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Keywords: ESG, portfolio management, investor beliefs, mutual funds, skin-in-the-game, sustainability

JEL Classifications: G11, G23

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Revealed Beliefs about Responsible Investing: Evidence from Mutual Fund Managers *

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February 5, 2023

Abstract

What do asset managers believe regarding the financial performance of Environmental, Social, and Governance (ESG) investment strategies? We address this question by exploring the relationship between fund managers' co-ownership and portfolio ESG performance. Managers with more "skin in the game" exhibit significantly lower ESG performance in funds they manage than their peers. ESG performance is sensitive to changes in managerial ownership. Co-investing managers were less likely to increase their stake in high-ESG stocks after exogenous shocks in ESG-driven fund flows. Moreover, the negative effect of managerial ownership on ESG performance is stronger for managers paid to maximize assets under management and weaker for managers paid exclusively to maximize financial returns. Overall, the results are contrary to what one would expect if fund managers, on average, considered ESG strategies an enhanced form of portfolio management to maximize financial performance.

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1 Introduction

Integrating environmental, social, and governance (ESG) considerations in investment strategies is one of the major trends in the asset management industry. Investment companies expect to incorporate ESG elements into nearly two-thirds of their portfolios within a decade (Index Industry Association, 2022). Recent evidence suggests that improving a fund's sustainability performance and accounting for ESG factors during the investment process is likely to reflect investors' preferences and demand.[1] However, it remains unclear how professional money managers actually perceive ESG integration (the practice of incorporating ESG information into the investment process) and its effect on financial performance.[2] This paper fills the void.

Two opposing narratives on the sustainability claims of asset managers are increasingly debated. On the one hand, proponents of ESG integration view it as an *enhanced* form of portfolio management through which fund managers can increase long-term financial performance by accounting for material information on emerging risks and opportunities (see, e.g.,

[1]Recent studies suggest that investors perceive ESG risks as substantial, may have non-pecuniary motives while investing, and direct higher flows to relatively more sustainability-oriented funds. See, e.g., Bollen (2007); Renneboog, Ter Horst, and Zhang (2011); Hartzmark and Sussman (2019); Bauer, Ruof, and Smeets (2021); Barber, Morse, and Yasuda (2021); Ceccarelli, Ramelli, and Wagner (2022) among others.

[2]For instance, institutional investors and asset managers declare to consider climate change as a material risk for their portfolios and act accordingly (Krüger, Sautner, and Starks, 2020). Nowadays, many, if not most, asset managers explicitly and publicly embrace ESG integration (e.g., BlackRock, 2022). However, surveys can help only to a certain extent to unveil asset managers' ESG beliefs, as they have incentives to overstate their sustainability commitment and express excess optimism about the out-performance of their strategies. Analyzing the realized financial performance of their funds also has its own limitations because it is not necessarily indicative of the performance expected *ex-ante* by fund managers (see, e.g., Elton, 1999; Pástor, Stambaugh, and Taylor, 2020, 2022.

Renneboog, Ter Horst, and Zhang, 2008; Maxfield and Wang, 2020). On the other hand, critics argue that financial intermediaries use ESG strategies primarily to maximize flows (and hence fees) by catering to the preferences of sustainability-conscious investors, even if this comes at the expense of future expected financial performance. Understanding the relative importance of these competing views has important practical implications. However, the task is challenging as it requires insights into fund managers' genuine opinions about ESG investing.

In this paper, we employ a revealed beliefs approach to shed light on how fund managers perceive ESG investment strategies. We analyze how portfolio selection choices vary with the personal investments of managers in the funds they manage. Previous literature suggests that money managers who tie their personal wealth to funds—that is, have "skin in the game"—are more likely to invest based on their own utility function and beliefs. For instance, portfolio managers with money at stake in their funds are less likely to hold lottery-like stocks (Agarwal, Jiang, and Wen, 2022), have lower investment risks (Ma and Tang, 2019), and are more prone to deliver higher risk-adjusted performance (Khorana, Servaes, and Wedge, 2007; Cremers et al., 2009; Agarwal, Daniel, and Naik, 2009) relative to other managers. By studying for the first time how managerial ownership relates to ESG performance, we attempt to uncover the motivational drivers of ESG practices in the mutual fund industry.

The basic idea of our empirical strategy is straightforward. Suppose managerial co-investment makes fund managers invest based on their own utility functions and a fund

manager is maximizing her utility. If she considers ESG integration as being associated with superior expected financial performance, we expect her to more aggressively tilt fund holdings toward firms with better ESG practices in a fund she co-invests relative to a fund in which she has no ownership. Conversely, suppose a fund manager considers ESG factors primarily to cater to sustainability-conscious investors without expectations for superior risk-adjusted returns. In that case, we expect her to chase less ESG performance in a fund she owns a stake in relative to a fund without ownership.

We base our analyses on a comprehensive dataset of managerial ownership for 1,216 actively managed broadly-diversified U.S. equity mutual funds over the period from January 2015 through December 2020. We focus on funds that follow a well-diversified strategy in which managers are unrestricted in their exposure to ESG factors. (Thus, we exclude funds that commit to following socially responsible investing practices in their prospectuses and only use them in a robustness test.) The start of our sample period in 2015 is determined by the availability of our main portfolio sustainability measures, but it is also when ESG strategies started increasing in popularity in the US. Our sample covers a total of 2,537 unique fund managers. For each of these fund managers, we hand-collect information on managerial ownership in the funds that they run from mutual funds' Statements of Additional Information (SAI). 77% of funds in our sample have at least one manager who co-invests personal wealth in the fund, with the average amount of managerial investment being about $802,000. Our primary measure of fund ESG performance is the peer-adjusted fund's asset-

weighted average sustainability score of holdings, computed from sustainability scores that are measured and disclosed by Morningstar based on Sustainalytics firm-level scores.

Our main finding is that fund managerial ownership is associated with lower future fund sustainability performance. We find this negative relationship between portfolio manager ownership and future portfolio sustainability performance at the fund, fund family, and manager levels. Moreover, looking within funds, we find that ESG performance decreases as managerial ownership increases. The observed effect is economically sizable. A one-standard-deviation higher USD amount of managerial ownership is associated with a 26% of a one-standard-deviation lower peer-adjusted ESG performance.

To further investigate fund managers' revealed beliefs regarding ESG, we test whether changes in managerial ownership explain the investment choices of fund managers. We find that managers opt for less ESG-oriented firms following increases in managerial ownership, whereas reductions in fund managers' stakes lead to positive changes in portfolio sustainability metrics. In addition, we find that managers who co-invest tend to overweight stocks with severe ESG issues in their portfolios and allocate less capital to stocks with no controversies. Importantly, in a set of placebo tests, we find no relation between managerial ownership and sustainability performance in the sub-samples of explicit ESG funds and explicit indexers, in which managers are significantly constrained in their ability to adopt or not ESG strategies. Further, in an extensive set of robustness checks, we confirm that the negative ownership-ESG performance link is robust to several alternative potential explanations.

We interpret the negative relationship between managerial ownership and sustainability performance as a revealing sign that fund managers, on average, do not believe ESG factors to be a positive driver of financial performance.[3] Two additional results support this interpretation.

First, in a difference-in-differences setting, we show that while funds on average tilted towards higher portfolio sustainability in reaction to the publication of Morningstar's Sustainability Globes in March 2016, an exogenous shock in the flows incentives of having a high ESG performance (Hartzmark and Sussman, 2019; Gantchev, Giannetti, and Li, 2021), this tilt was much less pronounced with funds with more managerial ownership. Also, fund managers with more skin in the game shifted less toward high-ESG stocks during the Covid-19 financial market turbulence in the first half of 2020.

Second, the cross-sectional heterogeneity exploiting differences in compensation contracts is also revealing. In particular, the negative effect of ownership on ESG is significantly amplified for managers whose compensation is explicitly linked also to assets under management (hence, to their ability to attract flows), and it is significantly mitigated for managers with compensation contracts exclusively tied to the fund's financial performance. These differences highlight how fund managers' often conflicting goals of maximizing flows and fund

[3]In addition to portfolio investment decisions, which we here study, an important tool for responsible investing is also the engagement with portfolio companies to advance their sustainability practices. Institutional investors, especially large ones, can have an important influence in that respect (e.g., Dyck et al., 2019; Azar et al., 2021). Reforming "dirty" firms in a sustainability direction can also be a profitable investment opportunity (Gollier and Pouget, 2014). However, individual portfolio managers are not generally in a position to exert a strong direct influence on firms, implementing ESG investing mostly through the tool of portfolio selection.

returns may influence portfolio ESG performance.

Overall, our analyses indicate that fund managers do not expect ESG strategies to deliver higher risk-adjusted performance. This suggests that the popularity of these strategies in the mutual fund industry is primarily driven by client demand, that is, by the possibility of fund managers attracting higher flows by tilting their portfolios in a higher ESG direction.

