al. (2005)	MS
Risk premium	Monthly net return minus risk free rate.	MS
6-factor alpha	The alpha computed based on rolling window estimates of factor beta. For each	MS
	fund at month end, we use the previous 60 months to estimate the betas based on the 6-factor model (Fama-French five factors and momentum), requiring at least 36 monthly returns available.	
CAPM alpha	The alpha computed based on rolling window estimates of factor beta. For each fund at month end, we use the previous 60 months to estimate the betas based on the CAPM, requiring at least 36 monthly returns available.	MS
CAPM beta	The beta estimated using the previous 60 months' return and based on the CAPM, requiring at least 36 monthly returns available.	MS
Management fee	Reported actual percentage that was deducted from an investment's average net assets to pay the investment's management.	MS
Expense ratio	The percentage of fund assets paid for operating expenses and management fees, according to fund's annual report.	MS
Polluting indus- try	The top 15 industries with highest Scope 1 GHG emission or intensity based on SASB SICS 77-industry. Polluting industries include coal operations, construc- tion materials, iron & steel producers, oil & gas exploration & production, oil & gas midstream, oil & gas refining & marketing, agricultural products, electric utilities & power generators, gas utilities & distributors, waste management, pulp & paper products, chemicals, air freight & logistics, airlines, car rental & leasing, cruise lines, marine transportation, and rail transportation.	CS

D Online Appendix: Supplementary Figures

Figure D.1: Overlapping of top 25 emitters and top 25 stocks by market cap. This figure displays the top 25 emitters and their presence among the top 25 stocks by market capitalization. The vertical axis lists all companies that have ever been in the top 25 emitters during the sample period from 2010 to 2022. Each cell represents a company's status for a specific quarter. The lightest color indicates that the company is not among the top 25 emitters but not among the top 25 stocks by market capitalization. Dark blue indicates that the company is present in both the top 25 emitters and top 25 stocks by market capitalization lists. Panel A focuses on the top 25 emitters based on absolute GHG (Scope 1) emissions, while Panel B focuses on the top 25 emitters based on emission intensity.



(A) Top emitters by absolute emission



OGE ENERGY CORP AMERICAN ELECTRIC POWER CO DUKE ENERGY CORP ALLETE INC PNM RESOURCES INC XCEL ENERGY INC NRG ENERGY INC PINNACLE WEST CAPITAL CORP PPL CORP WEC ENERGY GROUP INC AMEREN CORP MGE ENERGY INC GREAT PLAINS ENERGY INC CALPINE CORP KENON HOLDINGS LTD DYNEGY INC FIRSTENERGY CORP IDACORP INC VISTRA CORP WESTMORELAND COAL CO CLECO CORP CF INDUSTRIES HOLDINGS INC ATLANTIC POWER CORP SFL CORP LTD TECO ENERGY INC DTE ENERGY CO EAGLE MATERIALS INC CONSOL ENERGY INC PORTLAND GENERAL ELECTRIC CO COSTAMARE INC DIANA SHIPPING INC ENTERGY CORP ENETI INC OTTER TAIL CORP ATLAS CORP GLOBAL SHIP LEASE INC GOLAR LNG LTD AVISTA CORP DANAOS CORPORATION QUESTAR CORP DOMINION ENERGY INC PROGRESS ENERGY INC EDISON INTERNATIONAL TEEKAY CORP SCORPIO TANKERS INC GEVO INC SAFE BULKERS INC HALLADOR ENERGY CO DHT HOLDINGS INC INTERNATIONAL SEAWAYS INC ALLEGHENY ENERGY INC SEANERGY MARITIME HOLDINGS C STAR BULK CARRIERS CORP CLEVELAND-CLIFFS INC BERRY CORP CIVITAS RESOURCES INC NATIONAL FUEL GAS CO SCANA CORP NISOURCE INC NEXTERA ENERGY INC TALEN ENERGY CORP -OLD VECTREN CORP



E Online Appendix: Supplementary Tables

Table E.1: Holdings of top 25 emitters by emission intensity. This table shows the holdings of top emitters by Scope 1 GHG emission intensity of ESG funds. The sample is restricted to fund-quarters with at least 60% of holdings having available GHG emission data. In Panel A, the dependent variable is the difference in holdings of top emitters between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted holdings of top emitters. "Diff%" is calculated by scaling the "Diff" using the benchmarks' holdings of top emitters. These differences are further broken down into extensive margin and intensive margin. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

