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 "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 holding deviation and thus little outperformance on other ESG or financial measures: Over 90% of the emission reduction is achieved by selectively eliminating the 2% holdings comprising the top 25 highest-emitting companies; 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. Although emission reductions are achieved without compromising risk profiles based on standard factors, ESG funds are significantly less effective as a hedge against some macroeconomic risk factors, such as energy-driven inflation.

Keywords: ESG, Selection, Mutual funds, Benchmark, Top emitters

JEL classification: G23; M14

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1 Introduction

The growth of ESG funds has encountered notable challenges, as 2023 marked the first calendar year of net outflows in over a decade (Morningstar, 2024). Society demands to know whether and how these funds meet their sustainability promises. Existing literature documents that ESG funds exert minimal, if any, "treatment" or engagement with the companies they hold (e.g., Heath, Macciocchi, Michaely and C. Ringgenberg, 2023; Atta-Darkua, Glossner, Krueger and Matos, 2023). Any impact is likely through stock "selection," though the exact manner and extent of such selection remain ambiguous. Hence, understanding how these funds select and adjust their portfolios in pursuit of ESG objectives has important implications for investors' assessment of fund performance and risks, as well as for firms' cost of capital and corporate attention to environmental concerns.

The goal of this article is to systematically anatomize and quantify the stock selection practices of US equity ESG funds. Specifically, we examine whether and how ESG portfolio holdings differ from otherwise identical non-ESG funds (or relative to benchmark indices) in terms of carbon emission, ESG scores, and various social dimensions; and the costs associated with these selection strategies, including impacts on diversification, sensitivity to climate and inflation risks, and overall performance. We also explore differences in stock selection strategies between active and index funds.

Our research provides several novel insights into the stock selection processes of ESG funds. We highlight four key findings here. First, we find that ESG funds largely retain the primary components of benchmark indices in their portfolios, exhibiting minimal deviations in holdings, while selectively eliminating the top 25 emitting companies at extensive margin. This approach results in significantly reduced emissions at the portfolio level relative to benchmarks and non-ESG funds, with over 90% of the emission reduction attributable to adjustments in approximately 2% of holdings comprising the top emitters. Second, this

¹Larry 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 (Financial Times, 2023).

²Kim and Yoon (2023) find that PRI signatories do not necessarily construct portfolios with higher ESG score as compared to those of other. Gibson Brandon, Krueger and Schmidt (2021) show that higher ESG scores are evident in ESG funds in the global sample; however, this pattern is not present in the US sample.

strategy yields negligible differences in standard risk profiles, such as portfolio standard deviation. Yet, ESG funds are significantly less exposed to ESG-related risks. Thus, despite holding almost identical portfolios to non-ESG funds, ESG funds "walk the talk" by avoiding a handful of highly polluting firms. Third, ESG funds do not compromise financial performance; over the sample period (2000–2022), their returns have been comparable to those of similar non-ESG funds.

Fourth, the stock-selection strategies of index funds and active funds differ. Since index funds are constrained to track the performance of a pre-specified index, ESG index funds achieve emission reductions primarily through stock-level selection. In contrast, ESG active funds, which are less constrained, accomplish this more through industry-level selection.

To gain deeper insight into our research questions, we use two distinct choices for an appropriate risk-adjusted benchmark. First, we follow many related studies that compare ESG funds to non-ESG funds with similar characteristics (e.g., Hartzmark and Sussman, 2019; Heath et al., 2023). This approach enables us to evaluate the deviations in holdings of ESG funds relative to their non-ESG peers, given their focus on ESG considerations. However, this scaling is incomplete, as it does not account for the benchmark performance against which an ESG fund is typically evaluated—such as the Morningstar Category index for the fund's investment category. Indeed, this type of index benchmarking is commonly used when studying mutual fund performance (Ma, Tang and Gómez, 2019; Cohen, Kim and So, 2024). Hence, we add a comparison to a benchmark that often serves as an objective vardstick for evaluating performance and assessing fund manager compensation.³

We begin with investigating the extent to which ESG funds deviate from their otherwise similar non-ESG counterparts, i.e., matched non-ESG funds within the same Morningstar Category. Overall, we conclude that the holding deviations are negligible—based on the deviation levels between non-ESG funds and their closest matching non-ESG counterparts within the same category, serving as a placebo test. In our sample, 80% of ESG funds are classified as large-cap, with an average deviation of only 0.05 percent per stock relative to

³We maintain the flexibility to incorporate alternative benchmark index choices, such as the subjective Primary Prospectus Benchmark index sourced from funds' prospectuses (e.g., Sensoy, 2009; Cremers, Fulkerson and Riley, 2022), or other objective types of indices. Our main findings remain robust under these alternative specifications, with results available upon request.

their similar non-ESG counterparts; this is comparable to a similar 0.05 percent deviation per stock observed when comparing these non-ESG funds to their closest matching non-ESG funds. For the remaining 20% of ESG funds, the deviation can be larger, ranging from approximately 0.5 percent for mid-cap funds to about 1 percent for small-cap funds; yet is also comparable to the levels of deviation between similar non-ESG fund groups.

A striking observation from the portfolio holdings of ESG-designated mutual funds reveals that emission reductions are achieved predominantly through exclusion at the extensive margin rather than through adjusted weights at the intensive margin. Specifically, among the top 25 corporate emitters—responsible for over half of total reported emissions—35% of ESG funds refrain from holding any shares. Although these divestments represent less than 2% of total portfolio holdings, they account for over 90% of the realized emission reductions attributable to ESG screening. Outside this subset, ESG portfolios are statistically indistinguishable from non-ESG counterparts along environmental dimensions, suggesting that targeted exclusions, rather than broad-based decarbonization, drive the observable effects of ESG investing.

Upon closer inspection, we find that active and index funds employ somewhat different strategies to cut emission. Concerning the top 25 emitters, 38.9% of ESG active funds hold no shares, compared to just 4.5% of ESG index funds. Another crucial aspect is to understand whether the selection is achieved by de-weighting the brownest firms within each industry or simply de-weighting the brownest industries: 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, echoing active funds' focus on avoiding the top emitters. This is precisely due to the diversification constraints placed on passive funds, which lead them to de-weight specific firms within industries while still retaining the majority of industries in the benchmark.

Subsequent inquiry involves quantifying the greenness of ESG funds using various ESG metrics, including emissions, ESG ratings, board diversity, and ESG risk exposures. We consider both ESG performance between ESG funds and their Morningstar benchmark index as well as benchmark-adjusted ESG performance between ESG funds and comparable non-ESG counterparts, controlling for market-wide fluctuations over time and isolate within-

family and within-category variations.

The most significant and meaningful outperformance is sourced from real environmental metrics. The portfolios held by ESG funds display a significant 36% reduction in absolute GHG emissions and a 26% decrease in emission intensity when compared to their benchmark indices. Non-ESG funds' portfolios exhibit significantly higher emission than their ESG counterparts, though they also record lower emissions relative to their benchmarks. This latter finding suggests 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); Pastor, Stambaugh and Taylor (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 observing a substantial reduction in portfolio emissions, we find minimal—less than 1% (but significant)—cross-sectional differences in portfolio ESG or E scores between funds and their benchmark indices, as well as between ESG and non-ESG funds. This outcome becomes less surprising when noting the intrinsic characteristics of these scores: Many ratings incorporate additional components such as governance and disclosure, and the weight of emission reduction is limited. In addition, many of the ESG ratings apply industry adjustments, resulting in very limited cross-sectional variation in average scores across different industries (detailed in Table E.10 in Online Appendix Section E). This reconciles the discrepancies observed 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 ESG risk exposure. Using the Sustainalytics risk score and various RepRisk measures, we find that portfolio companies of ESG funds have a significantly 4% lower Sustainalytics risk score and a 19% smaller likelihood of ESG incidents compared to those in their benchmark indices, with even greater differences when compared to similar non-ESG counterparts. However, the outperformance of ESG funds on social aspects, such as board diversity and employee safety, is not significant.

A key question is whether the selection of green stocks comes at the expense of funds' performance (e.g., financial returns) and fundamental risk profiles, such as diversification,

volatility, and exposure to macroeconomic risks.

We begin by examining the financial performance of ESG funds, a topic of considerable debate in the literature.⁴ In general, net of fees, there are no significant differences between ESG funds and their comparable non-ESG counterparts based on risk-adjusted abnormal returns (e.g., 6-factor alpha, CAPM alpha); though ESG funds tend to slightly outperform non-ESG funds based on benchmark-adjusted net returns (with statistical significance).⁵ The outperformance, if any, is primarily driven by ESG index funds; nonetheless, the results are sensitive to the empirical specifications used—with full fixed effect structure and controls employed, the performance differences become negligible. Conversely, ESG active funds do not demonstrate outperformance, partly due to the higher management fees they charged compared to both ESG index funds and non-ESG active counterparts. Additionally, comparing the net-of-fee alpha of ESG funds to that of benchmark indices leads to the same conclusion.

ESG fund strategies may influence not only their returns but also their risk profiles, such as portfolio volatility, diversification, and market beta. We find that the average monthly return volatility of ESG funds is 4.76%, only marginally higher than the 4.56% observed in their benchmark indices and the 4.92% noted in non-ESG counterparts, though statistically significant.⁶ Not surprisingly, index funds consistently demonstrate lower volatility compared to active funds. This is despite ESG funds holding only 17% of the firms in their benchmark indices (see also Pollet and Wilson (2008)), and having twice the industry concentration of their benchmarks, another measure of diversification (e.g., Kacperczyk, Sialm and Zheng, 2005).

⁴The literature presents mixed conclusions regarding the relationship between ESG performance and financial performance, largely due to the diverse measures employed and the varying perspectives adopted in different studies. For instance, firm-level analysis generally suggests a positive association between ESG performance and financial outcomes (e.g., Eccles, Ioannou and Serafeim, 2014; Friede, Busch and Bassen, 2015; Bolton and Kacperczyk, 2021; Hsu, Li and Tsou, 2023; Bolton and Kacperczyk, 2023); while studies examining ESG funds tend to report a negative relationship (e.g., Hartzmark and Sussman, 2019; Raghunandan and Rajgopal, 2022; Gantchev, Giannetti and Li, 2024).

⁵When comparing the benchmark-adjusted abnormal returns of ESG and non-ESG funds, particularly after including controls and fixed effects, both the economic and statistical significance levels become very small—consistently less than 1 basis point of outperformance per month across all alpha measures.

⁶Note that the monthly return volatility is calculated as the standard deviation of monthly returns. Therefore, a monthly volatility of 4.87% corresponds to an annual volatility of approximately $4.76\% \times \sqrt{12} = 16.49\%$.

We also assess the systematic risk of ESG funds through their market beta. ESG funds exhibit a lower CAPM beta relative to their benchmark indices, while their beta levels are comparable to those of similar non-ESG funds.⁷ Another relevant set of risk factors are certain macroeconomic risks. In particular, many emission reduction strategies of ESG funds frequently lead to the avoidance of energy and utility stocks. Measured by exposure to energy inflation shocks (methodology outlined in Fang, Liu and Roussanov (2025)), ESG funds exhibit significantly lower energy beta relative to both their benchmark indices and non-ESG counterparts, demonstrating reduced effectiveness as a hedge against energy-driven inflation. Quantitatively, during the top one-sixth quantile of increase in energy prices periods, ESG funds underperform their non-ESG peers by an annualized excess return of 6.71%. This finding highlights the limitations of ESG funds' strategies in capturing benefits during energy-inflation episodes. Conversely, we also observe that during the bottom one-sixth quantile, when energy prices declined, ESG funds outperform their non-ESG counterparts by an annualized excess return of 3.97%. Overall, ESG funds are less exposed to energy shocks.