This paper contributes to two different strands of literature. First, it adds to the literature on the effects of fund manager ownership on portfolio characteristics and performance. In finance, managerial ownership is generally considered an effective tool to mitigate agency problems (Jensen and Meckling, 1976). The mutual fund industry is not exempt from agency problems: While investors would like to maximize risk-adjusted fund returns, fund managers may deviate from this objective due to, for instance, career concerns (Chevalier and Ellison, 1999) and their desire to increase investment flows (Chevalier and Ellison, 1997). Several contributions find that managerial ownership, by better aligning the interests of fund managers and investors, improves fund performance (Khorana, Servaes, and Wedge, 2007; Cremers et al., 2009), and it reduces excessive risk-taking (Ma and Tang, 2019) and reliance on lottery-like stocks (Agarwal, Jiang, and Wen, 2022). We show that, on average, fund managerial ownership is associated with generally lower sustainability performance by over-weighting high-ESG firms. We interpret this result as evidence that fund managers do not consider ESG issues as material drivers of a portfolio's financial performance, despite a

widespread narrative in the asset management industry suggesting otherwise.[4]

Second, our paper contributes to the literature on the behavior of financial intermediaries on sustainability issues. Investor demand for responsible investment products (e.g., Hartzmark and Sussman, 2019; Bauer, Ruof, and Smeets, 2021; Barber, Morse, and Yasuda, 2021) gives fund managers strong incentives to adopt ESG strategies. While the objectives of increasing ESG performance and maximizing financial returns may sometimes overlap, fund managers often have to strike a balance. Liang, Sun, and Teo (2022) find that hedge funds endorsing the United Nations Principles for Responsible Investment (PRI) attract greater investor flows but underperform other hedge funds, and this underperformance is greater for hedge funds with poor incentive alignment. Ceccarelli, Ramelli, and Wagner (2022) study how fund managers react to the trade-off between making their portfolios less exposed to carbon risk and maximizing the benefits of portfolio diversification. Gantchev, Giannetti, and Li (2021) argue that fund managers balance the benefits on flows of stronger sustainability performance and the benefits of higher financial returns.[5] Costello et al. (2022) show that environmentally committed fund managers hold more green stocks and perform better on them than non-committed managers. In contemporaneous work, Cremers, Riley, and Zam-

[4]Our paper also links to the more general literature on whether corporate social responsibility (CSR) practices are the result of agency problems (in line with Jensen and Meckling (1976)) or of shareholder value maximization. For example, Ferrell, Liang, and Renneboog (2016) show that corporations with higher managerial pay-for-performance sensitivity (a measure of better governance) engage more in CSR. By contrast, Ghitti, Gianfrate, and Reccagni (2022) find that executive ownership is negatively associated with a firm's CSR. For a review of the literature on the links between CSR/ESG and corporate performance, see Gillan, Koch, and Starks (2021).

[5]Conflicts between sustainability and financial objectives may also arise in mutual fund voting at firms' annual general meetings (Michaely, Ordonez-Calafi, and Rubio, 2021; Di Giuli, Garel, and Petit-Romec, 2022), when managers vote "by voice" rather than "by feet", that is, through their capital allocation.

brana (2023) find a positive relationship between a portfolio's active ESG tilt and its future performance among explicit ESG funds (but not among conventional funds). Through a revealed beliefs approach, our paper documents that, on average, managers of not explicitly ESG-oriented funds perceive a tension between their funds' exposure to high-ESG stocks and expected financial returns. Of course, there are also many managers co-investing in their high-sustainability funds, reflecting the presence of significant heterogeneity in beliefs on this topic, even among professional money managers.

2 Data and sample design

This section provides a description of the data sources and the main variables of portfolio manager ownership and mutual fund characteristics. In addition, we provide supplementary details on the construction of variables in the Appendix.

2.1 Mutual fund data

We identify our sample of mutual funds and fund managers based on two main data sources, the CRSP Survivor-Bias-Free U.S. Mutual Fund Database (CRSP MF) and the Morningstar Direct Mutual Fund Database (MS Direct).

Our sample covers broadly diversified equity-only U.S. mutual funds. In our main empirical analyses, we wish to focus on funds that are supposed to follow a well-diversified

strategy in which managers are unrestricted in their decision to consider ESG factors or not. Therefore, we exclude index funds and funds that state in prospectuses that they consider ESG factors as a part of their investment process from our main sample. We use these funds in placebo tests.

We aggregate the data at the fund level by total net asset weighting of the corresponding fund share classes from the CRSP MF. Additionally, to guard against the possibility of incubation bias affecting our results (Evans, 2010), we exclude funds with total net assets lower than $1 million.

Our initial sample consists of 1,273 funds managed by 2,616 unique managers, and the sample period spans from January 2015 through December 2020. The start of our sample period is determined by the availability of Morningstar's portfolio sustainability scores, but it also coincides with when ESG strategies started gaining popularity in the US.

We proxy managers' integration of ESG factors into the investment process through Morningstar's mutual fund sustainability scores, based on firm-level measures provided by Sustainalytics.[6] Like most ESG data providers, Sustainalytics bases its firm-level ESG assessments on issues that are deemed to be financially material, that is, to have the potential to significantly impact the value of a company within a specific industry (e.g., Sustainalytics,

[6]Morningstar's sample is restricted to fund-reporting date observations in which asset-weighted coverage of fund's portfolio holdings is at least 67% (50% prior to October 2018) and in which the number of fund peers is less than 30 (affecting only 54 fund-quarter observations in our sample). Funds report holdings on a quarterly basis, thus to estimate monthly scores, the most recent reported portfolio is carried forward, and the score is estimated using the updated company-level ESG scores each month. The percentage of the assets under management of the covered securities is then rescaled to 100%.

2021). We compute our main variable of interest, *Peer-adj. sustainability score*, as the difference in each quarter, between the fund's asset-weighted sustainability score and the related peer-average asset-weighted sustainability score (excluding the fund's score itself), divided by the average asset-weighted sustainability score of peer funds, where we define peers to be the funds in the same style category.[7] Higher sustainability scores reflect a greater managerial commitment to considering ESG factors in the investment selection relative to peer funds.

We also consider Morningstar's sustainability ratings (Globes) and sustainability rank as alternative measures of a fund's sustainability performance. *Globes* is a categorical variable based on the number of Morningstar globes assigned to the fund and takes the value from 1 to 5. *Sustainability rank* is a fund's decile rank based on the sustainability score relative to other funds in the same style segment.[8]

To capture fund portfolio sustainability inclination in more detail, we collect data on ESG issues of individual firms in mutual fund portfolios. Specifically, we calculate shares of mutual fund portfolio holdings with severe, high, significant, moderate, low, and no ESG controversies, as defined by Sustainalytics. The percentage of the assets under management

[7]Starting from September 2019, Sustainalytics and Morningstar replaced their firm and fund-levels ESG Sustainability scores with ESG Risk scores. To obtain consistent portfolio sustainability measures over time, we invert the peer-adjusted ESG scores from September 2019 onward, such that higher scores reflect higher overall sustainability throughout our sample period. In addition, we confirm that this change in methodology does not affect our findings when we separately investigate the pre- and post-change periods. These results are available upon request.

[8]Dolvin, Fulkerson, and Krukover (2019) report a significant difference in sustainability scores between small-cap and large-cap funds, with large-cap funds having better scores.

of the covered securities is then re-scaled to 100%. Next, we calculate peer-adjusted measures of shares on each of the six categories by subtracting the corresponding category average portfolio shares of funds in the same style segment.

The main fund control variables include fund size, fund family size, fund age, expense ratio, fund turnover, fund performance, fund flows, volatility, a binary indicator of whether the fund is managed by a team, and a female manager indicator. Table A1 in the Appendix provides descriptions for each of these variables and details on other fund and manager characteristics used in the paper.

2.2 Managerial ownership

We hand-collect information on mutual fund managers' ownership from funds' Statement of Additional Information (SAI), which we obtain from the SEC EDGAR (Electronic Data Gathering, Analysis, and Retrieval) database.

A typical SAI contains disclosure of portfolio manager(s) ownership stake as of the fiscal year-end of a fund (most funds report it during the fourth quarter of the calendar year). Funds are required to report whether each portfolio manager's ownership falls in one of the following brackets: \$0 (none), \$1–\$10,000, \$10,001–\$50,000, \$50,001–\$100,000, \$100,001–\$500,000, \$500,001–\$1,000,000, or above \$1,000,000. We compute our measure of managerial ownership by manually collecting this data for each manager and subsequently converting reported ranges into dollar amounts. Following Khorana, Servaes, and Wedge

(2007) and Ma and Tang (2019), we assume managerial ownership is at the midpoint of the reported ranges. For example, if the ownership stake of Manager A is in the range of $50,001–$100,000 reported in November, we assume the manager owns $75,000 in the fund. If a fund is managed by more than one manager, we aggregate the reported dollar amount for all managers in the team. Further, given that managerial ownership is reported on an annual basis, we assume that managerial ownership in month t equals the closest reported value for a given manager.

We define the variable *Ownership* as an indicator equal to one for fund managers with ownership above $0 in a given year and zero otherwise, and the variable *Ln($Ownership)* as the logarithm of one plus the dollar amount of the ownership.

In total, we collect data on the managerial ownership of 2,537 managers who managed 1,216 funds. Our final sample covers 22,789 observations, which is 96.10% of all fund-quarter observations in our sample over this period.[9]

2.3 Managerial compensation

From the same SAIs, we also hand-collect information on mutual fund managers' compensation structures. We define the indicator *Fixed pay* equal to one for managers receiving a fixed salary (and zero for managers with some type of variable compensation). We also

[9]The remaining 3.90% of fund-quarter observations without managerial ownership details primarily occur due to funds being merged or seizing to exist, thus not reporting an updated prospectus in the EDGAR database.

define variables indicating whether the manager's compensation is linked to the fund's financial performance (*Performance pay*), to assets under management (*AUM pay*), or to the advisor's profit (*Advisor profit pay*). While the majority of fund managers have contracts with multiple variable components, many are paid exclusively based on the fund's financial performance. We define the variable *Performance pay only* to indicate such cases.

2.4 Sample characteristics

Table 1 provides summary statistics for our sample of mutual fund managers and characteristics of the main variables of interest. The descriptive statistics reveal that 77% of funds in our sample have a manager (or a management team) co-investing personal capital in the fund. The average amount of managerial ownership is $802,208 (or 0.32% of assets under management). The average fund in our sample has about $3 billion in assets under management, comes from a family of funds that has $70 billion under management, has been in operation for about 24 years, has 1% expense ratio, 57% turnover ratio, and is likely to be managed by a management team (76% of funds) of male managers (only 18% of funds have at least one female manager). On average, funds in our sample invest 7.31% of assets to firms with severe and high ESG issues and 22.91% to firms that exhibit no ESG controversies.