			Holdings of top 25 emitters (fund-benchmark)						
		(.	1)	(2)	(3)	(4)	(5)	(6)	
ESG fund		-0.0	000	-0.002***	-0.002***	-0.002***	-0.004***	-0.004***	
		(-0.'	733)	(-3.588)	(-3.235)	(-2.874)	(-2.949)	(-3.040)	
ESG fund \times Active	Э					-0.002**	-0.001	-0.001	
						(-2.005)	(-1.201)	(-0.395)	
Non-ESG fund $\times A$	Active					-0.004***	-0.003***	-0.003***	
						(-5.976)	(-5.058)	(-3.682)	
Ln(TNA)					-0.000***			-0.000***	
					(-2.974)			(-2.790)	
Quarterly return					0.001			0.001	
					(0.948)			(0.951)	
Management fee					-0.001			-0.001	
					(-1.075)			(-1.255)	
Constant		-0.00)4***	-0.004***	0.005*	-0.000	-0.001*	0.007**	
_		(-15.	.287)	(-19.786)	(1.730)	(-0.723)	(-1.937)	(2.456)	
Quarter FE		Ν	ю	Yes	Yes	No	Yes	Yes	
Fund family FE		Ν	ю	Yes	Yes	No	Yes	Yes	
MS category FE		N	ю	No	No	No	Yes	Yes	
MS category \times Ind	lex fund	FE N	ю	Yes	Yes	No	No	No	
N		108	,385	$108,\!352$	$104,\!952$	$108,\!385$	108,352	104,952	
Adj. R^2		0.0	000	0.277	0.280	0.004	0.276	0.278	
Panel B. Descriptiv	ve statis	tics							
	Fund	Benchmark	Diff	Diff%	Extensive	margin Ir	ntensive marg	in Obs	
ESG (all)	0.7%	1.1%	-0.4%	6 -38.5%	192.2	2%	-92.2%	14,364	
ESG (active)	0.7%	1.1%	-0.5%	~ -40.9%	192.8	3%	-92.8%	12,552	
ESG (index)	1.0%	1.2%	-0.3%	6 -23.1%	185.7	1%	-85.7%	1,812	
Non-ESG (all)	0.9%	1.3%	-0.4%	~ -30.4%	232.5	5%	-132.5%	94,021	
Non-ESG (active)	0.8%	1.3%	-0.4%	~ -34.0%	224.8	3%	-124.8%	84,160	
Non-ESG (index)	1.4%	1.4%	0.0%	6 -3.0%	895.3	8%	-795.3%	9,861	

Panel A. ESG funds vs non-ESG funds

Table E.2: Individual ESG scores. This table shows the portfolio-level ESG scores from five rating agencies. The sample is restricted to fund-quarters with at least 60% of holdings having available ESG scores data from each of the rating agencies, including KLD, MSCI, Refinitiv, S&P, and Sustainalytics. "Diff" is the difference of portfolio-level value-weighted E scores between funds and their benchmarks. "Diff%" is calculated by scaling the "Diff" using the benchmarks' ESG score. For the subsample of fund-quarters with higher portfolio-level ESG scores than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. For a comprehensive description of the variables, please refer to Appendix C.