Our paper contributes to the literature on the association between institutional investors and corporate ESG performance (e.g., Pastor et al., 2023), particularly the selection strategies employed by ESG funds. The existing evidence on "selection" remains mixed and limited across various ESG measures and samples. For example, Raghunandan and Rajgopal (2022) find that self-labeled ESG funds select firms based solely on ESG scores rather than actual carbon emissions or compliance records, while Kim and Yoon (2023) report no improvement in ESG scores after funds became PRI signatories. While the majority of existing research has concentrated exclusively on comparing the performance differences between ESG and non-ESG fund portfolios, this study contributes to the literature by elucidating the underlying mechanisms through which such differences emerge. Our findings indicate that ESG funds deviation only modestly in holdings compared to otherwise identical non-ESG counterparts. Despite these small deviations, ESG funds achieve significant reductions in portfolio-level emissions—primarily by selectively excluding only a very small subset of high-

⁷As perhaps expected, ESG index funds have a lower market beta (0.831) compared to ESG active funds (0.918); in comparison, their benchmark indices have an average beta of 1.003.

emitting firms. Additionally, we employ a comprehensive set of Environmental and Social measures and show how results vary across these different measures.

Prior literature suggests that ESG investing may have limited real-world impact on corporate behavior and capital allocation. Edmans, Levit and Schneemeier (2023) demonstrate that exclusion strategies fail to effectively incentivize high-polluting companies to undertake corrective actions. Similarly, Berk and van Binsbergen (2021) show that ESG investing exerts minimal impact on firms' cost of capital. Broader empirical evidence also reveals minimal treatment and causal effects from ESG investment strategies. Our findings align with these results and provide the mechanistic explanation for these limited firm-level effects: The negligible divergence in holdings between ESG and non-ESG funds translates into equally negligible pressure on firms. This fundamental similarity in portfolio composition thus explains why ESG funds fail to generate meaningful pressure on corporate ESG practices or cost of capital.

Our study also contributes to the ongoing debate on the relationship between ESG performance and financial performance. Prior research using emissions as a metric has found evidence of a positive carbon premium (e.g., Bolton and Kacperczyk, 2021; Hsu et al., 2023; Bolton and Kacperczyk, 2023) and developed related theoretical frameworks (e.g., Pástor, Stambaugh and Taylor, 2021). However, more recent studies report no premium when considering emissions intensity or disclosed emissions metrics, or accounting for data release lags (e.g., Zhang, 2024; Aswani, Raghunandan and Rajgopal, 2023; Atilgan, Demirtas, Edmans and Gunaydin, 2023). Similarly, while some studies using ESG scores, such as Friede et al. (2015), find a positive relationship between ESG and financial performance, others, like Brammer, Brooks and Pavelin (2006) and Duque-Grisales and Aguilera-Caracuel (2021), report a negative association. Our paper addresses this question from the unique perspective of investment funds, employing a range of return metrics such as factor model alphas and benchmark-adjusted returns. We find that ESG funds are able to generate positive net-of-fee alpha, yet their net-of-fee financial performance is not significantly different from that of their benchmarks or comparable non-ESG peers, which reinforces our earlier insights into the

⁸Heath et al. (2023) show that ESG funds primarily engage in selection rather than treatment. 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.

fund selection strategies. Beyond this average effect, we find that ESG index funds stand out by consistently outperforming both ESG active funds and non-ESG funds. Understanding these nuances can aid investors in making more informed decisions that align with both their non-pecuniary values and financial objectives.

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. 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.

⁹Table E.1 in Online Appendix E provides a summary of the trade-off comparison among the three

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 1 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, Mateus and Todorovic, 2019; Cohen et al., 2024).

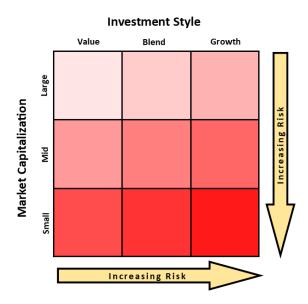


Figure 1: The Morningstar Category style box.

2.2 Fund data

To construct our sample, we use quarter-end holding data of all mutual funds investing in US equity, both active and inactive open-ended funds, 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:

benchmark options.

a fund being a sustainable investment product, or compliance with EU SFDR Article 8 (light green) or Article 9 (dark green).¹⁰

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

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.

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, Koelbel and Rigobon (2022).

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

¹⁰We 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" ("EU SFDR" criteria appy to all funds marketed in EU, including those investing in US equity markets). 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.

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, Servaes and Tamayo (2017).¹¹ 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.

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 serves as a proxy of negative ESG incident and sentiment, 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 data, which we aggregate to determine the number of negative ESG incidents per quarter.

¹¹The 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.

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, Hauptmann and Serafeim (2021). SICS offers varying levels of granularity, including an 11-sector version, a 38-subsector version, and a 77-industry 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.¹² Additionally, we incorporate the standard Fama-French 49 industries classification for a robustness check, and the primary results remain unchanged.

¹²For more details on the SASB industry data, see https://sasb.org/find-your-industry.

2.5 Summary statistics

We exclude fund-quarters with missing holding data, benchmark holding data, management firm information, or inconsistent benchmark across share classes.¹³ 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.¹⁴ 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 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,

¹³To 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.

¹⁴The average holdings of US equity in our sample funds are 81.9%.

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 $K = \{1, 2, ..., K\}$. 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 $\mathbf{w}_{jt} = (w_{jt}^1, w_{jt}^2, ..., w_{jt}^K)^T$, 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 $\mathbf{W}_{jt} = (W_{jt}^{I_1}, W_{jt}^{I_2}, ..., W_{jt}^{I_N})^T$.

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 value-weighted 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 fund-quarter 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

$$\Delta_{jt} = \boldsymbol{s}_{t}^{T}(\boldsymbol{w}_{jt} - \overline{\boldsymbol{w}}_{jt}) \qquad \text{(stock-level expression)}$$

$$= \boldsymbol{S}_{jt}^{T} \boldsymbol{W}_{jt} - \overline{\boldsymbol{S}}_{jt}^{T} \overline{\boldsymbol{W}}_{jt} \quad \text{(industry-level expression)}$$
(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

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

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

Another way of decomposition differentiates extensive margin and intensive margin, specifically for holdings of top emitters. Extensive margin speaks for the decision of whether to hold the stock or not. It is computed as the sum of the weights of stocks that are held

by the benchmark but not held by the fund, scaled by the sum of the weights of top 25 emitters. The weights are determined by the benchmark portfolio holdings. While intensive margin refers to the decision to underweight or overweight the top emitters relative to the benchmark, conditional on the stock being held. Mathematically,

$$\%Extensive_{jt} = \sum_{\substack{w_{jt}^k = 0, \\ \overline{w}_{jt}^k \neq 0}} s_t^k \overline{w}_{jt}^k / \sum s_t^k \overline{w}_{jt}^k$$

$$\%Intensive_{jt}^{underweight} = \sum_{\substack{w_{jt}^k \neq 0, \\ \overline{w}_{jt}^k \neq 0, \\ w_{jt}^k < \overline{w}_{jt}^k}} s_t^k \overline{w}_{jt}^k / \sum s_t^k \overline{w}_{jt}^k$$

$$\%Intensive_{jt}^{overweight} = \sum_{\substack{w_{jt}^k \neq 0, \\ \overline{w}_{jt}^k \neq 0, \\ \overline{w}_{jt}^k \neq 0, \\ w_{jt}^k \geq \overline{w}_{jt}^k}} s_t^k \overline{w}_{jt}^k / \sum s_t^k \overline{w}_{jt}^k$$

$$(4)$$

where s_t^k equals 1 if firm k is one of the top 25 emitters by absolute emissions, 0 if otherwise.

Empirical design

For any ESG performance measure, we will present (i) comprehensive descriptive statistics that compare ESG funds, the entire sample of non-ESG funds, and their respective benchmarks, and (ii) an in-depth regression analysis to provide detailed insights into the extent to which ESG funds diverge from matched non-ESG funds with respect to their benchmark-adjusted performance:

$$BM\text{-}adj \ ESG \ performance_{jt} = \beta_0 + \beta_1 \times ESG \ fund_j + \vec{\gamma} \cdot \vec{V}_{jt} + \tau_t + \phi_f + \psi_c + \epsilon_{jt}$$

$$BM\text{-}adj \ ESG \ performance_{jt} = \beta_0 + \beta_1 \times ESG \ fund_j + \beta_2 \times ESG \ fund_j \times Active_j$$

$$+ \beta_3 \times Non\text{-}ESG \ fund_j \times Active_j + \vec{\gamma} \cdot \vec{V}_{jt} + \tau_t + \phi_f + \psi_c + \epsilon_{jt}$$

where \vec{V}_{jt} refers to standard control variables including ln(TNA), quarterly return and management fees, and τ_t denotes year-quarter fixed effect, ϕ_f denotes fund family fixed effect, ψ_c denotes fund category fixed effect. Incorporating these fixed effects enables us to isolate and examine the nuanced performance dynamics of ESG funds in a robust manner: We are

able to control for temporal market-wide fluctuations and to eliminate biases that may arise from comparing funds with inherently different risk and return profiles. More uniquely, the inclusion of fund family fixed effects allows us to isolate within-family variation, controlling for shared management styles, resources, and strategic objectives that can influence fund performance.

3.2 Holding deviation

We aim to determine the extent to which ESG funds deviate from their otherwise identical "optimal portfolios." But what defines their comparable "optimal portfolios" without ESG investment mandates? Although benchmark indices are predominantly utilized as reference points for assessing tracking error in returns, the data reveals the following patterns (shown in Table E.2 in Online Appendix Section E): (i) 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. ¹⁵ (ii) However, the number of stocks in ESG funds is much more comparable to that in non-ESG funds within the same category.

Therefore, 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 complicated 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.¹⁶ The matching process is conducted on an exclusive

¹⁵Note that 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. The number of stocks can also vary due to periodic rebalancing and changes in market conditions.

¹⁶Each 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

basis. After matching, 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, as presented in Table E.2 in Online Appendix Section E.

Recognizing that substantial differences in stock holdings can occur even among funds within the same category, we recommend comparing the average stock holdings of all ESG funds in a category to those 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.

In Column (1) and (2) of 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.

To assess the extent of deviation of ESG funds, we conduct a placebo test: We match the group of comparable non-ESG funds to their own closest non-ESG counterparts by performing again the same matching process—i.e., based on fund type, star rating, AUM, and Morningstar Category—then examine the deviation levels between these two groups of non-ESG funds. These deviation levels, shown in Column (3) and (4) of Table 2, serve as a reference. We find that the deviations between similar non-ESG funds are quite similar to those between ESG funds and their comparable non-ESG counterparts. This suggests that ESG funds, especially large-cap ones, have only marginal deviation in holdings.

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 period.

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. 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 corresponding benchmark indices assigned by Morningstar Category classification. These patterns persist when compared to non-ESG peers within the same category. The specifics of the emission results will be detailed in Section 4.1. In this section, our primary goal to answer a crucial question: How do ESG funds manage to select portfolios that achieve lower emission levels?

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 2. As illustrated in Panel A of Table 3 (Table E.3 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 (by emission intensity).

Note that 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, we find that these reduced holdings of top emitting profiles correspond to meaningfully lower emissions: 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 intuitively shown by Figure 3.

Another important insight from Panel A of Table 3 is that, when funds avoid top emitters, the reduction in emissions predominantly stems from extensive margin (on average 72.6% for ESG funds) rather than intensive margin, measured using equation (4).¹⁷ When examining the heterogeneity of this "top-emitters-avoidance" strategy between active and index funds, ESG active funds unsurprisingly exhibit a higher percentage of extensive margin avoidance compared to index funds. For top emitters by absolute emissions (by emission intensity), 38.9% (64.6%) of ESG active funds do not hold any of these top-emitting 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.¹⁸

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. This is evident from the variable Non-ESG $fund \times Active$ in Panel B of Tables 3 and E.3. 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.