- Table 1 -

Figure 1 shows the managerial ownership and share of mutual funds with managerial co-investment over the sample period 2015–2020. The percentage of funds with managerial

ownership ranges from 75% to 78%. We observe a general increase in managerial ownership (measured in dollars) over the years, from $762,149 in the first quarter of 2015 to $853,251 in the fourth quarter of 2020. Both the percentage of mutual funds with managerial ownership and the average amount of co-investment are higher than but in the same ballpark as what Ma and Tang (2019) found for the 2007-2014 period (70% and $540,000, respectively).

Looking at the compensation variables, we observe that around 96% of observations in our sample have fund managers with a bonus-linked compensation as opposed to a fixed salary. 24% of fund managers are paid (also) based on their fund's assets under management, 56% based on their advisor's profit, and 89% based on their fund's financial performance.[10] 32% of fund managers have their compensation tied exclusively to financial performance. These summary statistics are comparable with the ones reported in Ma, Tang, and Gomez (2019) for the 2006-2011 period.

3 Managerial ownership and ESG performance

Our key assumption is that fund managers with personal wealth tied to the funds they manage are more likely to choose portfolio holdings so to maximize financial performance. Thus, investigating the relationship between a manager's investment choices and her co-investment in the fund – having or not "skin in the game" – can reveal how fund managers

[10]In addition to these categories, advisors often (42.93% of funds in our sample) impose extra conditions that must be met before the payment to the manager becomes effective (so-called deferred pay). However, funds rarely provide a detailed description of the deferred option; thus, we do not include it in our analyses and only consider it in robustness tests. We find no instances of stand-alone deferred compensation.

perceive sustainability performance.

3.1 Main results

We start by providing simple graphical evidence on the relation of interest. Panel A in Figure 2 shows the average quarter-ahead peer-adjusted sustainability score for funds with and without managerial ownership. For each sample year, the relative sustainability performance of funds with co-investing managers appears systematically lower than the sustainability performance of other funds. The same pattern emerges for all quarters in our sample and when using alternative measures of portfolio sustainability/ESG. For instance, Panel B in Figure 2 shows that the distribution of Morningstar's sustainability Globes for the funds where managers co-invest is shifted to the left (towards fewer Globes) compared to funds with no managerial co-ownership.

- Figure 2 -

In Table 2, we formally test the link between a fund's managerial ownership and its future exposure to high-sustainability stocks. Specifically, we regress peer-adjusted sustainability scores on the *Ownership* indicator (specifications (1) to (3)) or on *Ln($Ownership)* (specifications (4) to (6)). In all the regressions, we control for fund size, fund family size, fund age, expense ratio, fund turnover, fund performance, fund flows, fund volatility, a management team indicator, and a female manager indicator. We lag all independent variables by one

quarter. To ensure that our results are unlikely to be driven by unobservable factors or heterogeneous trends, we include year-quarter, fund, fund family, and manager fixed effects, depending on the specification. To allow for cross-sectional and cross-temporal correlation of error terms, we double-cluster standard errors by year-quarter and fund.

- Table 2 -

The results indicate that a fund's managerial co-ownership is associated with lower future ESG/sustainability performance than an otherwise similar fund that is not co-invested by the manager. Regardless of the model specification, the estimated coefficients on our main measures of managerial ownership are negative and statistically significant at the 1% level. Not only does managerial ownership appears significant *per se* in explaining ESG performance (specifications (1) to (3)), but the higher the amount co-invested, the higher the reduction in a fund's sustainability performance (specifications (4) to (6)). In other words, the more "skin in the game" managers have in their funds, the less likely they seem to tilt their portfolios toward high-ESG-score firms. The effect is not only highly statistically significant but also economically important: For instance, based on the estimated coefficient of 0.17 in the specification (4), a one-standard-deviation higher USD amount of managerial ownership (5.74) implies a more than one-quarter of the standard deviation lower peer-adjusted ESG performance ($5.74 \times 0.17 = 0.98$, $0.98/3.79 = 0.26$). Figure 3 illustrates the relationship between sustainability performance and *Ln($Ownership)* through a binned scatter plot, controlling for fund characteristics and family fixed effects.

- Figure 3 -

Different specifications provide different perspectives on these results. In the baseline specifications (1) and (4), we start by including year-quarter and fund fixed effects.[11] This allows us to identify the managerial ownership effect from managerial turnover within funds and to control for unobservable characteristics at the fund level that may potentially influence a fund's ESG practices. The fund fixed effects pick up, among other things, possible differences between funds primarily targeting retail investors and funds primarily targeting institutional investors.[12] In addition, fund families may have different approaches to ESG topics on a family level or impose additional ESG-related guidance on their managers. Thus, in specifications (2) and (4), we include fund-family fixed effects. In this setting, we can compare the ESG performance of funds with and without managerial co-investment in the same family. Comparing within families, we observe lower magnitudes of the ownership effect, suggesting that part of the sustainability-ownership relationship is explained by fund family policies. Yet, the point estimates on *Ownership* and *Ln($Ownership)* are again negative and statistically significant at the 1% level. In specifications (3) and (6), we include manager/team fixed effects. This allows us to control for the possibility that some fund managers may shy away from integrating ESG factors into the investment process for various reasons

[11]For space reasons, we do not present regressions without fixed effects, but the results do not depend on this, with the coefficients on ownership in such regressions being of similar size or bigger than in the more saturated regressions.

[12]In results available upon request, we confirm that our results hold for retail and institutional mutual funds separately without statistically significant differences.

and, at the same time, may be more or less likely to co-invest in the funds they manage. Including manager/team fixed effects, too, has little effect on the point estimates and their significance.

Overall, our results provide strong evidence of a negative relation between the managerial stake in a fund and fund ESG performance.

3.2 Robustness

In what follows, we briefly discuss the results of an extensive set of robustness checks, which are reported in the Appendix.

3.2.1 Alternative fixed effects

In Appendix Table A2, we augment our primary analyses in Table 2 with even more stringent sets of fixed effects. In particular, in specifications (1) and (4), we add manager/team-by-quarter-year interaction fixed effects. For this exercise, we restrict the sample to managers who manage multiple funds simultaneously. In total, 1,933 managers (76% of all managers) in our sample run more than one fund (603 funds in total) at a certain point in our sample period, corresponding to 8,332 fund-quarter observations. Comparing within the same manager/team in the same quarter, we find that managers who run multiple funds simultaneously are more likely to have lower ESG performances in the funds in which they have a higher ownership stake. In specifications (2)-(3) and (5)-(6), we introduce family-by-quarter-year

and segment-by-quarter-year fixed effects. The point estimates of interest remain negative and highly statistically significant.

3.2.2 Placebo experiments

In Appendix Table A3, we run a "placebo" test using funds in which managers do not have much room to choose higher or lower ESG performance.

We observe no clear relationship between managerial ownership and fund sustainability for funds with explicit responsible investment mandates (specifications (1) and (2)). This non-result is what we would expect, as managers of these funds have to adopt ESG investment criteria by mandate, irrespectively of their "skin in the game". Similarly, we observe no clear effect of managerial ownership in a sample of explicit index funds (specifications (3) and (4)), in which managers have, by definition, no investment discretion.

3.2.3 Controlling for manager demographic characteristics

In Appendix Table A4 in the Appendix, we replicate our main finding controlling for additional manager characteristics. Notice that this analysis is nested in the specification with team/manager fixed effects in Table 2, but we here restrict the attention to the sub-sample of solo-managed mutual funds. Specifically, we control for: manager age and tenure because career concerns may simultaneously influence managers' co-investment and ESG risk-taking decisions; educational attainment because more educated and recently-graduated managers

may have more ESG-specialized skills; and the number of daughters because men parenting daughters may exhibit stronger social preferences (see, e.g., Cronqvist and Yu, 2017), and potentially also invest differently in their funds. (We obtained information on the gender composition of managers' kids for 153 managers following the procedure described in Agarwal, Cochardt, and Orlov, 2022.) Accounting for these additional demographic characteristics does not affect our main coefficients of interest.

3.2.4 Alternative measures of sustainability and ownership

Next, in Appendix Table A5, we use alternative measures of sustainability as dependent variables: the fund-level sustainability ranking (Panel A), the sustainability Globes (Panel B), and the shares of the portfolio invested in firms with different levels of involvement in ESG controversies. In all cases, we confirm that funds co-invested by their managers exhibit lower tilts towards high-sustainability/ESG assets.

In Appendix Table A6, we study the effect of yet another alternative measure of managerial ownership, the percentage of the managed fund's asset under management (*%Ownership/AUM*). This variable captures the "skin in the game" of fund managers relative to all the other fund investors rather than absolute incentives.[13] The results indicate that the higher the investment of fund managers relative to the fund's total AUM, the lower the fund's future ESG performance. Specifically, a one-standard-deviation higher *%Owner-*

[13]For instance, it is conceivable that a manager owning a more significant fraction of assets under management can shape the investment portfolio based on her beliefs with less pressure from large fund clients, in particular, institutional ones.

ship/AUM (0.77) is associated with a decrease in more than one-seventh of one standard deviation in ESG performance. In the most restrictive specification with manager/team fixed effects (specification (3)), this effect remains economically important but turns statistically insignificant.

3.3 Effects of managerial ownership changes

The results so far point to the existence of a negative relationship between managerial ownership and a fund's future sustainability performance. Further going beyond the analysis involving fund fixed effects (which already provides insights for developments within funds), we here provide further evidence on this relationship by analyzing more closely the effects of changes in managerial ownership on fund managers' ESG-related investment choices.

In our sample, we identify 1,099 fund-quarter observations with changes in managerial ownership, with an average change of $69,657. Of these episodes, 649 are increases in ownership (average increase: $437,404), and 450 are decreases in ownership (average decrease: –$460,717).