		Full sample					Sample with higher fund FSC score than benchmark		
		Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs
	ESG (all)	49.08	48.50	0.58	1.2%	14,739	2.8%	97.2%	9,369
	ESG (active)	48.95	48.48	0.47	1.0%	12,899	1.2%	92.8%	1,081
MSCI	LSG (mdex)	49.95	48.00	1.32	2.170	1,040	-17.270	117.270	1,000
	Non-ESG (all)	47.29	47.45	-0.14	-0.3%	100,019	9.970	90.170 95 107	47,905
	Non FSC (index)	41.22	47.38	-0.10	-0.370	90,233 10.286	14.970 91.4%	00.170 191.4%	6 502
	Non-ESG (mdex)	41.01	41.02	0.05	0.170	10,200	-21.470	121.470	0,032
	ESG (all)	63.38	63.88	-0.50	-0.8%	$14,\!141$	-32.9%	132.9%	$7,\!829$
	ESG (active)	62.71	63.55	-0.83	-1.3%	$12,\!330$	-40.0%	140.0%	$6,\!235$
BEF	ESG (index)	67.92	66.17	1.75	2.6%	1,811	-5.0%	105.0%	$1,\!594$
1021	Non-ESG (all)	58.81	59.58	-0.78	-1.3%	89,292	-25.9%	125.9%	43,713
	Non-ESG (active)	58.46	59.32	-0.85	-1.4%	79,766	-31.9%	131.9%	$37,\!471$
	Non-ESG $(index)$	61.71	61.84	-0.14	-0.2%	9,526	10.6%	89.4%	$6,\!242$
	ESG (all)	52.78	52.67	0.11	0.2%	$10,\!015$	-21.5%	121.5%	$5,\!985$
	ESG (active)	52.69	52.64	0.06	0.1%	8,785	-27.4%	127.4%	$4,\!875$
KID	ESG (index)	53.38	52.89	0.49	0.9%	1,230	4.5%	95.5%	$1,\!110$
KLD	Non-ESG (all)	52.10	52.17	-0.06	-0.1%	80,205	-19.3%	119.3%	$40,\!350$
	Non-ESG (active)	52.07	52.13	-0.06	-0.1%	$72,\!454$	-19.9%	119.9%	35,785
	Non-ESG $(index)$	52.40	52.46	-0.06	-0.1%	7,751	-14.7%	114.7%	4,565
	ESG (all)	40.31	39.63	0.69	1.7%	$11,\!990$	-11.5%	111.5%	$7,\!676$
	ESG (active)	39.74	39.38	0.36	0.9%	$10,\!393$	-15.5%	115.5%	$6,\!221$
Sl-D	ESG (index)	44.04	41.25	2.78	6.7%	1,597	5.5%	94.5%	$1,\!455$
S&F	Non-ESG (all)	37.51	37.73	-0.23	-0.6%	$68,\!637$	-16.4%	116.4%	$35,\!947$
	Non-ESG (active)	37.31	37.56	-0.25	-0.7%	$61,\!150$	-19.6%	119.6%	$31,\!130$
	Non-ESG (index)	39.13	39.15	-0.01	0.0%	$7,\!487$	4.3%	95.7%	4,817
	ESG (all)	60.64	60.77	-0.12	-0.2%	8,447	-37.6%	137.6%	4,631
	ESG (active)	60.38	60.69	-0.31	-0.5%	$7,\!337$	-51.9%	151.9%	$3,\!602$
STIC	ESG (index)	62.41	61.30	1.12	1.8%	$1,\!110$	12.3%	87.7%	1,029
505	Non-ESG (all)	59.76	60.19	-0.43	-0.7%	$56,\!900$	-53.2%	153.2%	25,724
	Non-ESG (active)	59.69	60.17	-0.48	-0.8%	50,752	-64.4%	164.4%	$21,\!612$
	Non-ESG $(index)$	60.36	60.39	-0.03	0.0%	$6,\!148$	6.0%	94.0%	4,112
Table E.3: Individual E scores. This table shows the portfolio-level E scores from five rating agencies. The sample is restricted to fund-quarters with at least 60% of holdings having available E scores data from each of the rating agencies, including KLD, MSCI, Refinitiv, S&P, and Sustainalytics. "Diff" is the difference of portfolio-level value-weighted E scores between funds and their benchmarks. "Diff%" is calculated by scaling the "Diff" using the benchmarks' E score. For the subsample of fund-quarters with higher portfolio-level E scores than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. For a comprehensive description of the variables, please refer to Appendix C.