Top emitters in major indices

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.

 $^{^{17}}$ The discussion of top emitters by emission intensity can be found in Table E.3 in Online Appendix Section E.

 $^{^{18}}$ The differences between ESG active and index funds are not clearly visible in Panel B of Tables 3 and E.3 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.

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. 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.

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. Our focus is particularly on the top 25 firms with the largest market capitalizations, as they are primary contributors to index returns. 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 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.

¹⁹Berkshire 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.

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

Another approach to building a greener investment portfolio—one that does not conflict with top-emitter avoidance strategies—is to generally avoid investing 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 Panel A of Table 4.20 Typically, ESG active funds hold fewer polluting industries (16.1% less) compared to ESG index funds (5.9% less). As shown in Panel B, the benchmark-adjusted holdings of polluting industries are also significantly lower for ESG funds compared to their non-ESG counterparts.

Further analysis of the polluting-industry avoidance 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 A and of Table 5, 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.²¹ 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 C of Table 5.²²

The result that ESG index funds perform selection in a more granular way (de-weighting

 $^{^{20}}$ The 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.

²¹In 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.

²²The results for absolute emissions follow a similar pattern, albeit less strongly: As shown in Table 6, 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.

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 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 within-industry 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 by briefly mentioning 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 "weighted-average carbon intensity" (WACI) of the portfolio (Robertson and Sanga, 2023).²³ 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.²⁴ 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 emission intensity, while Table 6 focuses on absolute emissions. ESG funds do live up to their claims of selecting less polluting portfolios than their benchmark indices. The differences are both large and statistically significant: (i) absolute emissions are 35.9% lower for ESG funds compared to their benchmarks, 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 A 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 B of Table 6 and 5). However, a somewhat counterintuitive finding is that non-ESG funds, particularly non-ESG active funds, show

 $^{^{23}}$ 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."

²⁴Name That Boon: SEC Proposes Rules on ESG Fund Names & Disclosures.

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 both individual ESG scores and a combined ESG score, i.e., the average of the existing ESG scores including MSCI, Refinitiv, KLD, S&P Global, and Sustainalytics.²⁵ 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 of combined ESG scores are presented in Table 7. ESG funds tend to select stocks with slightly higher though statistically significant ESG scores compared to both their benchmark indices (Panel A) and non-ESG peers within the same Morningstar Category (Panel B), with average percentage differences mostly less than 1%.²⁶ This difference in scores between ESG and non-ESG funds is partly consistent with previous literature exam-

²⁵Note 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.

²⁶For the comparison between ESG and non-ESG funds within the same category, the net benchmark-adjusted difference is around 0.5 and the group average is around 50.

ining the US PRI signatories (e.g., Gibson Brandon, Glossner, Krueger, Matos and Steffen, 2022; Kim and Yoon, 2023). The findings from various rating agencies provide consistent evidence, as detailed in Table E.4 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. Therefore, despite a significant discrepancy and low correlation among various rating providers, we can rule out the possibility that using combined ESG scores results in individual score-level differences negating each other.

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 B in Table 7. This difference becomes less pronounced in column (6) when 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 (≈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.6 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 5, the cross-sectional industry average ESG score variations are minimal.²⁷ 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, 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.10 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 A of Table 7, primarily stems from within-industry selection rather than across-industry selection, which corroborates the observations in Figure 5.

²⁷We use industries defined by SASB SICS 38 Subsectors. The results remain similar, if not worse, when using the Fama-French 49 Industry Classification.

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.10 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.²⁸

The results of Sustainalytics risk score are provided in Table 9.²⁹ The RepRisk measures, including RRI and number of ESG incidents, can be found in Table E.8 and E.9 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% less RRI and a significant 4.1% lower risk score (Panel A). 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 B of Tables 9, E.8, and E.9. 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.

²⁸Papers utilizing the RepRisk measures include Houston, Lin, Shan and Shen (2022), Gantchev, Giannetti and Li (2022), Bonelli, Brière and Derrien (2022), Derrien, Krueger, Landier and Yao (2022), and Duan, Li and Michaely (2023).

²⁹The scores have only been available since 2018, resulting in a smaller number of observations.

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 5, 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].³⁰

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.

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.³¹ 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 A of Table 10. Similarly, non-ESG funds have less diversified boards

³⁰Note 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.

³¹Hence we remove the restriction of having 60% holding data available in this specific analysis.

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 Panel A when compared to their benchmarks and the variable Non-ESG $fund \times Active$ in Panel B when compared to similar ESG counterparts. 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 better employee safety, especially when compared to their similar non-ESG counterparts; but only marginally better board diversity.

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 funds' financial performance, portfolio diversification, portfolio return volatility, exposure to systemic risks and other macroeconomic risks, etc. The overall costs appear to be negligible.

5.1 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 (excess return) and alphas (CAPM, 4-factor, 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: Net-of-fee risk premium 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.³². The alphas are calculated as the risk-adjusted excess return based on factor models for which the beta is estimated based on previous 60-month returns, requiring at least 36 months of the return data available for estimation. The results are presented in Table 14.

As can be seen from Panel A of Table 14, for full-sample analysis, on average we show that ESG funds exhibit a slight underperformance compared to their benchmark indices in terms of monthly risk premium (-5.6bps/month), while outperform their benchmarks with respect to CAPM alpha (2.5bps/month), 4-factor alpha (4.3bps/month) and 6-factor alpha (16.7bps/month). However, when comparing benchmark-adjusted returns between ESG funds and their non-ESG peers within the same Morningstar Category, the outperformance only remains for risk-premium measure yet disappears across all alpha measures, especially when adding controls and fixed effects: (i) When measured by risk premium (Panel B), ESG funds show a persistent and statistically significant outperformance of 3.8bps/month; (ii) But when measured by CAPM/4-factor/6-factor alpha (Panel C/D/E), the outperformance of ESG funds no longer persist.

Within ESG funds, we further break down the fund types to identify by whom the net return difference, if any, is generated. The overall underperformance in net-of-fee risk premium stems from ESG active funds (-7.4bps/month). In contrast, ESG index funds exhibit significantly higher risk premium and alphas compared to the active peers, as evident from the full-sample summary in Panel A and the interaction term ESG fund \times Active in Panel B, C, D and E of Table 14. Quantitatively, when comparing ESG index funds to their benchmarks, ESG index funds notably outperform on average, with a 25bps higher monthly CAPM alpha, a 29bps higher monthly 4-factor alpha, and a 33bps higher monthly

³²AUVs 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.

6-factor alpha, as detailed in Panel A. This distinction between index and active funds also extends to non-ESG fund samples, based on the inspection of the interaction term non-ESG $fund \times Active$. In fact, non-ESG active funds consistently underperform their benchmarks after fees, regardless of the alpha measures employed.

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 16. 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.

5.2 Diversification and portfolio return volatility

ESG fund strategies may influence not only their financial performance but also their standard risk profiles. In this section, we examine 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).³³ 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

³³In 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.

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, 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 1.36% 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—calculated as the standard deviation of monthly/quaterly returns—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 (4.76% compared to 4.56% monthly, and 9.09% compared to 8.55% quarterly).³⁴ 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.³⁵

 $^{^{34}}$ For instance, a monthly volatility of 4.87% corresponds to an annual volatility of approximately $4.76\%\times\sqrt{12}=16.49\%.$

³⁵All the findings in this section remain robust when comparing matched samples of ESG and non-ESG

Not all ESG funds are born equal

It is also likely that ESG funds employing different strategies exhibit varying financial performance and risk profile. 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.³⁶

We present the comparison results between ESG funds that employ divestment strategies and those that do not in Table E.11 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 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 and risk 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 (-0.1bps/month), CAPM alpha measure (-17.2bps/month), and 6-factor alpha measure (-11.8bps/month); though the results disapper after adding fixed effects. Additionally, these divestment funds appear to be somewhat less diversified, exhibiting slightly

funds, with detailed results available upon request.

 $^{^{36}}$ If we consider the full ESG fund sample, $136/516 \approx 26.4\%$ of ESG funds consistently divest from top emitters.

higher volatility and greater industry concentration compared to other ESG funds (Panel C).

5.3 Beta

We further examine the systematic risk of ESG funds by investigating their CAPM beta, with the results presented in Table 14. As shown in Panel A, ESG funds exhibit an average beta of 0.907 post fees, while their benchmarks have a beta of 1.003 post fees. However, ESG funds do not seem to differ from their comparable non-ESG counterparts in terms of benchmark-adjusted beta, both economically and statistically. This holds true particularly when controls and fixed effects are included, as detailed in Panel B.

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

Besides standard risk factors, ESG strategies may also influence exposure to other risks. As we show in the previous sections, ESG funds aim to reduce portfolio emissions by steering clear of major polluters and environmentally harmful industries, often resulting in a smaller investment in utility and energy sector companies. This strategy might have a downside, as it could limit the funds' ability to benefit from potential increases in the value of energy and utility stocks.

To illustrate, we examine their exposure to macroeconomic risks, such as inflation. Using the approach outlined by Fang et al. (2025), we construct inflation shock variable at monthly level by estimating the unexpected components of inflation with a vector autoregression (VAR) model. This VAR model incorporates headline, core, food, and energy inflation, along with the risk-free rate and the log price-dividend ratio of the aggregate stock market portfolio. We then assess each fund's and benchmark's exposure to these inflation shocks by

regressing their monthly excess returns against the inflation shocks.

The results are reported in Table 15. In the first specification (Column (1) to (3)), we use the headline inflation shock as a risk factor, while in the second specification (Column (4) to (6)), we include core and energy inflation shocks jointly as risk factors. ESG funds exhibit significantly lower in-sample headline and energy betas compared to both their benchmarks and non-ESG funds.

This finding suggests that ESG funds are less exposed to energy shocks, in other words, somewhat less effective as a hedge against energy-driven inflation shocks, aligning with our expectations. In quantitative terms, during months when energy inflation shocks exceed 30% (the top 1/6 quantile of our sample), ESG funds show an annualized excess return that is 6.71% lower than that of non-ESG funds; Conversely, in the bottom 1/6 quantile, when energy prices fell, ESG funds outperform their non-ESG counterparts by an annualized excess return of 3.97%. That is to say, during the period of heightened energy inflation, for instance, in 2022, non-ESG funds and benchmarks, which typically have greater exposure to energy sector stocks, were able to benefit from the surge in energy prices. In contrast, ESG funds were less able to take advantage of this value inflation, underscoring the limitations of their strategies in capitalizing on energy-driven inflation shocks. Certainly, ESG funds generally outperform non-ESG funds except during these periods of high energy inflation shocks, and therefore, the average return pattern aligns with our findings throughout the entire sample period.

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, environmental and social performances, and risks through the lens of stock selection. To assess their performances, 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.

Overall, their selection process can be regarded as relatively superficial and narrow in scope. First, over 90% of this environmental performance is achieved by selectively avoiding a very small subgroup of top emitting profiles. On average, 35% of ESG funds do not hold any companies from this subgroup, that is to say, ESG funds mainly attain tangible outcomes through selection at extensive margin rather than intensive margin. Second, for the large-cap categories—where over 80% of ESG funds are classified—the average stock-level holding deviation is fairly small (less than 10 basis point). Therefore, it is unsurprising to expect their financial performance closely mirroring that of their benchmark indices and similar non-ESG counterparts, and their impact limited on portfolio companies' ESG improvements, attention to environmental and social issues, or cost of capital.