- Figure 4 -

Figure 4 shows the average changes in peer-adjusted sustainability scores following changes in managerial ownership. We observe that episodes of increases in managerial ownership are followed by decreases in fund sustainability scores, whereas reductions in fund managers'

stake portend increases in sustainability scores in the next quarter. The effects on sustainability are especially pronounced following changes in ownership above $1 mln USD and following episodes of initial managerial co-investment or complete withdrawals of managerial stake in a fund. Following no changes in ownership (20,206 fund-quarter observations in total), we observe no changes in the peer-adjusted sustainability score (average change: –0.01%).

- Table 3 -

Panel A in Table 3 reports the results of regressions of quarter-ahead changes in sustainability performance on various measures of ownership changes.[14] We find that increases (decreases) in ownership are followed by decreases (increases) in ESG performance. This result is highly statistically significant for all alternative measures of ownership changes.

Importantly, in Panel B in Table 3, we find no evidence for the opposite directional effect in the ownership-ESG relationship: Quarterly changes in fund sustainability performance are not followed by changes in managerial ownership. See also Figure A1 in the Appendix for an illustration. This finding is important because conceivably, it might have been that fund managers, when they do not adopt ESG strategies in their investment strategies, have to co-invest more in their funds to signal their effort/skill/commitment to investors. According

[14]These measures include: *ChangeOwnership*, a categorical variable that equals 1 for fund-quarter observations with an ownership increase, -1 for a decrease in ownership, and 0 for no change; *ChangeLn($Ownership)*, as a logarithm of one plus the absolute dollar amount of the change, multiplied by -1 for negative changes; *ChangeOwnership%*, a percentage change in ownership; and *OwnershipIncrease* and *OwnershipDecrease* dummy variables equal to 1 for episodes of positive and negative change in ownership, respectively, and zero otherwise.

to this interpretation, we would expect increases in fund sustainability to be followed by decreases in managerial co-ownership. This does, however, not seem to be the case.

4 Interpretation

We have so far provided evidence of a strong negative relationship between a fund's managerial ownership and its future sustainability performance. We interpret this evidence as a revealing sign that fund managers do not consider ESG performance as a positive material driver of a portfolio's financial performance. In this section, we probe this interpretation further.

4.1 Effects of exogenous shocks in ESG-driven flows

Consider first an exogenous shock that increases fund managers' incentives to adopt ESG strategies by increasing the influence of a fund's sustainability performance on investment flows. The publication of Morningstar's Sustainability Globes in March 2016 precisely constitutes such a shock. Investors strongly flocked to funds with more labels (Hartzmark and Sussman, 2019). In turn, fund managers willing to attract higher flows increased their demand for high-ESG stocks (Gantchev, Giannetti, and Li, 2021). If professional money managers perceive a significant tension between sustainability and financial performance, as our revealed beliefs interpretation suggests, we can expect fund managers with "skin-in-the-

game" to react less to the publication of the Globes, i.e., to chase less sustainability-driven flows because they would perceive this to come at the expense of financial performance.

To test for this conjecture, in Table 4, we run difference-in-differences (DID) regressions of fund peer-adjusted sustainability scores from 2015-Q1 through 2016-Q4. The explanatory variables of interest are the interaction term *Ownership* × *PostGlobes* and *Ln($Ownership)* × *PostGlobes*, where *PostGlobes* is an indicator variable equal to 1 for observations after 2016-Q1. We control for the same set of variables used in our main analyses. In specifications (2) and (4), we also interact the control variables with *PostGlobes* to account for potential changes of their effects over time (though the results do not depend on this).

- Table 4 -

The estimated coefficients in specifications (1) and (2) indicate that co-investing managers moved less toward more-sustainable assets in reaction to the publication of the Globes ratings in March 2016.[15] The difference-in-differences effect is economically important, as it corresponds to more than one-tenth of the standard deviation of the peer-adjusted sustainability score. Similarly, higher managerial ownership is associated with a weaker reaction by fund managers to the publication of the Globes and the flow allure associated with it.

According to many observers, the sudden, unanticipated outbreak of Covid-19 repre-

[15]Besides fund managers' trading decisions, quarterly changes in portfolio ESG scores may also derive from changes in market values of portfolio assets. However, as Panel A in Appendix Table A7 shows, we do not observe any difference-in-differences effect when using the sub-sample of U.S. index funds, whose sustainability performance, by construction, is likely to vary with asset price changes but not active trading decisions. Hence, we can attribute the results in Table 4 to fund managers' behavior.

sented another major shock to the demand for sustainable investments.[16] Whether this high demand for sustainable assets was driven by fundamental or non-fundamental considerations is still up for debate. It is, therefore, interesting to study whether fund managers with "skin in the game" increased or decreased their exposure to high-ESG firms during this period.

- Table 5 -

In Table 5, we regress fund peer-adjusted sustainability scores over the period from 2018-Q1 through 2020-Q4, interacting our ownership variables with *Covid-19*, an indicator variable equal to 1 for observations in 2020-Q1 and 2020-Q2.[17] In specifications (2) and (4), we also interact the control variables with *Covid-19*. Both measures of managerial co-ownership are associated with a statistically significant *lower* shift toward high-ESG stocks during the Covid-19 financial market turbulence. (As for the previous difference-in-differences exercise, we do not observe any significant differences among index funds. See Panel B of Appendix Table A7). These results indicate that also and especially during the early phases of the pandemic, skin-in-the-game fund managers did not consider ESG factors as major drivers of firm value, at least not to the extent implied by market prices.

[16] In line with this view, the extant literature indicates that high-ESG stocks were more resilient in the first half of 2020 (Albuquerque et al., 2020; Ding et al., 2021). Glossner et al. (2022) find no evidence that institutional investors, on average, significantly re-balanced their portfolios toward more sustainable firms. However, ESG-themed funds experienced inflows (Pástor and Vorsatz, 2020). While retail flows to sustainable funds declined from the pre-Covid period (Döttling and Kim, 2022), institutional investor flows increased and helped these funds mitigate the market crash for high-ESG stocks (Albuquerque, Koskinen, and Santioni, 2023).

[17] We obtain similar results when focusing only on the effect in 2020-Q1 only, or throughout 2020. By contrast, we do not find any significant differences when using the placebo period of the second half of 2019 as the treated period.

4.2 The role of managers' compensation structure

The heterogeneity of our main findings based on fund managers' compensation structure also provides insights relevant to the interpretation.

Managerial compensation can significantly influence the degree of agency conflicts in mutual funds (Chevalier and Ellison, 1997; Ma, Tang, and Gomez, 2019). If fund managers perceive a significant tension between a fund's sustainability and expected financial performances, we can expect them to be less likely to chase ESG performance when having strong incentives to maximize returns instead of investment flows. Hence, for managers contractually incentivized to focus on financial performance, we expect ESG performance to be less influenced by managerial ownership.[18]

In Table 6, we estimate the effect on ESG performance of the interaction of managerial ownership with various elements of the compensation contract, controlling for family fixed effects.[19] In specifications (1) and (3), we test the effects of three common types of variable compensation: compensation linked to AUM, to advisory profitability, or to the fund's financial performance.[20]

[18]In this sense, performance-based compensation is likely to have an effect similar to managerial ownership. However, it is interesting to note that performance-based compensation is asymmetric in the sense that managers receive a bonus for outperforming their benchmarks, but they are not penalized if they underperform. For this reason, performance-based pay is not the same as having "skin-in-the-game" through investments of personal wealth in the fund.

[19]In these regressions, we can not control for fund-fixed effects because compensation contracts are mostly unchanged over time.

[20]Similar to Ma, Tang, and Gomez (2019), we find that incentives based on these targets are not necessarily mutually exclusive. Out of observations with variable compensation, around 33% pay managers only based on investment performance; 6% offer a bonus based only on the advisor's profits; and 0.3% offer a bonus based exclusively on AUM. For all the other funds in our sample, managers receive some combination of the

- Table 6 -

The regression results show a statistically significant positive coefficient on *AUM pay*, which means that portfolio managers with incentives to maximize investment flows strongly tend to invest more in high-ESG stocks. Specifically, explicit AUM managerial incentives explain around 30% of a one-standard-deviation in *Peer-adj. sustainability score*. However, when these managers co-invest in their portfolios, their emphasis on ESG investments almost completely vanishes; the interaction term in column (1) is about as big as the main effect of *AUM pay*. This result is consistent with the presence of potential conflicts between fund managers' objectives of increasing investment flows and maximizing risk-adjusted fund returns, as established in Chevalier and Ellison (1997).[21]

In specifications (2) and (4), we test the effect of having the fund manager's compensation *exclusively* tied to financial performance, a feature characterizing around 32% of our sample observations (of which 71% exhibit managerial ownership). We find that managers exclusively paid based on financial performance invest less than other managers in high-ESG stocks even without managerial ownership (see the negative coefficient on *Performance pay*

three types of bonus. Ma, Tang, and Gomez (2019) show that the probability of having the compensation linked to the advisor's profit (*Advisory pay*) is significantly higher if the manager is a founder or co-owner of the advisory firm (twice more likely in our sample). In our setting, this may produce other confounding effects on the managerial perception of ESG. For this reason, the regressions in Table 6 additionally control for an eponymous manager indicator (which does not influence our estimates).

[21] In results available upon request, we also test the effect of having compensation exclusively based on a fixed salary, as opposed to performance-based bonuses. However, as in Ma, Tang, and Gomez (2019), this applies only to a tiny fraction of our funds, specifically, to only 3.2% of managers. We find that having a fixed salary significantly amplifies the negative relationship between ESG performance and managerial ownership. The estimated coefficients are not statistically significant, presumably due to the small variability in the fixed salary and ownership relationship.

only). For these managers, ownership matters less as an additional motivation not to overweight high-ESG stocks, as indicated by the positive estimated coefficients on the interaction terms *Ownership* × *Performance pay only* and *Ln($Ownership)* × *Performance pay only*.