			Full sample				Sample E score	with higher f than benchm	und ark
		Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs
	ESG (all)	60.07	58.92	1.15	2.0%	14,266	27.4%	72.6%	9,180
	ESG (active)	59.69	58.72	0.97	1.6%	$12,\!458$	27.1%	72.9%	$7,\!491$
MSCI	ESG (index)	62.74	60.31	2.44	4.0%	1,808	28.7%	71.3%	$1,\!689$
MISCI	Non-ESG (all)	55.71	55.85	-0.14	-0.3%	$91,\!801$	31.5%	68.5%	$45,\!552$
	Non-ESG (active)	55.58	55.71	-0.13	-0.2%	$82,\!072$	35.7%	64.3%	$39,\!653$
	Non-ESG $(index)$	56.79	57.03	-0.24	-0.4%	9,729	3.7%	with higher for than benchm. Within ind 72.6% 72.9% 71.3% 68.5% 64.3% 96.3% 135.5% 136.8% 130.7% 131.9% 139.6% 86.2% 109.4% 106.7% 119.4% 99.0% 99.0% 99.0% 99.0% 108.2% 113.3% 87.9% 114.7% 117.8% 95.1% 120.4% 129.8% 88.9% 114.6% 120.5% 82.7%	$5,\!899$
	ESG (all)	58.49	59.25	-0.77	-1.3%	$14,\!004$	-35.5%	135.5%	$7,\!641$
	ESG (active)	57.54	58.76	-1.22	-2.1%	$12,\!196$	-36.8%	136.8%	6,023
BEE	ESG (index)	64.83	62.54	2.30	3.7%	1,808	-30.7%	130.7%	$1,\!618$
цы	Non-ESG (all)	52.56	53.67	-1.11	-2.1%	87,817	-31.9%	131.9%	$42,\!136$
	Non-ESG (active)	52.08	53.30	-1.22	-2.3%	$78,\!424$	-39.6%	139.6%	36,069
	Non-ESG (index)	56.55	56.78	-0.23	-0.4%	9,393	13.8%	86.2%	6,067
	ESG (all)	54.52	54.49	0.03	0.1%	9,361	-9.4%	109.4%	$5,\!150$
	ESG (active)	54.41	54.46	-0.05	-0.1%	8,175	-6.7%	106.7%	4,068
KID	ESG (index)	55.33	54.71	0.61	1.1%	$1,\!186$	-19.4%	119.4%	1,082
RLD	Non-ESG (all)	53.96	54.11	-0.15	-0.3%	67,777	1.0%	99.0%	$31,\!491$
	Non-ESG (active)	53.93	54.09	-0.16	-0.3%	60,788	1.0%	99.0%	27,167
	Non-ESG (index)	54.22	54.27	-0.05	-0.1%	6,989	1.0%	99.0%	4,324
	ESG (all)	41.62	41.14	0.47	1.1%	$11,\!981$	-8.2%	108.2%	$7,\!284$
	ESG (active)	40.72	40.75	-0.03	-0.1%	$10,\!384$	-13.3%	113.3%	$5,\!815$
Cℓ-D	ESG (index)	47.44	43.70	3.74	8.6%	$1,\!597$	12.1%	87.9%	$1,\!469$
JAL	Non-ESG (all)	36.50	37.04	-0.54	-1.5%	$68,\!478$	-14.7%	114.7%	$34,\!859$
	Non-ESG (active)	36.12	36.73	-0.61	-1.6%	60,993	-17.8%	117.8%	$30,\!052$
	Non-ESG $(index)$	39.58	39.57	0.01	0.0%	$7,\!485$	4.9%	95.1%	$4,\!807$
	ESG (all)	61.59	61.84	-0.25	-0.4%	8,408	-20.4%	120.4%	$4,\!542$
	ESG (active)	61.15	61.70	-0.55	-0.9%	7,298	-29.8%	129.8%	3,500
SUS	ESG (index)	64.44	62.74	1.71	2.7%	$1,\!110$	11.1%	88.9%	$1,\!042$
505	Non-ESG (all)	59.83	60.45	-0.61	-1.0%	56,274	-14.6%	114.6%	$25,\!879$
	Non-ESG (active)	59.70	60.39	-0.69	-1.1%	$50,\!301$	-20.5%	120.5%	21,798
	Non-ESG (index)	60.95	60.96	-0.01	0.0%	5,973	17.3%	82.7%	4,081

Table E.4: *RepRisk index.* This table shows the portfolio-level RepRisk index. The sample is restricted to fund-quarters with at least 60% of holdings having available RepRisk index data. In Panel A, the dependent variable is the difference of portfolio-level value-weighted RepRisk index between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted RepRisk index. "Diff%" is calculated by scaling the "Diff" using the benchmarks' RepRisk index. For the subsample of fund-quarters with lower portfolio-level RepRisk index than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