Upon quantifying their methods, outcomes, and costs, we conclude that ESG funds "walk the talk" 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, ESG funds do not outperform in terms of primary ESG scores and charge relatively higher management fees. They are also less effective as a hedge against some macroeconomic risk factors, such as energy-driven inflation.

We further categorize ESG funds into ESG active and ESG index sub-samples to explore their distinct strategies and performances. Interestingly, 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. Perhaps contrary to expectations, ESG index funds execute the selection in a more granular and rigorous manner; but this is 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.

In a nutshell, although ESG funds are making strides in creating greener portfolios, their efforts are regrettably limited. After all, these funds do not significantly engage in reducing firms' carbon footprints, and their selection strategies are only likely influential on at most a very small subset of firms. 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.

References

- Aswani, Jitendra, Aneesh Raghunandan, and Shivaram Rajgopal, "Are carbon emissions associated with stock returns?," Review of Finance, forthcoming, 2023.
- Atilgan, Yigit, K Ozgur Demirtas, Alex Edmans, and A Doruk Gunaydin, "Does the Carbon Premium Reflect Risk or Mispricing?," Working paper, 2023.
- Atta-Darkua, Vaska, Simon Glossner, Philipp Krueger, and Pedro Matos, "Decarbonizing institutional investor portfolios: Helping to green the planet or just greening your portfolio," *Working paper*, 2023.
- Berg, Florian, Julian F Koelbel, and Roberto Rigobon, "Aggregate confusion: The divergence of ESG ratings," *Review of Finance*, 2022, 26 (6), 1315–1344.
- Berk, Jonathan B. and Jules H. van Binsbergen, "The Impact of Impact Investing," Working paper, 2021.
- Bolton, Patrick and Marcin Kacperczyk, "Do investors care about carbon risk?," *Journal of financial economics*, 2021, 142 (2), 517–549.
- and _ , "Global pricing of carbon-transition risk," The Journal of Finance, 2023, 78 (6), 3677–3754.
- Bonelli, Maxime, Marie Brière, and François Derrien, "Do Employees Care about ESG? Evidence from Employee Share Plans," Working paper, 2022.
- Brammer, Stephen, Chris Brooks, and Stephen Pavelin, "Corporate social performance and stock returns: UK evidence from disaggregate measures," Financial management, 2006, 35 (3), 97–116.

- Brandon, Rajna Gibson, Philipp Krueger, and Peter Steffen Schmidt, "ESG rating disagreement and stock returns," *Financial Analysts Journal*, 2021, 77 (4), 104–127.
- _ , Simon Glossner, Philipp Krueger, Pedro Matos, and Tom Steffen, "Do responsible investors invest responsibly?," Review of Finance, 2022, 26 (6), 1389–1432.
- Caskey, Judson and N. Bugra Ozel, "Earnings expectations and employee safety," Journal of Accounting and Economics, 2017, 63, 121–141.
- Cohen, Lauren, David Kim, and Eric C. So, "Benchmark-Adjusted Performance of US Equity Mutual Funds and the Issue of Prospectus Benchmarks," Working paper, 2024.
- Cremers, KJ Martijn, Jon A Fulkerson, and Timothy B Riley, "Benchmark discrepancies and mutual fund performance evaluation," *Journal of Financial and Quantitative Analysis*, 2022, 57 (2), 543–571.
- Derrien, Francois, Philipp Krueger, Augustin Landier, and Tianhao Yao, "ESG News, Future Cash FLows, and Firm Value," Working paper, 2022.
- Duan, Tinghua, Frank Weikai Li, and Roni Michaely, "Consumers' Reaction to Corporate ESG Performance: Evidence from Store Visits," Working paper, 2023.
- Duque-Grisales, Eduardo and Javier Aguilera-Caracuel, "Environmental, Social and Governance (ESG) Scores and Financial Performance of Multilatinas: Moderating Effects of Geographic International Diversification and Financial Slack," *Journal of Business Ethics*, 2021, 168, 315–334.
- Eccles, Robert G, Ioannis Ioannou, and George Serafeim, "The impact of corporate sustainability on organizational processes and performance," *Management science*, 2014, 60 (11), 2835–2857.
- Edmans, Alex, Doron Levit, and Jan Schneemeier, "Socially Responsible Divestment," Working paper, 2023.
- Fang, Xiang, Yang Liu, and Nikolai L. Roussanov, "Getting to the Core: Inflation Risks Within and Across Asset Classes," Review of Financial Studies, forthcoming, 2025.

- Financial Times, "The real impact of the ESG backlash," www.ft.com/content/a76c7feb-7fa5-43d6-8e20-b4e4967991e7 December 2023.
- Friede, Gunnar, Timo Busch, and Alexander Bassen, "ESG and financial performance: aggregated evidence from more than 2000 empirical studies," *Journal of sustainable finance & investment*, 2015, 5 (4), 210–233.
- Gantchev, Nickolay, Mariassunta Giannetti, and Rachel Li, "Does Money Talk? Divestitures and Corporate Environmental and Social Policies," *Review of Finance*, 2022, 26 (6), 1469–1508.
- _ , _ , and _ , "Sustainability or performance? Ratings and fund managers' incentives,"

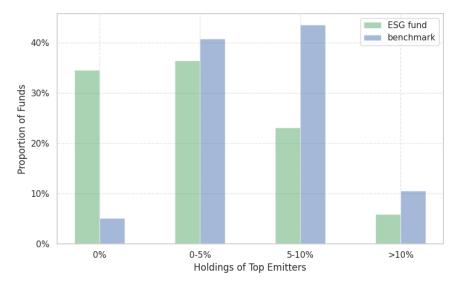
 Journal of Financial Economics, 2024, 155, 103831.
- Grewal, Jody, Clarissa Hauptmann, and George Serafeim, "Material sustainability information and stock price informativeness," *Journal of Business Ethics*, 2021, 171, 513–544.
- Hartzmark, Samuel M and Abigail B Sussman, "Do investors value sustainability? A natural experiment examining ranking and fund flows," The Journal of Finance, 2019, 74 (6), 2789–2837.
- Heath, Davidson, Daniele Macciocchi, Roni Michaely, and Matthew C. Ringgenberg, "Does socially responsible investing change firm behavior?," Review of Finance, 2023, 27 (6), 2057–2083.
- Houston, Joel F., Chen Lin Lin, Hongyu Shan, and Mo Shen, "How Does ESG Shape Consumption?," Working paper, 2022.
- Hsu, Po-Hsuan, Kai Li, and Chi-Yang Tsou, "The pollution premium," The Journal of Finance, 2023, 78 (3), 1343–1392.
- Kacperczyk, Marcin, Clemens Sialm, and Lu Zheng, "On the industry concentration of actively managed equity mutual funds," *The Journal of Finance*, 2005, 60 (4), 1983–2011.

- Kim, Soohun and Aaron Yoon, "Analyzing active fund managers' commitment to ESG: Evidence from the United Nations Principles for Responsible Investment," Management science, 2023, 69 (2), 741–758.
- Lins, Karl V., Henri Servaes, and Ane Tamayo, "Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis," Journal of Finance, 2017, 72, 1785–1824.
- Ma, Linlin, Yuehua Tang, and Juan-Pedro Gómez, "Portfolio Manager Compensation in the U.S. Mutual Fund Industry," *Journal of Finance*, 2019, 74 (2), 587–638.
- Mateus, Irina Bezhentseva, Cesario Mateus, and Natasa Todorovic, "Benchmark-Adjusted Performance of US Equity Mutual Funds and the Issue of Prospectus Benchmarks," *Journal of Asset Management*, 2019, 20 (1), 15–30.
- Morningstar, "U.S. sustainable funds register first annual outflows in 2023," www.morningstar.com/sustainable-investing/us-sustainable-funds-register-first-annual-outflows-2023 January 2024.
- Pástor, L'uboš, Robert F Stambaugh, and Lucian A Taylor, "Sustainable investing in equilibrium," *Journal of Financial Economics*, 2021, 142 (2), 550–571.
- Pastor, Lubos, Robert F Stambaugh, and Lucian A Taylor, "Green Tilts," Working paper, 2023.
- Pollet, Joshua M and Mungo Wilson, "How does size affect mutual fund behavior?," The Journal of Finance, 2008, 63 (6), 2941–2969.
- Raghunandan, Aneesh and Shiva Rajgopal, "Do ESG funds make stakeholder-friendly investments?," Review of Accounting Studies, 2022, 27 (3), 822–863.
- Robertson, Adriana Z. and Sarath Sanga, "Aggregating Values: Mutual Funds and the Problem of ESG," *University of Chicago Law Review Online*, 2023.
- **Sensoy, Berk A**, "Performance evaluation and self-designated benchmark indexes in the mutual fund industry," *Journal of Financial Economics*, 2009, 92 (1), 25–39.

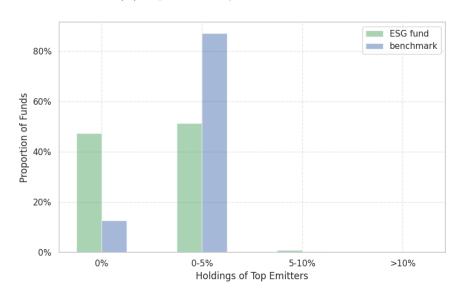
Zhang, Shaojun, "Carbon Returns Across the Globe," *Journal of Finance, forthcoming*, 2024.

A Figures

Figure 2: *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.

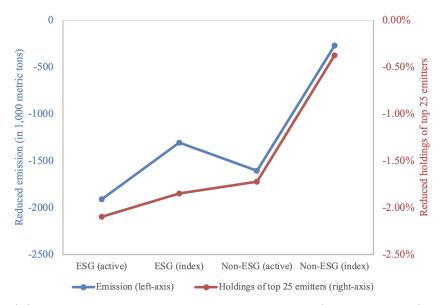


(A) Top emitters by absolute emission

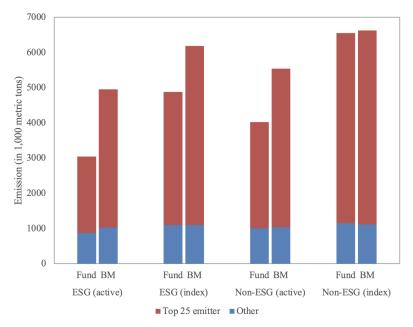


(B) Top emitters by emission intensity

Figure 3: ESG funds' strategy: avoidance of top emitters. Panel A displays the differences in holdings and emissions between ESG funds and their benchmark indices. Panel B breaks down the portfolio-level emissions for ESG funds and their matched non-ESG counterparts relative to their benchmarks. In the visualization, red areas indicate emissions attributable to the top 25 emitters, while blue areas correspond to emissions attributable to the remaining firms.