Overall, the effects on the portfolio ESG performance of managers' compensation structure, and its interactions with managerial ownership, support the interpretation that – based on their actions – fund managers expect portfolios tilted towards higher-ESG firms to deliver lower future expected returns.

5 Conclusion

The adoption of environmental, social, and governance (ESG) strategies has been one of the most important developments in the asset management industry over the last decade, and some observers expect it to increase even further in the future. However, its role in asset management is increasingly debated. Some declare "ESG integration" to be an enhanced form of portfolio management accounting for new forms of risks and opportunities; others argue that it is mostly a way for asset managers to maximize their fees at the expense of financial returns.

Those better positioned to judge which of these two opinions about their behavior is the most accurate depiction of average reality are asset managers themselves. But what do they believe regarding the financial performance of ESG strategies? Surveys may not be particularly revealing because fund managers have incentives to express excess optimism

about their investment choices. Studying differences in realized returns between high-ESG vs. low-ESG funds is also problematic, as it does not necessarily reflect differences in ex-ante expectations (Elton, 1999; Pástor, Stambaugh, and Taylor, 2020).

In this paper, we circumvent these empirical challenges by adopting a revealed beliefs approach: We infer fund managers' expectations regarding ESG by studying the sustainability performance of their funds when they have "skin in the game", that is, when their investment choices have consequences also on personal wealth. We find evidence of a robust negative relationship between mutual fund managerial ownership and future portfolio sustainability performance. The effect is economically important: Based on our estimates, a one-standard-deviation increase in the USD amount of managerial ownership can explain more than one-quarter of the standard deviation of funds' sustainability performance.

The study has at least two practical implications. First, it raises concerns about marketing sustainable investment strategies as a way to attain superior financial performance. Investors should be cautious in blindly accepting a business case for sustainability that fund managers, on average, do not seem to believe. Of course, ESG strategies may or may not pay off in the long run regardless of fund managers' beliefs, which may be distorted or myopic. For instance, Cheng, Raina, and Xiong (2014) show that U.S. securitization agents did not anticipate the 2007 housing market crash even in their own personal home transactions with significant personal wealth at stake.

Second, our results are also relevant for investors committed to sustainable investments,

willing to give up some financial returns in the short run to reward firms with good ESG practices (and penalize those with bad ones). When fund managers do not share the same commitment and/or beliefs, their co-investment in the funds may paradoxically create a misalignment of interests in which investors' sustainability preferences are overlooked.

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Figures

Figure 1: Fund managerial ownership over time
This graph shows the average managerial fund ownership in USD (left vertical axis) and the average fraction of managerial-owned funds (right vertical axis) from 2015 through 2020.

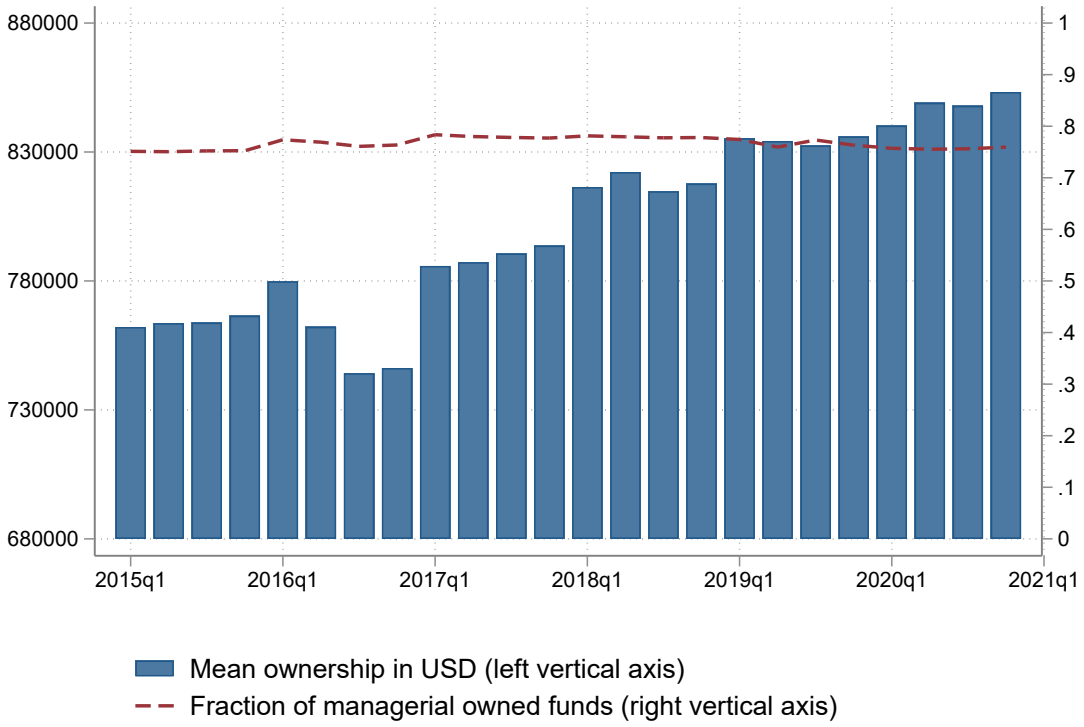


Figure 2: Fund managerial ownership and sustainability performance
Panel A shows the annual average peer-adjusted sustainability score for mutual funds with and without managerial ownership from the beginning of 2015 through the end of 2020. Panel B shows the distributions of Morningstar sustainability rating (Globes) for the same two groups of funds.

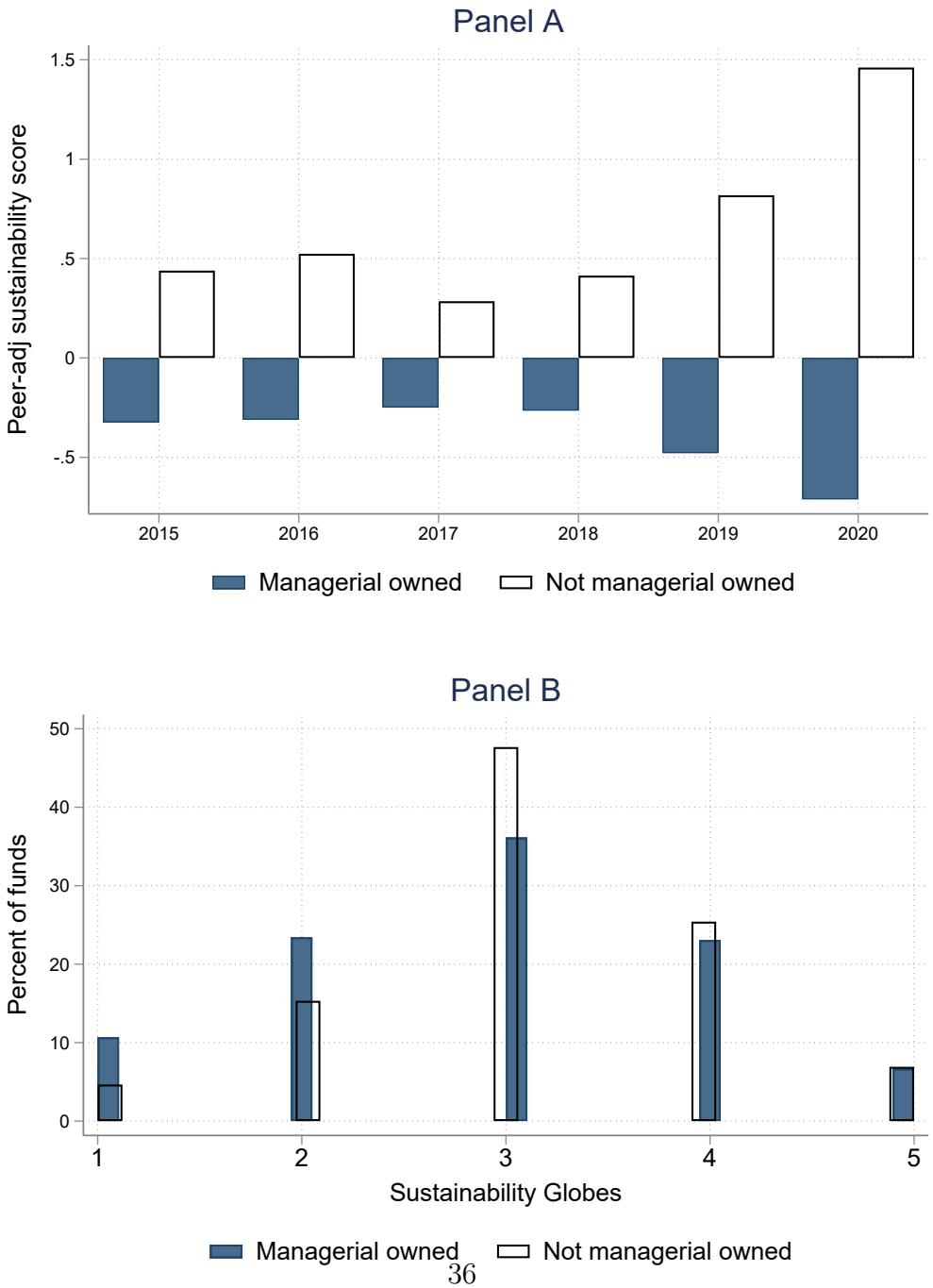


Figure 3: Main result: Fund managerial ownership and sustainability performance

This binned scatter plot shows the relationship between funds' quarter-ahead peer-adjusted sustainability score and *Ln($Ownership)*. The graph controls for fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators) and family and year-quarter fixed effects.