	RepRisk index (fund-benchmark)							
	(1)	(2)	(3)	(4)	(5)	(6)		
ESG fund	-0.962***	-1.398***	-1.415***	0.790**	0.075	-0.442		
	(-4.198)	(-3.750)	(-3.544)	(2.371)	(0.129)	(-0.657)		
ESG fund \times Active				-2.758^{***}	-2.287^{***}	-0.977		
				(-8.438)	(-4.269)	(-1.435)		
Non-ESG fund \times Active				-0.734***	-0.633**	0.124		
				(-2.835)	(-2.116)	(0.349)		
Ln(TNA)			0.071^{**}			0.065^{*}		
			(2.035)			(1.844)		
Quarterly return			-0.823*			-0.931^{*}		
			(-1.689)			(-1.896)		
Management fee			-2.212^{***}			-1.936^{***}		
			(-5.500)			(-4.712)		
Constant	-1.021^{***}	-0.969***	-0.778	-0.364	-0.407	-0.976		
	(-13.061)	(-14.617)	(-1.015)	(-1.482)	(-1.467)	(-1.204)		
Quarter FE	No	Yes	Yes	No	Yes	Yes		
Fund family FE	No	Yes	Yes	No	Yes	Yes		
MS category FE	No	No	No	No	Yes	Yes		
MS category \times Active fund FE	No	Yes	Yes	No	No	No		
Ν	$93,\!439$	$93,\!413$	90,411	$93,\!439$	$93,\!413$	90,411		
Adj. R^2	0.004	0.359	0.363	0.011	0.346	0.348		

Panel A. ESG funds vs non-ESG funds

Panel B. Descriptive statistics

		Full	sample	Sample	e with lower fu	ınd		
		Fun	sampic			RepRisk in	dex than bend	chmark
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs
ESG (all)	25.68	27.66	-1.98	-7.2%	11,203	42.8%	57.2%	6,886
ESG (active)	25.04	27.37	-2.33	-8.5%	9,787	42.7%	57.3%	6,469
ESG (index)	30.09	29.66	0.43	1.4%	1,416	45.1%	54.9%	417
Non-ESG (all)	22.36	23.38	-1.02	-4.4%	$82,\!236$	51.5%	48.5%	46,730
Non-ESG (active)	22.11	23.21	-1.10	-4.7%	$73,\!687$	54.0%	46.0%	$43,\!434$
Non-ESG (index)	24.46	24.83	-0.36	-1.5%	$8,\!549$	18.6%	81.4%	$3,\!296$

Table E.5: *ESG incidents.* This table shows the portfolio-level ESG incidents. The sample is restricted to fund-quarters with at least 60% of holdings having available ESG incidents data from RepRisk. In Panel A, the dependent variable is the difference of portfolio-level value-weighted ESG incidents between funds and their benchmarks. "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an ESG (or non-ESG) fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. In Panel B, "Diff" is the same as the dependent variable in Panel A—the benchmark-adjusted ESG incidents. "Diff%" is calculated by scaling the "Diff" using the benchmarks' ESG incidents. For the subsample of fund-quarters with lower portfolio-level ESG incidents than the benchmarks, these differences are further broken down into across-industry and within-industry selection, based on the SICS 38-Subsector Classification. Average values across fund-quarter observations are provided. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

	ESG incidents (fund-benchmark)						
	(1)	(2)	(3)	(4)	(5)	(6)	
ESG fund	-0.849***	-0.825***	-0.847***	-0.269	-0.502	-0.762**	
	(-7.323)	(-4.881)	(-4.675)	(-1.191)	(-1.403)	(-2.017)	
ESG fund \times Active				-1.309^{***}	-1.020^{***}	-0.409	
				(-5.680)	(-3.041)	(-1.097)	
Non-ESG fund \times Active				-0.630***	-0.651^{***}	-0.304*	
				(-5.386)	(-4.515)	(-1.790)	
Ln(TNA)			0.030^{*}			0.030^{*}	
			(1.840)			(1.803)	
Quarterly return			0.978^{***}			0.964^{***}	
			(4.798)			(4.710)	
Management fee			-0.945***			-0.835***	
			(-5.420)			(-4.763)	
Constant	-0.593***	-0.596***	-0.544	-0.026	-0.012	-0.343	
	(-16.071)	(-19.314)	(-1.517)	(-0.235)	(-0.089)	(-0.895)	
Quarter FE	No	Yes	Yes	No	Yes	Yes	
Fund family FE	No	Yes	Yes	No	Yes	Yes	
MS category FE	No	No	No	No	Yes	Yes	
MS category \times Active fund FE	No	Yes	Yes	No	No	No	
Ν	$120,\!415$	120,384	116,746	$120,\!415$	$120,\!384$	116,746	
Adj. R^2	0.011	0.335	0.338	0.019	0.327	0.329	