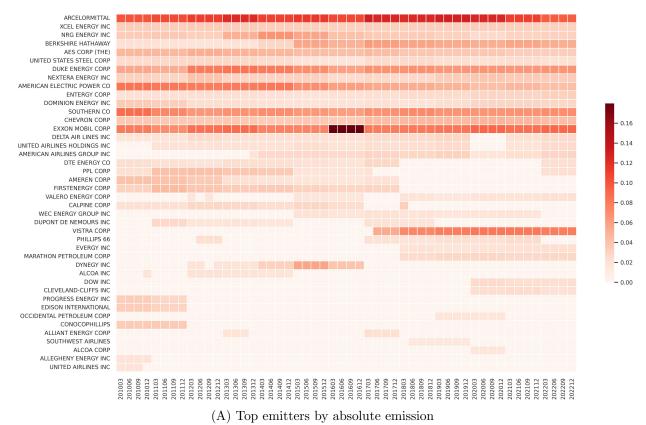


(A) Reduced emissions and holdings of top emitters (fund-benchmark)

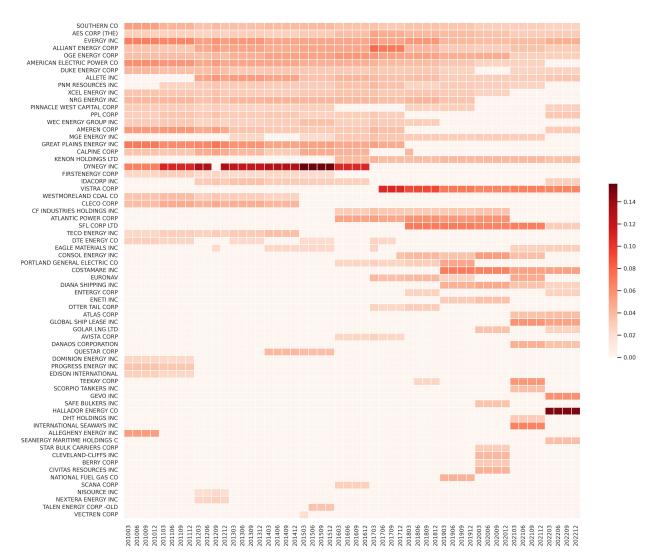


(B) Decomposition of emissions

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 absolute GHG (Scope 1) emissions, while Panel B focuses on the top 25 emitters based on emission intensity.³⁷

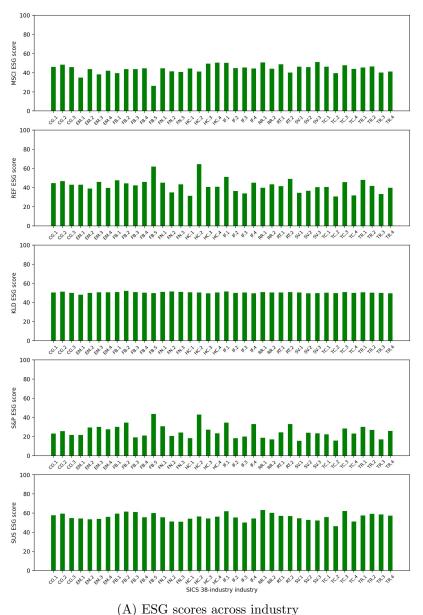


³⁷In Panel A, ExxonMobil's emission level in 2016 is abnormally high, which can be partly due to the November 2016 fire at Baton Rouge Refinery. The fire was caused by an explosion on a sulfuric-acid alkylation unit that made octane-boosting components of gasoline in the sprawling Baton Rouge refinery and chemical plant.

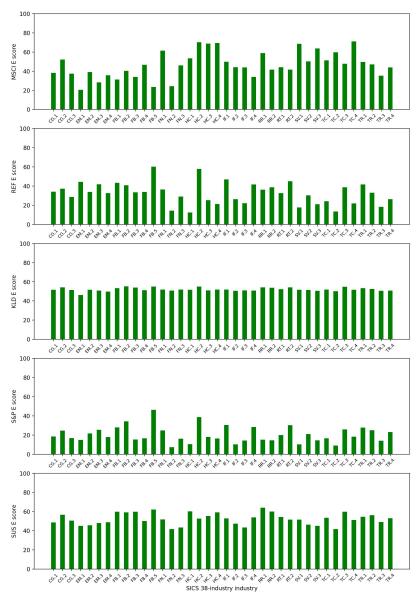


(B) Top emitters by emission intensity

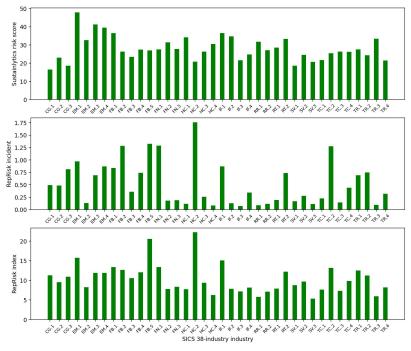
Figure 5: Industry variation of ESG scores and emissions. This figure shows the average ESG scores and emission across SICS 38 subsectors over the sample period from 2010 to 2022. Panel A shows the distribution of industry average (equal-weighted) ESG scores from the five rating agencies. Panel B and 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.³⁸



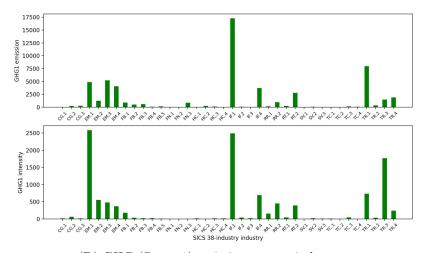
 $^{^{38}}$ As discussed in the main body of the paper, we present the Sustainalytics risk scores within the range of [0, 50] in Panel C. Since a score above 40 indicates the most severe category, only 2% of the fund-quarter observations exceed a score of 50, and none of the industry averages surpass this threshold.



(B) E scores across industry



(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. 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.

Panel A. Sample selection

	Fund-quarter	Number
	observations	of funds
US equity funds from MorningStar (2010-2022)	988,260	19,005
minus missing holding data	(360,177)	(1,822)
minus missing benchmark holding data	(38,559)	(157)
minus inconsistent benchmark across share classes	(8,664)	(254)
minus missing management firm	(644)	(14)
US equity funds with benchmark information	580,216	16,758
Aggregate share classes to fund level	124,171	3,914
minus US equity holding comprises less than 50% of fund holdings	(3,756)	(65)
US equity fund-quarter data	120,415	3,849
ESG funds	14,932	516
ESG active funds	13,080	452
ESG index funds	1,852	64
Non-ESG funds	105,483	3,333
Non-ESG active funds	94,903	3,014
Non-ESG index funds	10,580	319

Panel B. Morningstar Categories and benchmark indices

Category	Index	Fund-quarter observations	Number of funds	Percent (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%
Mid-Cap Blend	Russell Mid Cap TR USD	7,782	250	6.5%
Mid-Cap Growth	Russell Mid Cap Growth TR USD	9,322	253	6.6%
Small Value	Russell 2000 Value TR USD	5,309	156	4.1%
Small Blend	Russell 2000 TR USD	12,069	375	9.7%
Small Growth	Russell 2000 Growth TR USD	9,106	263	6.8%
Total		120,415	3,849	100.0%

Table 2: Holdings deviation. This table presents (i) the holding deviations between ESG funds and their matched non-ESG funds within the same Morningstar Category, and (ii) the holding deviations between matched non-ESG funds and their closest matching non-ESG peers within the same Morningstar Category, serving as a reference to measure how much ESG funds deviate. 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 reports the average values across different category-quarter observations. For a comprehensive description of the variables, please refer to Appendix C.

			matched G funds		on-ESG funds vs onon-ESG peers	NI C	
	Category	(1)	(2)	(3)	(4)	No. of	
		Holding	Holding	Holding	Holding	ESG funds	
		deviation	deviation	deviation	deviation		
		(Sum)	(Average)	(Sum)	(Average)		
	Large value	56.69%	0.08%	54.14%	0.07%	50	
	Large blend	34.34%	0.01%	30.48%	0.01%	217	
	Large growth	48.84%	0.05%	39.39%	0.03%	96	
	Mid value Active Mid blend	182.44%	0.58%	151.66%	0.52%	4	
Active		126.77%	0.05%	104.98%	0.04%	30	
	Mid growth	151.67%	0.29%	126.61%	0.21%	12	
	Small value	194.62%	0.99%	176.94%	0.81%	2	
	Small blend	106.71%	0.06%	98.88%	0.04%	39	
	Small growth	188.55%	0.72%	169.71%	0.60%	2	
	Large value	71.05%	0.09%	62.57%	0.09%	4	
	Large blend	27.83%	0.01%	12.14%	0.00%	53	
T., J.,,	Large growth	53.28%	0.07%	52.35%	0.09%	4	
Index	Mid blend	93.16%	0.15%	84.95%	0.13%	1	
	Small blend	150.81%	0.09%	129.61%	0.08%	1	
	Small growth	158.72%	0.73%	170.00%	0.17%	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, "Diff" is the difference in holdings of top emitters between funds and their benchmarks. "Diff" is calculated by scaling the "Diff" using the benchmarks' holdings of top emitters. These differences are further broken down into top emitters not held by funds, top emitters underweighted by funds, and top emitters overweighted by funds. In Panel B, the dependent variable is benchmark-adjusted holdings of top emitters (same as "Diff" in Panel A). "ESG" (or "non-ESG") is a dummy variable that equals one if the fund is an active fund, and zero otherwise. "Active" is a dummy variable that equals one if the fund is an active fund, and zero otherwise. 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. Descriptive statistics

	Fund	Benchmark	Diff	Diff%	Extensive margin	Intensive Underweight	margin Overweight	Obs
ESG (all)	3.3%	5.4%	-2.1%	-38.4%	72.6%	10.7%	16.7%	14,364
ESG (active)	3.1%	5.2%	-2.1%	-40.3%	77.1%	9.7%	13.2%	12,552
ESG (index)	4.8%	6.6%	-1.8%	-28.0%	42.5%	17.0%	40.6%	1,812
Non-ESG (all)	3.7%	5.2%	-1.6%	-30.2%	68.3%	12.4%	19.3%	94,021
Non-ESG (active)	3.5%	5.2%	-1.7%	-33.3%	73.4%	11.8%	14.8%	84,160
Non-ESG (index)	5.4%	5.8%	-0.4%	-6.5%	28.5%	17.1%	54.4%	9,861

Panel B. ESG funds vs non-ESG funds

	Holdings of top 25 emitters (fund-benchmark)							
	(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)		
$\operatorname{Ln}(\operatorname{TNA})$			-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		
N	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		

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, "Diff" is the difference in holdings of polluting industries between funds and their benchmarks. "Diff" is calculated by scaling the "Diff" using the benchmarks' holdings of polluting industry. In Panel B, the dependent variable is the benchmark-adjusted holdings of polluting industries (same as "Diff" in Panel A). "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. 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.

Panel A. Descriptive statistics

	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs
ESG (all)	10.9%	12.8%	-1.9%	-14.8%	14,364
ESG (active)	10.7%	12.7%	-2.0%	-16.1%	$12,\!552$
ESG (index)	12.7%	13.5%	-0.8%	-5.9%	1,812
Non-ESG (all)	12.3%	13.7%	-1.4%	-10.5%	94,021
Non-ESG (active)	12.1%	13.7%	-1.6%	-11.7%	84,160
Non-ESG (index)	14.2%	14.2%	-0.1%	-0.6%	9,861

Panel B. Polluting industries

	Hol	dings of SIC	S polluting	industries (f	und-benchm	ark)
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	-0.004**	-0.009***	-0.010***	-0.007*	-0.015**	-0.021***
	(-2.008)	(-2.690)	(-2.825)	(-1.752)	(-2.236)	(-3.033)
ESG fund \times Active				-0.012***	-0.004	0.010
				(-2.901)	(-0.607)	(1.371)
Non-ESG fund \times Active				-0.015***	-0.010***	-0.003
				(-7.282)	(-4.181)	(-0.782)
$\operatorname{Ln}(\operatorname{TNA})$			-0.001**			-0.001**
			(-2.269)			(-2.247)
Quarterly return			-0.001			-0.000
			(-0.118)			(-0.064)
Management fee			-0.019***			-0.021***
			(-4.142)			(-4.378)
Constant	-0.014***	-0.014***	0.020**	-0.001	-0.004**	0.023**
	(-14.974)	(-17.641)	(1.971)	(-0.438)	(-1.974)	(2.442)
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	$108,\!385$	$108,\!352$	106,742	$108,\!385$	$108,\!352$	106,742
$Adj. R^2$	0.001	0.355	0.358	0.006	0.353	0.356