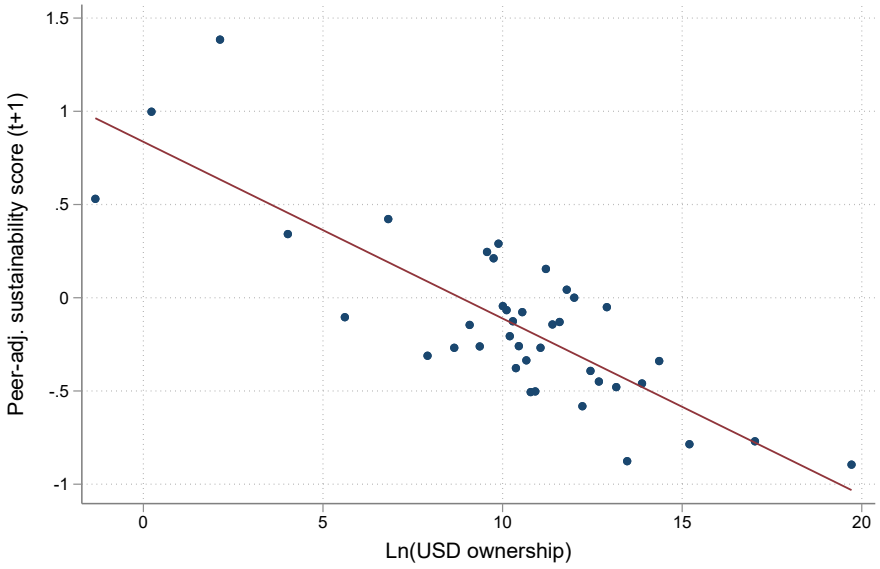
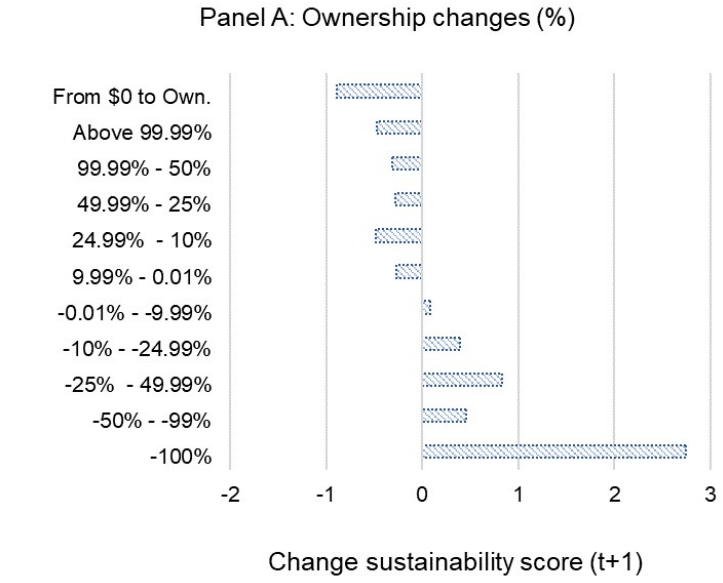
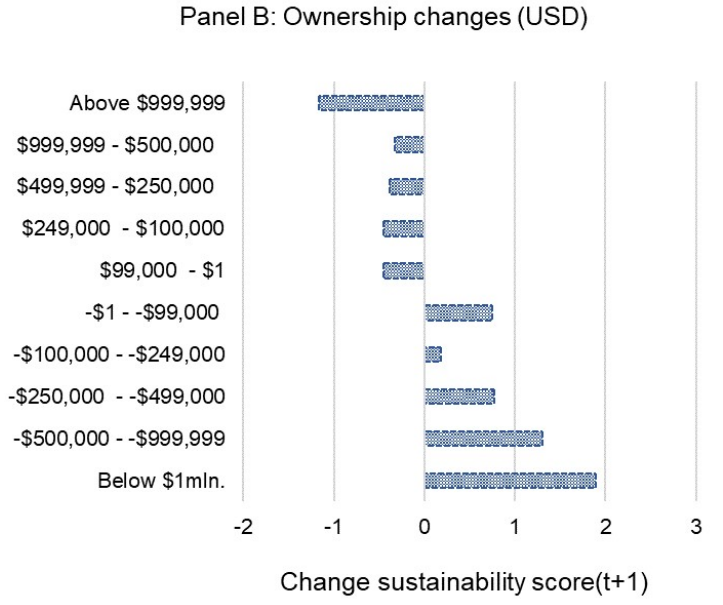


Figure 4: Changes in managerial ownership and changes in sustainability performance

These graphs show the average changes in peer-adjusted sustainability scores following changes in managerial ownership, defined either in percentage changes over the previous level of ownership (Panel A) or in USD (Panel B).





Tables

Table 1: Descriptive statistics
This table shows descriptive statistics of the variables used in the analyses. The sample consists of non-financial constituents of Russell 3000. Appendix Table A1 provides a description of all variables.

	N	min	p25	mean	p50	p75	max	sd
Ownership	22,789	0.00	1.00	0.77	1.00	1.00	1.00	0.42
Ln($Ownership)	22,789	0.00	9.21	10.20	13.30	13.86	16.38	5.74
$Ownership (/1,000)	22,789	0.00	10.00	802.21	600.00	1,050.00	13,000.00	1,008.66
%Ownership/AUM	22,435	0.00	0.00	0.32	0.04	0.20	6.51	0.77
Peer-adj. sustainability score	22,789	-32.46	-2.09	-0.15	-0.01	1.91	29.12	3.79
Sustainability rank	22,789	1.00	3.00	5.39	5.00	8.00	10.00	2.83
Globes	9,369	1.00	2.00	2.97	3.00	4.00	5.00	1.04
Severe	21,157	0.00	0.00	1.30	0.00	1.95	18.77	2.21
High	21,157	0.00	0.00	6.01	3.80	10.83	39.32	6.41
Significant	21,157	0.00	3.52	21.80	23.68	36.93	76.76	17.27
Moderate	21,157	0.00	22.93	29.98	30.28	36.87	73.63	10.36
Low	21,157	0.00	10.15	17.99	16.70	25.35	59.95	9.71
No controversies	21,157	0.00	5.84	22.91	13.77	38.70	96.17	21.06
Family size	22,747	0.18	7.96	9.27	9.77	10.73	14.06	2.43
Fund size	22,662	0.00	5.07	6.37	6.44	7.67	12.45	1.89
Fund age	22,789	1.32	15.81	24.10	20.85	27.27	96.53	13.79
Expense ratio	22,336	0.00	0.85	1.02	1.00	1.18	5.35	0.34
Turnover	22,344	0.00	0.25	0.57	0.45	0.74	8.84	0.51
Fund flows	22,529	-1.17	-0.05	0.02	-0.02	-0.00	422.53	3.06
Fund return	22,618	-0.54	0.00	0.03	0.04	0.07	0.70	0.10
Fund volatility	22,744	0.12	4.84	7.65	6.88	9.74	31.67	3.68
Team	22,789	0.00	1.00	0.76	1.00	1.00	1.00	0.43
Female	22,789	0.00	0.00	0.18	0.00	0.00	1.00	0.38
Fixed pay	22,129	0.00	0.00	0.04	0.00	0.00	1.00	0.19
AUM pay	21,851	0.00	0.00	0.24	0.00	0.00	1.00	0.43
Advisor profit pay	21,851	0.00	0.00	0.56	1.00	1.00	1.00	0.50
Performance pay	22,129	0.00	1.00	0.89	1.00	1.00	1.00	0.31
Performance pay only	22,129	0.00	0.00	0.32	0.00	1.00	1.00	0.47

Table 2: Main result

This table shows the results of OLS regressions of funds' quarter-ahead peer-adjusted sustainability score on *Ownership* (specifications (1)-(3)) and *Ln($Ownership)* (specifications (4)-(6)), from January 2015 through December 2020. The sample includes active broadly diversified equity-only U.S. mutual funds. The regressions control for lagged fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators). The regressions also include quarter-year fixed effects, and fund, fund family, or manager/team fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)					
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership	-2.11***	-1.29***	-1.53***			
	(-5.14)	(-4.62)	(-4.33)			
Ln($Ownership)				-0.17***	-0.09***	-0.12***
				(-5.14)	(-4.44)	(-4.18)
Family size	0.22	-0.14	0.29***	0.22	-0.14	0.30***
	(1.18)	(-0.57)	(2.93)	(1.18)	(-0.60)	(2.89)
Fund size	-0.03	0.02	-0.14**	-0.01	0.03	-0.12*
	(-0.20)	(0.26)	(-2.08)	(-0.07)	(0.49)	(-1.88)
Fund age	0.01	-0.00	0.01	0.01	-0.01	0.01
	(0.30)	(-0.79)	(1.16)	(0.25)	(-0.88)	(0.97)
Expense ratio	-0.19	-0.41	-0.43	-0.22	-0.41	-0.42
	(-0.33)	(-0.94)	(-1.13)	(-0.38)	(-0.95)	(-1.11)
Turnover	-0.25	-0.37**	-0.01	-0.27	-0.39**	-0.01
	(-1.26)	(-2.33)	(-0.06)	(-1.37)	(-2.48)	(-0.04)
Fund flows	0.15**	-0.03	0.11	0.15**	-0.04	0.11
	(2.13)	(-0.55)	(1.60)	(2.18)	(-0.58)	(1.61)
Return	-0.07	-0.74	-0.09	-0.08	-0.69	-0.07
	(-0.06)	(-0.63)	(-0.08)	(-0.07)	(-0.59)	(-0.07)
Volatility	-0.07	-0.27***	-0.08	-0.07	-0.27***	-0.08
	(-1.36)	(-5.52)	(-1.49)	(-1.31)	(-5.48)	(-1.49)
Team	0.03	0.15		0.06	0.17	
	(0.11)	(0.86)		(0.25)	(0.97)	
Female	-0.22	-0.03		-0.19	-0.02	
	(-0.84)	(-0.10)		(-0.73)	(-0.08)	
Constant	0.31	4.70*	0.07	0.32	4.64*	0.00
	(0.15)	(2.01)	(0.08)	(0.16)	(1.98)	(0.00)
Observations	21,926	21,935	21,597	21,926	21,935	21,597
R-squared	0.50	0.25	0.56	0.50	0.25	0.56
Quarter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	No	No	Yes	No	No
Fund family FE	No	Yes	No	No	Yes	No
Manager/Team FE	No	No	Yes	No	No	Yes