Panel B. Descriptive statistics

		E.J	ll compl	Sample	e with lower fu	ınd		
		r u.	n sampi	e		ESG incide	ents than bend	chmark
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	Obs
ESG (all)	6.07	7.51	-1.44	-19.2%	14,932	21.4%	78.6%	9,871
ESG (active)	5.77	7.38	-1.60	-21.7%	$13,\!080$	20.6%	79.4%	9,214
ESG (index)	8.18	8.47	-0.29	-3.5%	1,852	32.1%	67.9%	657
Non-ESG (all)	4.53	5.12	-0.59	-11.6%	$105,\!483$	33.1%	66.9%	$63,\!102$
Non-ESG (active)	4.36	5.02	-0.66	-13.1%	$94,\!903$	33.9%	66.1%	$59,\!148$
Non-ESG (index)	6.04	6.06	-0.03	-0.4%	$10,\!580$	21.8%	78.2%	$3,\!954$

Table E.6: *Data vendors' ESG score methodologies.* This table details how various data vendors compute ESG scores. Panel A covers industry adjustments, while Panel B outlines the components considered and their associated weights.

Panel A. Industry adjustment

	Industry-specific weight	Industry-adjusted score
MSCI	Yes. Key Issue Weights are determined through a com-	MSCI provides Final Industry-
	bination of two factors: (1) how much each industry	Adjusted Company Score, but we
	contributes to the main externality connected to the is-	are using the unadjusted version in this
	sue as compared to other industries (for instance, how	study.
	carbon-intensive the industry is relative to other indus-	
	tries) and (2) the time horizon within which the exter-	
	nality may materialize.	
REF	Yes. The weight of environmental, social, and gover-	Yes. Refinitiv uses percentile rank scor-
	nance pillar scores vary across industries. Within in each	ing to compute the category scores. ³⁵
	pillar, the category weights of environmental and social	Environmental and social category
	pillar vary across industries depending on the material-	scores compare firms within TRBC in-
	ity. The category weights of governance pillar are the	dustry group, while governance cate-
	same across industries, Management $67\%,$ Shareholders	gory scores compare firms within the
	20%, CSR Strategy 13%, respectively.	same country of incorporation.
KLD	No.	No.
S&P	Yes. The weight of environmental, social, and gover-	No, but it is suggested to compare the
	nance dimension score vary across industries.	performance within industry.
SUS	Yes. Each industry has a customized weight matrix that	No.
	defines the relative importance of each indicator and	
	reflects the emphasis on key ESG issues per industry.	

 $^{{}^{35}}Score = \frac{(No. of companies with a worse value+No. of companies with the same value as the current one/2)}{No. of companies with a value.}$

	Component	Sub-score and Weights
MSCI	Environmental:	Sub-scores of
	 Climate change: Carbon emissions, Product carbon footprint, Climate change vulnerability, Financing environmental impact Natural capital: Water stress, Biodiversity and land use, Raw material sourcing Pollution and waste: Toxic emissions and waste, Packaging material and waste, Electronic waste Environmental opportunities: Opportunities in clean tech, Opportunities in green building, Opportunities in renewable energy 	each theme and issue and their weights are provided.
	Social:	
	 Human capital: Labor management, Health and safety, Human capital development, Supply chain labor standards Product liability: Product safety and quality, Chemical safety, Privacy and data security, Consumer financial protection, Responsible investment, Health and demographic risk Social opportunities: Opportunities in nutrition and health, Access to communications, Access to health care, and Access to finance 	
	Governance:	
	Corporate governanceCorporate behaviorStakeholder opposition: Community relations, Controversial sourcing	
REF	Environmental:	Performance
	 Emission: Emissions, Waste, Biodiversity, Environmental management systems Innovation: Product innovation, Green revenues, research and development (R&D) and capital expenditures (CapEx) Resource use: Water, Energy, Sustainable packaging, Environmental supply chain 	of data items are provided. It includes boolean data like policy human rights,
	Social:	and numeric data like total
	CommunityHuman rightsProduct responsibility: Responsible marketing, Product quality, Data	CO2 equiva- lent emissions

privacy • Workforce: Diversity and inclusion, Career development and training,

Working conditions, Health and safety

to revenues.