Table 5: 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, "Diff" is the the difference of portfolio-level value-weighted emission intensity between funds and their benchmarks. "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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level emission intensity (same as "Diff" in Panel A). "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 C, the regression specification features

Across-industry selection_{jt} =
$$\beta_0 + \beta_1 \times Index \ fund_j + \vec{\gamma} \cdot \vec{V}_{jt} + \tau_t + \phi_f + \psi_c + \epsilon_{jt}$$
,

where "Across-industry selection" 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. 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. Descriptive statistics

		Full sample					e with lower fundament	
	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

Panel B. ESG funds vs non-ESG funds

	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)		
$\operatorname{Ln}(\operatorname{TNA})$			-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
N	$108,\!385$	$108,\!352$	$104,\!952$	$108,\!385$	$108,\!352$	104,952
Adj. R^2	0.000	0.328	0.328	0.005	0.326	0.326

Panel C. Across-industry selection

		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			
N	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			

Table 6: 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, "Diff" is the difference of portfolio-level value-weighted absolute emission between funds and their benchmarks. "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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level absolute emission (same as "Diff" in Panel A). "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 C, the regression specification features

Across-industry selection_{jt} =
$$\beta_0 + \beta_1 \times Index \ fund_j + \vec{\gamma} \cdot \vec{V}_{jt} + \tau_t + \phi_f + \psi_c + \epsilon_{jt}$$
,

where "Across-industry selection" is the proportion of emission difference that is attributed to across-industry selection, "Index fund" is a dummy variable that equals one if the fund is an index fund, and zero otherwise. The analysis is based on the subsample of fund-quarters with lower portfolio-level emission than their benchmarks. 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. Descriptive statistics

		Full sample					e with lower fu	
	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%	$4,\!453$

Panel B. ESG funds vs non-ESG funds

		Absol	ute emission	(fund-bench	nmark)	
	(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)
$\operatorname{Ln}(\operatorname{TNA})$			-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
N	$108,\!385$	$108,\!352$	104,952	$108,\!385$	$108,\!352$	104,952
Adj. R^2	0.001	0.440	0.443	0.013	0.430	0.434

Panel C. Across-industry selection

			Across-indu	stry selection	1		
		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)	
$\operatorname{Ln}(\operatorname{TNA})$			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	
N	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	

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, "Diff" is the difference of portfolio-level value-weighted ESG 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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level ESG scores (same as "Diff" in Panel A). "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. 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. Descriptive statistics

		Ful	l sample	-	with higher f			
	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%	$6,\!487$

Panel B. ESG funds vs non-ESG funds

		ES	SG score (fu	nd-benchma	rk)	
	(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)
$\operatorname{Ln}(\operatorname{TNA})$			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

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, "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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level E scores (same as "Diff" in Panel A). "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. 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. Descriptive statistics

		Full	sample	_	with higher f			
	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

Panel B. ESG funds vs non-ESG funds

		I	E score (fund	l-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)
$\operatorname{Ln}(\operatorname{TNA})$			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
N	$108,\!130$	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

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, "Diff" is the difference of portfolio-level value-weighted Sustainalytics risk score between funds and their benchmarks. "Diff%" is calculated by scaling the "Diff" using the benchmarks' Sustainalytics risk score. For the subsample of fund-quarters with lower portfolio-level 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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level Sustainalytics risk score (same as "Diff" in Panel A). "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. 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. Descriptive statistics

		Full	sample			nple with lower		
	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

Panel B. ESG funds vs non-ESG funds

		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)
$\operatorname{Ln}(\operatorname{TNA})$			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
N	$41,\!404$	$41,\!379$	40,167	$41,\!404$	$41,\!379$	$40,\!167$
$Adj. R^2$	0.020	0.501	0.501	0.023	0.497	0.497

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, "Diff" is the difference of portfolio-level value-weighted board diversity between funds and their benchmarks. "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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level board diversity (same as "Diff" in Panel A). "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. *, **, 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. Descriptive statistics

		Full	sample	-	with higher f			
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	Obs	Across ind	Within ind	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
Non-ESG (all)	22.3%	22.4%	-0.1%	-0.5%	90,704	-26.2%	126.2%	45,752
Non-ESG (active)	22.2%	22.3%	-0.1%	-0.5%	80,929	-32.1%	132.1%	39,885
Non-ESG (index)	22.9%	23.0%	-0.2%	-0.7%	9,775	14.6%	85.4%	$5,\!867$

Panel B. ESG funds vs non-ESG funds

		Boar	d diversity (fund-benchr	nark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	0.002***	0.001	0.001	0.007***	0.005***	0.004**
	(2.758)	(1.046)	(1.100)	(6.480)	(3.215)	(2.324)
ESG fund \times Active				-0.006***	-0.003**	-0.001
				(-5.160)	(-2.169)	(-0.344)
Non-ESG fund \times Active				0.000	0.001**	0.003***
				(0.745)	(2.025)	(3.699)
$\operatorname{Ln}(\operatorname{TNA})$			-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***	-0.001***	0.004*	-0.002***	-0.002***	0.001
	(-5.138)	(-5.850)	(1.674)	(-2.823)	(-3.753)	(0.262)
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	104,725	104,693	$101,\!385$	104,725	104,693	$101,\!385$
Adj. R^2	0.001	0.276	0.278	0.003	0.274	0.275

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, "Diff" is the difference of portfolio-level value-weighted incident rate between funds and their benchmarks. "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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level incident rate (same as "Diff" in Panel A). "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. 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. Descriptive statistics

		Full	sample	-	e with lower fu			
	Fund	Benchmark	Diff	$\mathrm{Diff}\%$	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

Panel B. ESG funds vs non-ESG funds

		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)
$\operatorname{Ln}(\operatorname{TNA})$			-0.375**			-0.350**
			(-2.425)			(-2.371)
Quarterly return			16.376**			16.374**
			(2.524)			(2.526)
Management fee			3.292			3.511
			(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

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 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.

Panel A. Portfolio diversification

	N.	Number of stocks held			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%	3,330
Non-ESG (active)	113	756	-643	4.73%	2.40%	2.33%	3,011
Non-ESG (index)	570	815	-245	2.26%	1.30%	0.95%	319

Panel B. Return volatility

	Monthly return volatility			Quarterly return volatility			
	Fund	Benchmark	Difference	Fund	Benchmark	Difference	Obs
ESG (all)	4.76%	4.56%	0.21%	9.09%	8.55%	0.54%	460
ESG (active)	4.81%	4.58%	0.23%	9.20%	8.60%	0.61%	405
ESG (index)	4.41%	4.35%	0.06%	8.20%	8.17%	0.03%	55
Non-ESG (all)	4.92%	4.84%	0.08%	9.11%	9.20%	-0.08%	3,182
Non-ESG (active)	4.93%	4.86%	0.07%	9.14%	9.24%	-0.10%	2,871
Non-ESG (index)	4.82%	4.67%	0.14%	8.90%	8.76%	0.15%	311

Table 13: Fund return. This table shows the funds' return. In Panel A, "Diff" is the difference of risk premium/CAPM alpha/4-factor alpha/6-factor alpha between funds and their benchmarks. In Panel B/C/D/E, the dependent variable is the benchmark-adjusted risk premium/CAPM alpha/4-factor alpha/6-factor alpha (same as "Diff" in Panel A). "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. 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.

Panel A. Descriptive statistics

	D 1	Risk pre		01	CAPM alpha				
	Fund	Benchmark	Diff	Obs	Fund	Benchmark	Diff	Obs	
ESG (all)	0.860%	0.916%	-0.056%	$32,\!471$	0.021%	-0.004%	0.025%	27,771	
ESG (active)	0.846%	0.919%	-0.074%	$28,\!596$	-0.012%	-0.006%	-0.007%	24,369	
ESG (index)	0.963%	0.895%	0.068%	$3,\!875$	0.262%	0.012%	0.250%	3,402	
Non-ESG (all)	0.842%	0.930%	-0.088%	249,686	-0.145%	-0.097%	-0.049%	$198,\!315$	
Non-ESG (active)	0.834%	0.930%	-0.096%	$225,\!626$	-0.156%	-0.100%	-0.056%	$178,\!240$	
Non-ESG (index)	0.918%	0.929%	-0.011%	24,060	-0.051%	-0.062%	0.011%	20,075	
		4-factor	alpha		6-factor alpha				
	Fund	Benchmark	Diff	Obs	Fund	Benchmark	Diff	Obs	
ESG (all)	0.016%	-0.028%	0.043%	27,771	0.167%	0.000%	0.167%	27,771	
ESG (active)	-0.020%	-0.029%	0.009%	24,369	0.146%	0.001%	0.145%	24,369	
ESG (index)	0.270%	-0.020%	0.291%	3,402	0.322%	-0.008%	0.330%	3,402	
Non-ESG (all)	-0.123%	-0.075%	-0.049%	$198,\!315$	-0.001%	0.004%	-0.005%	$198,\!315$	
Non-ESG (active)	-0.133%	-0.076%	-0.057%	$178,\!240$	-0.003%	0.005%	-0.008%	$178,\!240$	
Non-ESG (index)	-0.043%	-0.062%	0.019%	20,075	0.015%	-0.006%	0.022%	20,075	

Panel B. Risk premium

		Risk	preimum (f	und-benchma	ark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	0.032***	0.039***	0.038***	0.079***	0.063***	0.039*
	(3.4159)	(3.2065)	(3.0794)	(4.2227)	(3.0626)	(1.8084)
ESG fund \times Active				-0.142***	-0.086***	-0.027
				(-7.1768)	(-4.5567)	(-1.2011)
Non-ESG fund \times Active				-0.085***	-0.058***	-0.025**
				(-10.9825)	(-6.9789)	(-2.3293)
Ln(TNA)			-0.004**			-0.004**
			(-2.4258)			(-2.2532)
Management fee			-0.087***			-0.083***
			(-5.4390)			(-5.1227)
Constant	-0.088***	-0.089***	0.060*	-0.011*	-0.037***	0.074**
	(-25.2335)	(-35.0469)	(1.6613)	(-1.6492)	(-4.7217)	(2.0457)
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	$351,\!854$	$351,\!851$	346,703	$351,\!854$	$351,\!851$	346,703
Adj. R^2	0.000	0.054	0.052	0.000	0.054	0.052

Panel C. CAPM alpha

		CAPM alpha (fund-benchmark)						
	(1)	(2)	(3)	(4)	(5)	(6)		
ESG fund	0.074***	0.004	0.006	0.239***	-0.009	-0.018		
	(4.4973)	(0.2133)	(0.3180)	(6.3587)	(-0.2223)	(-0.3983)		
ESG fund \times Active				-0.257***	-0.057	-0.022		
				(-6.5151)	(-1.3893)	(-0.4935)		
Non-ESG fund \times Active				-0.066***	-0.069***	-0.046***		
				(-5.3863)	(-5.8241)	(-2.9395)		
$\operatorname{Ln}(\operatorname{TNA})$			0.002			0.003		
			(0.9634)			(1.1770)		
Management fee			-0.057**			-0.052**		
			(-2.3481)			(-2.1042)		
Constant	-0.049***	-0.040***	-0.050	0.011	0.022*	-0.024		
	(-10.0612)	(-11.2701)	(-0.8651)	(0.9701)	(1.9575)	(-0.4153)		
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	$226,\!086$	226,085	$223,\!375$	226,086	$226,\!085$	$223,\!375$		
Adj. R^2	0.000	0.046	0.046	0.001	0.046	0.046		