Table 3: Effect of changes in managerial ownership

This table shows, in Panel A, the results of OLS regressions of funds' quarter-ahead changes in peer-adjusted sustainability score on various measures of changes in managerial ownership. Panel B shows the results of OLS regressions of quarter-ahead managerial ownership changes on quarter changes in sustainability score. All regressions are based on the period from Q1 2015 through Q4 2020 and control for fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators), quarter-year, and fund fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Effects of changes in managerial ownership changes on sustainability

Dep. variable:	Change peer-adj. sustainability score (t+1)				
	(1)	(2)	(3)	(4)	(5)
ChangeOwnership	-0.71*				
	(-2.03)				
ChangeLn($Ownership)		-0.06**			
		(-2.10)			
ChangeLn($Ownership) (%)			-0.01*		
			(-1.89)		
OwnershipIncrease				-0.54**	
				(-2.29)	
OwnershipDecrease					1.11*
					(1.94)
Observations	20,755	20,755	20,576	20,755	20,755
R-squared	0.03	0.03	0.04	0.03	0.03
Constant & controls	Yes	Yes	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes

Panel B: Effects of changes in fund sustainability on managerial ownership

Dep. variable:	ChangeOwnership (t+1)	ChangeLn($Ownership) (t+1)
Change peer-adj. sustainability score	0.00	-0.00
	(0.01)	(-0.00)
Observations	20,916	20,916
R-squared	0.05	0.05
Constant & controls	Yes	Yes
Quarter-year FE	Yes	Yes
Fund FE	Yes	Yes

Table 4: Difference-in-differences effect of Globes introduction

This table shows the results of OLS difference-in-differences (DID) regressions of funds' quarter-ahead peer-adjusted sustainability score from Q1 2015 through Q4 2016 on *Ownership* (specifications (1)-(2)) and *Ln($Ownership)* (specifications (3)-(4)), and the interaction of these variables with the indicator *PostGlobes* equal to 1 after Q1 2016. The regressions control for fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators), and in specifications (2) and (4), also their interaction with *PostGlobes*. All regressions also include quarter-year and fund fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)			
	(1)	(2)	(3)	(4)
Ownership × PostGlobes	-0.31**	-0.41**		
	(-2.48)	(-2.89)		
Ln($Ownership) × PostGlobes			-0.01	-0.02*
			(-1.63)	(-2.30)
Ownership	-0.59**	-0.52*		
	(-2.61)	(-2.25)		
Ln($Ownership)			-0.05**	-0.04*
			(-2.80)	(-2.36)
Observations	6,854	6,854	6,854	6,854
R-squared	0.40	0.40	0.40	0.40
Constant & controls	Yes	Yes	Yes	Yes
Controls × PostGlobes	No	Yes	No	Yes
Quarter-year FE	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes

Table 5: Difference-in-differences effect of Covid-19

This table shows the results of OLS difference-in-differences (DID) regressions of funds' quarter-ahead peer-adjusted sustainability score from 2018-Q1 through 2020-Q4 on *Ownership* (specifications (1)-(2)) and *Ln($Ownership)* (specifications (3)-(4)), and the interaction of these variables with the indicator *Covid-19* equal to 1 for the first two quarters of 2020. The regressions control for fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators), and in specifications (2) and (4), also their interaction with *Covid-19*. All regressions also include quarter-year and fund fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)			
	(1)	(2)	(3)	(4)
Ownership × Covid-19	-0.43**	-0.46**		
	(-2.52)	(-2.52)		
Ln($Ownership) × Covid-19			-0.03**	-0.03**
			(-2.38)	(-2.41)
Ownership	-3.01***	-2.99***		
	(-5.86)	(-5.84)		
Ln($Ownership)			-0.25***	-0.24***
			(-5.79)	(-5.77)
Observations	11,056	11,056	11,056	11,056
R-squared	0.60	0.60	0.60	0.60
Constant & controls	Yes	Yes	Yes	Yes
Controls × Covid-19	No	Yes	No	Yes
Quarter-year FE	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes

Table 6: Cross-sectional heterogeneity across managers' compensation structure
This table shows the results of OLS regressions testing the cross-sectional heterogeneity of the main results in Table 2 along managers' compensation structure. All regressions are based on the period from Q1 2015 through Q4 2020 and control for fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team, female, and eponymous indicators), quarter-year, and family fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)			
	(1)	(2)	(3)	(4)
Ownership × AUM pay	-1.05*			
	(-2.06)			
Ownership × Advisory pay	-0.52			
	(-1.14)			
Ownership × Performance pay	-1.70			
	(-1.27)			
Ownership × Performance pay only		1.24***		
		(3.04)		
Ln($Ownership) × AUM pay			-0.08**	
			(-2.07)	
Ln($Ownership) × Advisory pay			-0.03	
			(-0.98)	
Ln($Ownership) × Performance pay			-0.11	
			(-1.15)	
Ln($Ownership) × Performance pay only				0.09***
				(2.87)
AUM pay	1.16**		1.16**	
	(2.20)		(2.18)	
Advisory pay	0.31		0.25	
	(0.60)		(0.49)	
Performance pay	1.00		0.82	
	(0.92)		(0.79)	
Performance pay only		-1.20**		-1.14**
		(-2.59)		(-2.43)
Ownership	0.77	-1.87***		
	(0.54)	(-4.71)		
Ln($Ownership)			0.04	-0.13***
			(0.43)	(-4.58)
Observations	21,035	21,305	21,035	21,305
R-squared	0.25	0.25	0.25	0.25
Constant & controls	Yes	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes	Yes
Family FE	Yes	Yes	Yes	Yes

Appendix

Table A1: Description of main variables
This table provides descriptions and sources of the main variables used in this paper. The following abbreviations are used: CRSP - CRSP Survivorship Bias Free Mutual Fund Database; MS - Morningstar Direct Database; SUST - Sustanalytics; SEC - SEC EDGAR database; AE - Authors' estimations; MC - manually collected.

Variable	Description	Source
A. Dependent variables		
Peer-adj. sustainability score	Segment-adjusted sustainability score computed as $\frac{(\sum_{s=1}^{n} ESGscore_{s,t} w_{i,s,t}) - \overline{ESGscore_t}^{style_i}}{\overline{ESGscore_t}^{style_i}}$ where $\sum_{s=1}^{n} ESGscore_{s,t} w_{i,s,t}$) is fund i's asset-weighted ESG score in quarter t, while $\overline{ESGscore_t}^{style_i}$ is the average ESG score in fund i's segment.	MS, SUST, AE
Sustainability rank	Decile rank of a fund based on sustainability measure relative to other funds in the same segment in a given quarter.	MS, SUST, AE
Globes	Number of Morningstar globes (from 1 to 5)	MS
Severe dummy	Dummy variable equal to 1 if a fund holds firms with severe ESG controversies in a given quarter and 0 otherwise.	SUST, AE
No controversies dummy	Dummy variable equal to 1 if a fund holds firms with no ESG controversies in a given quarter and 0 otherwise.	SUST, AE
Severe	Peer-adjusted share of severe ESG issues firms in a fund's portfolio.	SUST, AE
High	Peer-adjusted share of high ESG issues firms in a fund's portfolio.	SUST, AE
Significant	Peer-adjusted share of significant ESG issues firms in a fund's portfolio.	SUST, AE
Moderate	Peer-adjusted share of moderate ESG issues firms in a fund's portfolio.	SUST, AE
Low	Peer-adjusted share of low ESG issues firms in a fund's portfolio.	SUST, AE
No controversies	Peer-adjusted share of firms with no ESG controversies in a fund's portfolio.	SUST, AE
B. Main independent variables		
Ownership	Dummy variable equal to 1 if managerial ownership is above \$0 in a given quarter and 0 otherwise.	SEC, MC, AE
Ln(\$Ownership)	Logarithm of 1 plus a fund's total managerial ownership in USD. In the case of team-managed funds, we construct the aggregate ownership of the team by adding up each manager's ownership stakes in the fund.	SEC, MC, AE

%Ownership/AUM	Percentage of total managerial ownership over total assets under management, trimmed at the 99th percentile.	SEC, MC, AE
ChangeOwnership	Categorical variable that takes the value of 1 for funds with a positive change in ownership, 0 for no change, and -1 for a negative ownership change.	SEC, AE
ChangeLn($Ownership)	Logarithm of 1 plus a fund's total managerial ownership change in USD. In the case of negative change in ownership, we multiple the logarithm of 1 plus the absolute value of the change in dollar ownership by -1.	SEC, AE
OwnershipIncrease	Indicator variable equal to 1 for episodes of positive change in managerial ownership and 0 otherwise.	SEC, AE
OwnershipDecrease	Indicator variable equal to 1 for episodes of negative change in managerial ownership and 0 otherwise.	SEC, AE
Fixed pay	Indicator variable equal to 1 for managers compensated exclusively with a fixed salary.	SEC, MC, AE
AUM pay	Indicator variable equal to 1 for managers compensated also based on assets under management.	SEC, MC, AE
Advisor profit pay	Indicator variable equal to 1 for managers compensated also based on their advisor's profit.	SEC, MC, AE
Performance pay	Indicator variable equal to 1 for managers compensated also based on their fund's financial performance.	SEC, MC, AE
Performance pay only	Indicator variable equal to 1 for managers compensated exclusively based on their fund's financial performance.	SEC, MC, AE
C. Main control variables		
Returns (raw)	Fund's annual (monthly) raw net return.	CRSP
Fund size	Logarithm of a fund's total net assets in million USD.	CRSP, AE
Family size	Logarithm of a combined total net assets of funds belonging to the same fund family as a given fund in a given quarter, net of fund size of a fund itself.	CRSP, AE
Fund age	A fund's age in full years from the date the fund was first offered.	CRSP, AE
Turnover	A fund's turnover ratio.	CRSP
Expense ratio	A fund's expense ratio.	CRSP
Fund performance	Cumulative quarterly net-of-fee return.	CRSP, AE
Fund flows	Quarterly net percentage mutual fund flows, computed as the change in total net assets excluding growth in total net assets as a result of fund returns.	CRSP, AE
Fund volatility	Standard deviation of a fund daily returns in a given quarter.	CRSP, AE
Team	Dummy variable equal to 1 if a fund is managed by more than one individual in a given quarter and 0 otherwise.	CRSP, AE
Female	Dummy variable equal to 1 if a fund is managed by a female manager (solo or in a team) in a given quarter and 0 otherwise.	CRSP, AE