REF Governance:

- CSR strategy: CSR strategy, ESG reporting and transparency
- Management: Structure (independence, diversity, committees)
- Shareholders: Shareholder rights, Takeover defense

KLD Environmental

Social:

- Employee relations
- Diversity
- Human right
- Community
- Product

Governance

- S&P Environmental:
 - Food loss and waste
 - Climate strategy
 - Transition risk management
 - Biodiversity, ecosystems and land use
 - Waste management
 - Water use and management
 - Resource use and management

Social:

- Human capital management
- Human rights
- Labor relations
- Occupational health and safety
- Responsible marketing and labeling
- Community impact and relations
- Access and affordability
- Operational eco-efficiency and management

Governance

- Risk and crisis management
- Supply chain management
- Tax strategy
- Business ethics
- Corporate governance
- Customer relationship management
- Cyber security
- Product governance and excellence

Indicator variables for each strength and concern in each category are provided.

Sub-scores and their weights are provided. Raw data include firms' answer to CSA question and data points from and beyond company documents.

SUS Environmental:

• Formal environmental policy, Environmental management system, External certification of EMS, Environmental fines and non-monetary sanctions, Participation in carbon disclosure project, Scope of corporate reporting on GHG emissions, Programmes and targets to redice GHG emissions from own operations, Programmes and targets to increase renewable energy use, Carbon intensity, Carbon intensity trend, % Primary energy use from renewables, Operations related controversies or incidents

- Formal policy or programme on green procurement, Environmental supply chain incidents
- Products and services related controversies or incidents

Social:

- Policy on freedom of association, Formal policy on the elimination of discrimination, Programmes to increase workforce diversity, Percentage of employees covered by collective bargaining agreements, Employee turnover rate, Top employer recognition, Employee related controversies or incidents
- Scope of social supply chain standards, Supply chain monitoring system, Supply chain incidents
- Customer related controversies or incidents
- Activities in sensitive countries, Society and community related controversies or incidents
- Guidelines for philanthropic activities and primary areas of support, Corporate foundation, Percent cash donations of NEBT

Governance:

- Policy on bribery and corruption, Whistleblower programmes, Signatory to UN global compact, Tax transparency, Business ethics related to controversies or incidents
- CSR reporting quality, External verification of CSR reporting, Disclosure of directors' remuneration, Disclosure of directors' biographies, Oversight of ESG issues, Executive compensation tied to ESG performance, Board diversity, Separation of board chair and CEO role, Board independence, Audit committee independence, Non-audit fees relative to audit fees, Compensation committee independence, Governance related controversies or incidents
- Policy on political involvement and contributions, Total value of political contributions or political spending, Public policy related controversies or incidents

Sub-scores and their weights are provided. Table E.7: Consistent users of divestment investment strategies. This table compares the emissions, returns, and diversification of ESG funds that (consistently) use divestment strategies to those that do not. In Panel A, the dependent variables are absolute emissions and emission intensity. In Panel B, the dependent variables are risk premium, CAPM alpha and 6-factor alpha. In Panel C, the dependent variables are monthly return volatility and industry concentration. "Divestment" is a dummy variable that equals one if the fund does not hold any of the top 25 emitters for more than 80% of the quarters over the sample period, and zero otherwise. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with standard errors clustered by fund. For a comprehensive description of the variables, please refer to Appendix C.

Panel A. Emissions	

	А	bsolute emissio	n	Emission intensity		
	(1)	(2)	(3)	(4)	(5)	(6)
Divestment	-3343***	-3342***	-434*	-70***	-68***	-35***
	(-22.300)	(-21.801)	(-1.803)	(-10.658)	(-10.067)	(-3.573)
Ln(TNA)		-13	10		-3	-2
		(-0.201)	(0.222)		(-1.071)	(-0.944)
Quarterly return		42	-424		-2	-50***
		(0.291)	(-1.068)		(-0.225)	(-3.125)
Management fee		-85	-898***		-6	-25**
		(-0.293)	(-2.768)		(-0.892)	(-2.494)
Constant	3880^{***}	4229***	3904***	123***	181***	173***
	(26.414)	(2.935)	(3.881)	(26.823)	(3.407)	(4.514)
Quarter FE	No	No	Yes	No	No	Yes
Fund family FE	No	No	Yes	No	No	Yes
MS category \times Active fund FE	No	No	Yes	No	No	Yes
Ν	$14,\!932$	14,060	14,052	14,932	14,060	$14,\!052$
Adj. R^2	0.166	0.166	0.622	0.063	0.070	0.490