Panel D. 4-factor alpha

		4-fac	tor alpha (f	und-benchma	ark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	0.092***	-0.003	0.002	0.272***	-0.025	-0.030
	(5.6103)	(-0.1822)	(0.1374)	(6.8623)	(-0.5867)	(-0.6795)
ESG fund \times Active				-0.282***	-0.050	-0.022
				(-6.7976)	(-1.2181)	(-0.5022)
Non-ESG fund \times Active				-0.076***	-0.073***	-0.057***
				(-6.6089)	(-7.5699)	(-4.3945)
Ln(TNA)			0.000			0.000
			(0.0367)			(0.1962)
Management fee			-0.041*			-0.040*
			(-1.8784)			(-1.8103)
Constant	-0.049***	-0.037***	-0.010	0.019*	0.028***	0.033
	(-11.2088)	(-11.3237)	(-0.1925)	(1.8295)	(3.1304)	(0.6637)
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	226,086	226,085	$223,\!375$	226,086	226,085	$223,\!375$
$Adj. R^2$	0.000	0.048	0.047	0.001	0.048	0.047

Panel E. 6-factor alpha

		6-fa	ctor alpha (f	und-benchma	ark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	0.172***	-0.011	-0.008	0.308***	-0.075	-0.061
	(9.3217)	(-0.5983)	(-0.4391)	(6.7173)	(-1.5908)	(-1.2710)
ESG fund \times Active				-0.185***	0.067	0.033
				(-3.8132)	(1.4498)	(0.6903)
Non-ESG fund \times Active				-0.029***	-0.003	-0.024*
				(-2.5886)	(-0.2901)	(-1.8707)
Ln(TNA)			-0.010***			-0.009***
			(-4.2392)			(-4.1840)
Management fee			0.037			0.037
			(1.5611)			(1.5649)
Constant	-0.005	0.018***	0.186***	0.022**	0.020**	0.204***
	(-1.2720)	(5.3244)	(3.5461)	(2.0319)	(2.3164)	(4.0108)
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	$226,\!086$	226,085	$223,\!375$	226,086	226,085	$223,\!375$
Adj. R^2	0.001	0.045	0.044	0.001	0.045	0.044

Table 14: Exposure to market risk. This table shows the funds' exposure to market risk. In Panel A, "Diff" is the difference of CAPM-beta between funds and their benchmarks. In Panel B, the dependent variable is the benchmark-adjusted CAPM-beta (same as "Diff" in Panel A). "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. 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.

Panel A. Descriptive statistics

	CAPM Beta						
	Fund	Benchmark	Diff	Obs			
ESG (all)	0.907	1.003	-0.095	27,771			
ESG (active)	0.918	1.005	-0.086	24,369			
ESG (index)	0.831	0.988	-0.158	3,402			
Non-ESG (all)	0.998	1.035	-0.037	198,315			
Non-ESG (active)	0.999	1.037	-0.038	178,240			
Non-ESG (index)	0.988	1.013	-0.025	20,075			

Panel B. CAPM beta

		CAI	PM beta (fu	nd-benchma	rk)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	-0.058***	0.012	0.011	-0.132***	0.033*	0.035*
	(-7.8757)	(1.4324)	(1.3141)	(-7.0956)	(1.8378)	(1.9061)
ESG fund \times Active				0.071***	-0.017	-0.022
				(3.7612)	(-0.9626)	(-1.1955)
Non-ESG fund \times Active				-0.012*	0.005	0.003
				(-1.7470)	(0.9545)	(0.4532)
Ln(TNA)			-0.001			-0.001
			(-0.7873)			(-0.8470)
Management fee			0.003			0.004
			(0.3214)			(0.3719)
Constant	-0.037***	-0.045***	-0.029	-0.026***	-0.050***	-0.031
	(-14.7091)	(-25.9868)	(-1.2463)	(-3.9424)	(-9.9015)	(-1.3286)
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	$226,\!528$	$226,\!527$	$223,\!375$	$226,\!528$	$226,\!527$	$223,\!375$
Adj. R^2	0.020	0.546	0.542	0.024	0.544	0.541

Table 15: Exposure to inflation shocks. This table compares the exposure of ESG and non-ESG funds, as well as their benchmarks, to inflation shocks. Exposure to inflation shocks is measured by the in-sample beta, using inflation shocks as risk factors, indicating how much a fund's excess return varies with these shocks. The betas are estimated using the following regression:

$$r_{j,t}^e = \alpha_j + \beta_{\pi}^j \epsilon_{\pi,t} + u_{j,t},$$

where $r_{j,t}^e$ is the excess monthly return of fund j, $\epsilon_{\pi,t}$ is the shock to respective inflation. For a comprehensive description of the variables, please refer to Appendix C.

	Exposi	Exposure to headline inflation shock			Exposure to energy inflation shock			
	(1)	(2)	(3)	(4)	(5)	(6)		
	Fund	Benchmark	Difference	Fund	Benchmark	Difference	Obs	
ESG (all)	0.636	1.930	-1.293***	0.157	0.263	-0.105***	465	
ESG (active)	0.644	1.930	-1.287***	0.158	0.264	-0.105***	409	
ESG (index)	0.582	1.923	-1.341***	0.151	0.258	-0.107***	56	
Non-ESG (all)	2.352	2.045	0.307***	0.261	0.284	-0.023***	3,229	
Non-ESG (active)	2.402	2.045	0.357***	0.264	0.285	-0.021***	2,918	
Non-ESG (index)	1.887	2.044	-0.156	0.232	0.277	-0.045***	311	

Table 16: 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-year level. For a comprehensive description of the variables, please refer to Appendix C.

	Manager	ment fees	Expense 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.

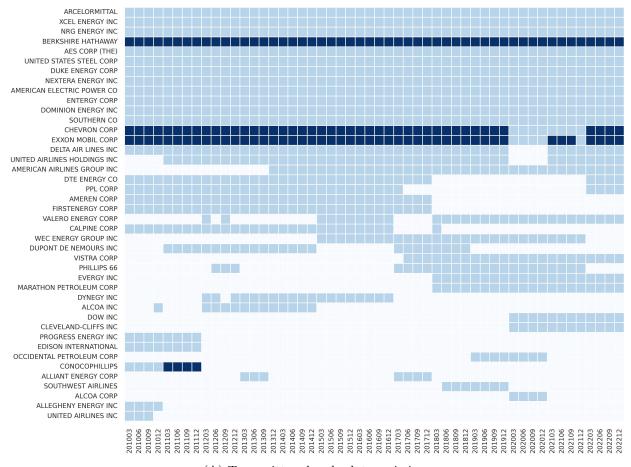
Variable	Definition	Source
KLD score	KLD ESG score is calculated as the average of the KLD environment category score, social category score and governance category score. While KLD has separate category for environment and corporate governance, the social category score is the average of the five KLD 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 multiply 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 governance score. The value ranges from 0 to 100. Data available from 2013.	SP
Sustainalytics score	Sustainalytics provides ESG score, environment score, social score and governance score. The value ranges from 0 to 100. Data available until 2019. ³⁹	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 GHG1 emission	The total number of ESG incidents the firm experienced in each quarter. Greenhouse gas emission from sources that are owned or controlled by the firm (Scope 1) in 1,000 metric tons CO2 equivalent.	RR TC

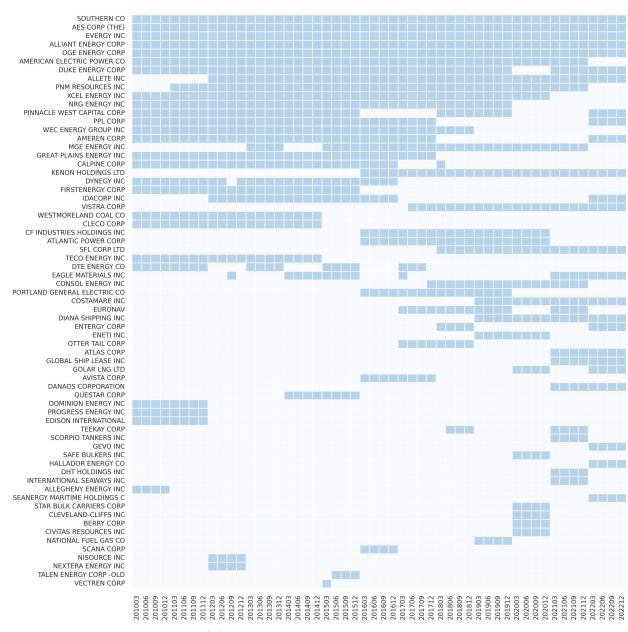
 $^{^{39}}$ Since 2018, Sustainalytics has altered its methodology to adopt a new ESG risk score.

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 return	The change in accumulation unit value (AUV) during the period and dividing 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 volatility	The standard deviation of a fund's US equity holding return based on its quarter-end holdings and quarterly stock return.	MS, 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 concentration	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 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.	MS
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 industry	The top 15 industries with highest Scope 1 GHG emission or intensity based on SASB SICS 77-industry. Polluting industries include coal operations, construction 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 for that quarter. Light blue signifies that the company is 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.





(B) Top emitters by emission intensity

E Online Appendix: Supplementary Tables

 $\begin{tabular}{l} Table E.1: $Benchmark\ Indices.$ This table presents a summarized comparison of three benchmark indices, encompassing both objective and subjective benchmarks. \\ \end{tabular}$

	Morningstar Category Index	Modern Portfolio Theory Index	Primary Prospectus Benchmark
Definition	precisely based on fund holdings and used for Morningstar fund rating system	used for standard risk calculations, such as alpha, beta, R-squared	primary benchmark as stated in fund's prospectus
Source	objective	objective	subjective
Coverage	best	uniform benchmarks	missing benchmarks

Table E.2: Number of stocks held. This table presents the average number of stocks held by ESG funds, their matched non-ESG peers, and their respective benchmark indices for each Morningstar Category.

	Category	ESG funds	Non-ESG funds	Benchmarks	No. of ESG funds
	Large value	73	76	572	50
	Large blend	140	130	809	217
	Large growth	48	83	487	96
	Mid value	62	59	571	4
Active	Mid blend	70	445	627	30
	Mid growth	55	62	370	12
	Small value	254	97	1,063	2
	Small blend	115	107	1,564	39
	Small growth	83	195	958	2
	Large value	217	389	572	4
	Large blend	380	548	809	53
т 1	Large growth	361	264	487	4
Index	Mid blend	559	300	627	1
	Small blend	433	1,612	1,564	1
	Small growth	210	119	958	1

Table E.3: 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, "Diff" is the difference in holdings of top emitters between funds and their benchmarks. "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. In Panel B, the dependent variable is the benchmark-adjusted holdings of top emitters (same as "Diff" in Panel A). "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. 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. Descriptive statistics

	Fund	Benchmark	Diff	Diff%	Extensive margin	Intensive margin	Obs
ESG (all)	0.7%	1.1%	-0.4%	-38.5%	192.2%	-92.2%	14,364
ESG (active)	0.7%	1.1%	-0.5%	-40.9%	192.8%	-92.8%	$12,\!552$
ESG (index)	1.0%	1.2%	-0.3%	-23.1%	185.7%	-85.7%	1,812
Non-ESG (all)	0.9%	1.3%	-0.4%	-30.4%	232.5%	-132.5%	94,021
Non-ESG (active)	0.8%	1.3%	-0.4%	-34.0%	224.8%	-124.8%	84,160
Non-ESG (index)	1.4%	1.4%	0.0%	-3.0%	895.3%	-795.3%	9,861

Panel B. ESG funds vs non-ESG funds

		Holdings o	f top 25 emi	tters (fund-l	penchmark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	-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				-0.002**	-0.001	-0.001
				(-2.005)	(-1.201)	(-0.395)
Non-ESG fund \times Active				-0.004***	-0.003***	-0.003***
				(-5.976)	(-5.058)	(-3.682)
$\operatorname{Ln}(\operatorname{TNA})$			-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	-0.004***	-0.004***	0.005*	-0.000	-0.001*	0.007**
	(-15.287)	(-19.786)	(1.730)	(-0.723)	(-1.937)	(2.456)
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 Index fund FE	No	Yes	Yes	No	No	No
N	$108,\!385$	$108,\!352$	104,952	$108,\!385$	$108,\!352$	104,952
Adj. R^2	0.000	0.277	0.280	0.004	0.276	0.278

Table E.4: Individual ESG scores. This table shows the individual 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. In Panel A, "Diff" is the difference of portfolio-level value-weighted ESG scores of each rating agency 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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level MSCI ESG scores (same as "Diff" in Panel A). "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. 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. Descriptive statistics

			Ful	l sample	е		_	with higher f	
		Fund	Benchmark	Diff	Diff%	Obs	Across ind	Within ind	Obs
MSCI	ESG (all) ESG (active) ESG (index) Non-ESG (all) Non-ESG (active)	49.08 48.95 49.93 47.29 47.22	48.50 48.48 48.60 47.43 47.38	0.58 0.47 1.32 -0.14 -0.16	1.2% 1.0% 2.7% -0.3% -0.3%	14,739 12,899 1,840 100,519 90,233	2.8% 7.2% -17.2% 9.9% 14.9%	97.2% 92.8% 117.2% 90.1% 85.1%	9,369 7,681 1,688 47,963 41,371
REF	Non-ESG (index) ESG (all) ESG (active) ESG (index) Non-ESG (all) Non-ESG (active) Non-ESG (index)	47.87 63.38 62.71 67.92 58.81 58.46 61.71	47.82 63.88 63.55 66.17 59.58 59.32 61.84	0.05 -0.50 -0.83 1.75 -0.78 -0.85 -0.14	0.1% -0.8% -1.3% 2.6% -1.3% -1.4% -0.2%	10,286 14,141 12,330 1,811 89,292 79,766 9,526	-21.4% -32.9% -40.0% -5.0% -25.9% -31.9% 10.6%	121.4% 132.9% 140.0% 105.0% 125.9% 131.9% 89.4%	6,592 7,829 6,235 1,594 43,713 37,471 6,242
KLD	ESG (all) ESG (active) ESG (index) Non-ESG (all) Non-ESG (active) Non-ESG (index)	52.78 52.69 53.38 52.10 52.07 52.40	52.67 52.64 52.89 52.17 52.13 52.46	0.11 0.06 0.49 -0.06 -0.06	0.2% 0.1% 0.9% -0.1% -0.1%	10,015 8,785 1,230 80,205 72,454 7,751	-21.5% -27.4% 4.5% -19.3% -19.9% -14.7%	121.5% 127.4% 95.5% 119.3% 119.9% 114.7%	5,985 4,875 1,110 40,350 35,785 4,565
S&P	ESG (all) ESG (active) ESG (index) Non-ESG (all) Non-ESG (active) Non-ESG (index)	40.31 39.74 44.04 37.51 37.31 39.13	39.63 39.38 41.25 37.73 37.56 39.15	0.69 0.36 2.78 -0.23 -0.25 -0.01	1.7% 0.9% 6.7% -0.6% -0.7% 0.0%	11,990 10,393 1,597 68,637 61,150 7,487	-11.5% -15.5% 5.5% -16.4% -19.6% 4.3%	111.5% 115.5% 94.5% 116.4% 119.6% 95.7%	7,676 6,221 1,455 35,947 31,130 4,817
SUS	ESG (all) ESG (active) ESG (index) Non-ESG (all) Non-ESG (active) Non-ESG (index)	60.64 60.38 62.41 59.76 59.69 60.36	60.77 60.69 61.30 60.19 60.17 60.39	-0.12 -0.31 1.12 -0.43 -0.48 -0.03	-0.2% -0.5% 1.8% -0.7% -0.8% 0.0%	8,447 7,337 1,110 56,900 50,752 6,148	-37.6% -51.9% 12.3% -53.2% -64.4% 6.0%	137.6% 151.9% 87.7% 153.2% 164.4% 94.0%	4,631 3,602 1,029 25,724 21,612 4,112

Panel B. ESG funds vs non-ESG funds (MSCI) $\,$

		MSC	ESG score	(fund-bench	mark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	0.718***	1.026***	1.059***	1.276***	1.257***	1.209***
	(7.478)	(7.032)	(6.962)	(5.194)	(3.902)	(3.595)
ESG fund \times Active				-0.855***	-0.520*	-0.297
				(-3.308)	(-1.685)	(-0.893)
Non-ESG fund \times Active				-0.212***	-0.255***	-0.122
				(-3.284)	(-3.194)	(-1.267)
Ln(TNA)			0.005			0.006
			(0.460)			(0.523)
Quarterly return			0.458***			0.462***
			(2.736)			(2.745)
Management fee			-0.403***			-0.326***
			(-3.543)			(-2.815)
Constant	-0.142***	-0.182***	-0.013	0.048	0.047	0.024
	(-5.189)	(-7.887)	(-0.050)	(0.840)	(0.630)	(0.090)
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 Index fund FE	No	Yes	Yes	No	No	No
N	115258	115229	111708	115258	115229	111708
Adj. R^2	0.013	0.324	0.324	0.016	0.320	0.320

Table E.6: 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. In Panel A, "Diff" is the difference of portfolio-level value-weighted E scores of each rating agency 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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level MSCI E scores (same as "Diff" in Panel A). "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. 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. Descriptive statistics

			Full	sample			Sample with higher fund E score than benchmark		
		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
MSCI	Non-ESG (all)	55.71	55.85	-0.14	-0.3%	91,801	31.5%	68.5%	$45,\!55$
	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%	96.3%	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
REF	ESG (index)	64.83	62.54	2.30	3.7%	1,808	-30.7%	130.7%	1,618
REF	Non-ESG (all)	52.56	53.67	-1.11	-2.1%	87,817	-31.9%	131.9%	42,13
	Non-ESG (active)	52.08	53.30	-1.22	-2.3%	$78,\!424$	-39.6%	139.6%	36,06
	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
KLD	ESG (index)	55.33	54.71	0.61	1.1%	1,186	-19.4%	119.4%	1,082
KLD	Non-ESG (all)	53.96	54.11	-0.15	-0.3%	67,777	1.0%	99.0%	31,49
	Non-ESG (active)	53.93	54.09	-0.16	-0.3%	60,788	1.0%	99.0%	27,16
	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
S&P	ESG (index)	47.44	43.70	3.74	8.6%	1,597	12.1%	87.9%	1,469
5&P	Non-ESG (all)	36.50	37.04	-0.54	-1.5%	$68,\!478$	-14.7%	114.7%	$34,\!85$
	Non-ESG (active)	36.12	36.73	-0.61	-1.6%	60,993	-17.8%	117.8%	30,05
	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
CTIC	ESG (index)	64.44	62.74	1.71	2.7%	1,110	11.1%	88.9%	1,042
	Non-ESG (all)	59.83	60.45	-0.61	-1.0%	56,274	-14.6%	114.6%	$25,\!87$
	Non-ESG (active)	59.70	60.39	-0.69	-1.1%	$50,\!301$	-20.5%	120.5%	21,79
	Non-ESG (index)	60.95	60.96	-0.01	0.0%	5,973	17.3%	82.7%	4,082

Panel B. ESG funds vs non-ESG funds (MSCI)

		MS	SCI E score (fund-benchr	nark)	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG fund	1.279***	1.074***	1.120***	2.628***	2.531***	2.585***
	(7.437)	(4.142)	(4.270)	(6.511)	(4.883)	(4.696)
ESG fund \times Active				-1.445***	-1.603***	-1.504***
				(-3.602)	(-3.147)	(-2.633)
Non-ESG fund \times Active				0.095	0.015	0.113
				(0.496)	(0.074)	(0.467)
$\operatorname{Ln}(\operatorname{TNA})$			0.105***			0.105***
			(3.653)			(3.622)
Quarterly return			0.570			0.576
			(1.466)			(1.479)
Management fee			-0.386			-0.189
			(-1.298)			(-0.625)
Constant	-0.138**	-0.112**	-2.025***	-0.223	-0.130	-2.262***
	(-2.091)	(-2.038)	(-3.191)	(-1.254)	(-0.699)	(-3.501)
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 Index fund FE	No	Yes	Yes	No	No	No
N	115,258	$115,\!229$	111,708	115,258	$115,\!229$	111,708
$Adj. R^2$	0.008	0.275	0.279	0.010	0.271	0.274

Table E.8: 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, "Diff" is the difference of portfolio-level value-weighted RepRisk index between funds and their benchmarks. "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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level RepRisk index (same as "Diff" in Panel A). "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. 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. Descriptive statistics

		Full	sample			-	e with lower fundex than bene	
	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

Panel B. ESG funds vs non-ESG funds

		Rep	Risk index (fund-benchn	nark)	
	(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)
$\operatorname{Ln}(\operatorname{TNA})$			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
N	$93,\!439$	$93,\!413$	90,411	$93,\!439$	$93,\!413$	$90,\!411$
$Adj. R^2$	0.004	0.359	0.363	0.011	0.346	0.348

Table E.9: 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, "Diff" is the difference of portfolio-level value-weighted ESG incidents between funds and their benchmarks. "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. In Panel B, the dependent variable is the benchmark-adjusted portfolio-level ESG incidents (same as "Diff" in Panel A). "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. *, **, 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. Descriptive statistics

		Fu	ll sampl	e		-	e with lower fu	
	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

Panel B. ESG funds vs non-ESG funds

		ESC	incidents (fund-benchm	nark)	
	(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)
$\operatorname{Ln}(\operatorname{TNA})$			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
N	$120,\!415$	$120,\!384$	116,746	$120,\!415$	$120,\!384$	116,746
$Adj. R^2$	0.011	0.335	0.338	0.019	0.327	0.329

Table E.10: 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 combination of two factors: (1) how much each industry contributes to the main externality connected to the issue as compared to other industries (for instance, how carbon-intensive the industry is relative to other industries) and (2) the time horizon within which the externality may materialize.	MSCI provides Final Industry-Adjusted Company Score, but we are using the unadjusted version in this study.
REF	Yes. The weight of environmental, social, and governance pillar scores vary across industries. Within in each pillar, the category weights of environmental and social pillar vary across industries depending on the materiality. The category weights of governance pillar are the same across industries, Management 67%, Shareholders 20%, CSR Strategy 13%, respectively.	Yes. Refinitiv uses percentile rank scoring to compute the category scores. ⁴⁰ Environmental and social category scores compare firms within TRBC industry group, while governance category scores compare firms within the same country of incorporation.
KLD	No.	No.
S&P	Yes. The weight of environmental, social, and governance dimension score vary across industries.	No, but it is suggested to compare the performance within industry.
SUS	Yes. Each industry has a customized weight matrix that defines the relative importance of each indicator and reflects the emphasis on key ESG issues per industry.	No.

 $[\]frac{40}{Score} = \frac{(\textit{No. of companies with a worse value} + \textit{No. of companies with the same value as the current one/2})}{\textit{No. of companies with a value.}}$

Panel E	3. Components and weights	
	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 	each theme and issue and their weights are provided.
	 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 	
	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 governance Corporate behavior Stakeholder 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
	 Community Human rights Product responsibility: Responsible marketing, Product quality, Data privacy 	CO2 equiva- lent emissions to revenues.
	• Workforce: Diversity and inclusion, Career development and training,	

Working conditions, Health and safety

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.11: 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.

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Pane	ΙΑ.	-E'n	nis	sio	ns

	Absolute emission			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	
N	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

	Risk premium				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										
N	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	Monthly return volatility			Industry concentration		
	(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	
N	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

Summary of ESG Fund Disclosure Requirements

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)		✓	✓
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

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.