Panel B. Returns

	F	tisk premiun	ı	C	CAPM alpha		6-	-factor alpha	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Divestment	-0.001***	-0.001***	0.001	-0.172***	-0.176***	0.078	-0.118***	-0.108***	0.045
	(-2.831)	(-3.010)	(1.414)	(-5.188)	(-5.337)	(1.477)	(-3.634)	(-3.647)	(1.261)
Ln(TNA)		0.000^{***}	0.000		0.019^{***}	0.003		0.002	-0.002
		(4.138)	(0.052)		(2.749)	(0.200)		(0.238)	(-0.239)
Management fee		-0.000	-0.000		0.028	-0.005		0.236^{***}	0.079
		(-0.140)	(-0.088)		(0.806)	(-0.074)		(6.300)	(1.345)
Constant	0.008^{***}	0.002	0.008***	0.062^{***}	-0.358**	-0.047	0.195^{***}	-0.078	0.126
	(52.152)	(1.074)	(2.621)	(3.423)	(-2.262)	(-0.157)	(8.880)	(-0.448)	(0.585)
Quarter FE	No	No	Yes	No	No	Yes	No	No	Yes
Fund family FE	No	No	Yes	No	No	Yes	No	No	Yes
MS category \times	No	No	Yes	No	No	Yes	No	No	Yes
Active fund FE									
Ν	27,731	27,318	27,318	27,731	$27,\!318$	$27,\!318$	27,731	$27,\!318$	$27,\!318$
Adj. R^2	0.000	0.000	0.825	0.001	0.001	0.175	0.001	0.003	0.215

Panel C. Diversification

	Mon	onthly return volatility Industry concentration				tion
	(1)	(2)	(3)	(4)	(5)	(6)
Divestment	0.008***	0.007***	0.002	0.024***	0.024***	0.009*
	(6.433)	(6.303)	(1.420)	(7.517)	(6.952)	(1.822)
Ln(TNA)		-0.001***	-0.001***		-0.001*	0.000
		(-4.640)	(-3.854)		(-1.746)	(0.050)
Quarterly return		-0.135***	-0.225***		0.051	-0.146
		(-4.207)	(-5.778)		(0.864)	(-1.320)
Management fee		-0.003***	-0.002		0.008^{***}	0.011^{***}
		(-2.975)	(-1.008)		(3.853)	(2.682)
Constant	0.047^{***}	0.076^{***}	0.081^{***}	0.024***	0.039^{***}	0.020
	(82.768)	(15.547)	(12.759)	(17.540)	(2.884)	(1.114)
Quarter FE	No	No	Yes	No	No	Yes
Fund family FE	No	No	Yes	No	No	Yes
MS category \times Active fund FE	No	No	Yes	No	No	Yes
Ν	506	494	313	516	494	313
Adj. R^2	0.080	0.222	0.541	0.117	0.133	0.510

F SEC: Fund Disclosure Requirement

Fund Disclosure Requirement	ESG Integration Funds	ESG- Focused Funds	ESG Impact Funds
A description of how the fund incorporates ESG into investment selection and what factors it considers.	√	√	√
A description of how the fund considers environmental factors and what data sources the fund may consider.	√1	√1	√ 1
ESG Strategy Overview Table (see Appendix B)		√	1
Scope 1 & 2 carbon footprint		√ 1	√1
Scope 3 carbon footprint (by industry)		√ 1	√1
Weighted average carbon intensity		√ 1	√1
Number of total engagements2 and % related to ESG		√3	√3
% of ESG proposals supported		√3	√3
Impacts sought to achieve, key metrics to access progress, time horizon and relationship between return and impact.			√1

Summary of ESG Fund Disclosure Requirements

¹Only required if the fund considers environmental/GHG emissions factors as part of its investment strategy.

²Defined as "substantive discussion advocating for specific ESG goals to be accomplished over a time period, where progress toward meeting such goal is measurable, that is part of an ongoing dialogue regarding this goal."

³Only required if either proxy voting and/or engagement is used as a means of implementing the fund's ESG strategy.