Table A2: Robustness: Alternative fixed effects

This table shows the results of OLS regressions of funds' quarter-ahead peer-adjusted sustainability score on *Ownership* and *Ln($Ownership)*, from January 2015 through December 2020. The specifications are as in Table 2 but with different sets of fixed effects: Manager/team × quarter-year (specifications (1) and (4)), Fund family × quarter-year (specifications (2) and (5)), segment × quarter-year fixed effects (specifications (1) and (4)). t-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)					
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership	-0.85***	-1.12***	-1.00***			
	(-2.82)	(-4.35)	(-4.92)			
Ln($Ownership)				-0.06**	-0.08***	-0.07***
				(-2.63)	(-4.19)	(-4.60)
Observations	8,332	19,290	21,925	8,332	19,290	21,925
R-squared	0.68	0.32	0.05	0.68	0.32	0.05
Constant & controls	Yes	Yes	Yes	Yes	Yes	Yes
Manager/Team x Quarter-year FE	Yes	No	No	Yes	No	No
Fund family x Quarter-year FE	No	Yes	No	No	Yes	No
Segment x Quarter-year FE	No	No	Yes	No	No	Yes

Table A3: Robustness: Placebo tests

This table shows the results of OLS regressions of funds' quarter-ahead peer-adjusted sustainability score on *Ownership* and *Ln($Ownership)*, from January 2015 through December 2020, for two "placebo" samples: US mutual funds with explicit responsible investment mandates (specifications (1) and (2)) and US explicit indexer mutual funds (specifications (3) and (4)). The regressions control for lagged fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators), quarter-year and fund fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses.***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)			
	ESG-mandate funds		Index fund	
	(1)	(2)	(3)	(4)
Ownership	0.77		0.40	
	(0.70)		(0.85)	
Ln($Ownership)		0.05		0.03
		(0.49)		(0.70)
Observations	1,512	1,512	2,834	2,834
R-squared	0.58	0.58	0.22	0.22
Constant & controls	Yes	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes

Table A4: Robustness: Additional demographic controls

This table replicates the main results in Table 2 controlling for additional demographic characteristics of fund managers: tenure and age (specifications (1) and (2)), education (specifications (3) and (4)) and number of daughters (specifications (5) and (6)). The sample is restricted to mutual funds with solo managers. *MBAmin* is an indicator equal to 1 if the manager has a MBA, PhD, JD, or MD degree, while *Degree year* is the year of the most recent educational degree earned. The regressions control for lagged fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and female indicators) and quarter-year fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)					
	Age and tenure controls		Education controls		Demographic controls	
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership	-2.86***		-3.37***		-3.94***	
	(-3.40)		(-4.05)		(-3.26)	
Ln($Ownership)		-0.24***		-0.28***		-0.31***
		(-3.42)		(-4.10)		(-3.42)
Tenure	0.08	0.08				
	(1.32)	(1.29)				
Manager age	-0.05	-0.04				
	(-0.52)	(-0.46)				
MBAmin			0.52	0.59		
			(0.65)	(0.70)		
Degree year			0.08	0.06		
			(1.68)	(1.16)		
Daughters					-1.00***	-0.99***
					(-3.37)	(-3.35)
Observations	4,552	4,552	3,842	3,842	2,644	2,644
R-squared	0.58	0.58	0.63	0.63	0.60	0.60
Constant & controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes

Table A5: Robustness: Alternative dependent variables

This table shows the results of OLS regressions of alternative measures of funds' sustainability performance on *Ownership* and *Ln($Ownership)*, from January 2015 through December 2020. Panel A shows the estimated effect on *Sustainability rank*; Panel B on *Sustainability Globes*; and Panel C on the portfolio exposure to firms with different levels of ESG controversies. t-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: With sustainability ranking						
Dep. variable:	Sustainability rank (t+1)					
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership	-1.24***	-0.70***	-0.91***			
	(-4.89)	(-4.06)	(-4.14)			
Ln($Ownership)				-0.10***	-0.09***	-0.06***
				(-4.93)	(-4.44)	(-3.84)
Observations	21,926	21,935	21,597	21,926	21,935	21,597
R-squared	0.52	0.22	0.56	0.52	0.25	0.56
Constant & controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other FE	Fund	Family	Manager	Fund	Family	Manager
Panel B: With sustainability Globes						
Dep. variable:	Sustainability Globes (t+1)					
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership	-0.47***	-0.27***	-0.33***			
	(-4.36)	(-3.67)	(-3.48)			
Ln($Ownership)				-0.04***	-0.02***	-0.02***
				(-4.26)	(-3.24)	(-3.27)
Observations	9,935	9,942	9,759	9,935	9,942	9,759
R-squared	0.66	0.27	0.63	0.66	0.27	0.63
Constant & controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other FE	Fund	Family	Manager	Fund	Family	Manager
Panel C: With controversies score						
Dep. variable:	Peer adj. share in portfolio (t+1)					
	Severe	High	Significant	Moderate	Low	No contr.
Ownership	0.58***	-0.18	-0.11	1.02**	-0.62*	-0.71*
	(4.21)	(-0.75)	(-0.23)	(2.22)	(-1.81)	(-1.73)
Observations	21,132	21,132	21,132	21,132	21,132	21,132
R-squared	0.47	0.58	0.69	0.60	0.54	0.72
Constant & controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund family FE	Yes	Yes	Yes	Yes	Yes	Yes

Table A6: Robustness: Effect of percentage of ownership on AUM
This table shows the results of OLS regressions of funds' quarter-ahead peer-adjusted sustainability score on *%Ownership/AUM* (specifications (1)-(3)) from January 2015 through December 2020. The sample includes active broadly diversified equity-only U.S. mutual funds. The regressions control for lagged fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators). The regressions also include quarter-year fixed effects, and fund, fund family, or manager/team fixed effects. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

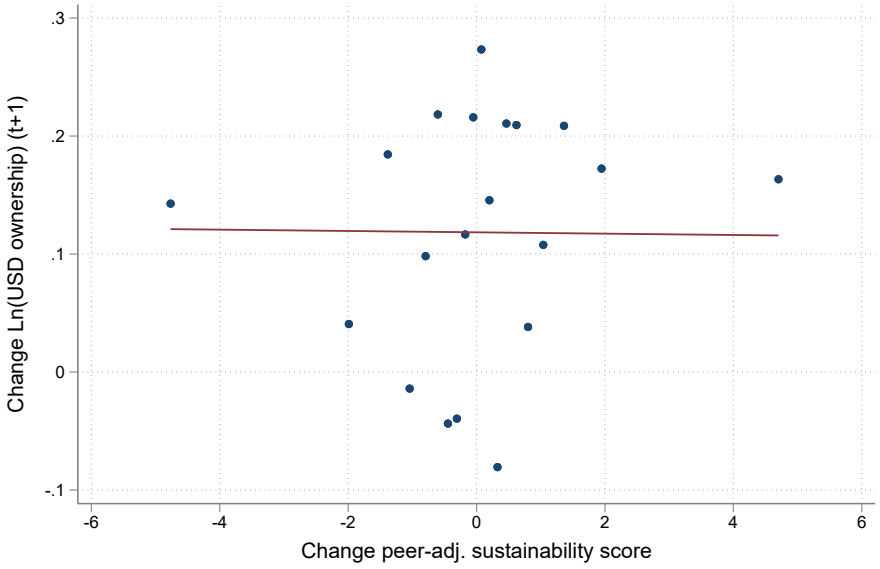
Dep. variable:	Peer-adj. sustainability score (t+1)		
	(1)	(2)	(3)
%Ownership/AUM	-0.64**	-0.54***	-0.31
	(-2.31)	(-3.55)	(-1.32)
Observations	21,723	21,733	21,396
R-squared	0.49	0.24	0.55
Constant & controls	Yes	Yes	Yes
Quarter-year FE	Yes	Yes	Yes
Fund FE	Yes	No	No
Fund family FE	No	Yes	No
Manager/Team FE	No	No	Yes

Table A7: Placebo tests: Difference-in-differences effects using index funds
This table shows the results of OLS regressions replicating the analyses in Tables 4 and 5 with the sub-sample of explicit index U.S. mutual funds. *t*-statistics, based on robust standard errors double-clustered at the fund and quarter levels, are reported in parentheses. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Peer-adj. sustainability score (t+1)			
	(1)	(2)	(3)	(4)
Panel A: Introduction of Globes				
Dep. variable:	Peer-adj. sustainability score (t+1)			
	(1)	(2)	(3)	(4)
Ownership × PostGlobes	0.10	0.28		
	(0.60)	(1.37)		
Ln($Ownership) × PostGlobes			0.01	0.03
			(0.83)	(1.56)
Ownership	-0.13	-0.26		
	(-0.18)	(-0.35)		
Ln($Ownership)			-0.03	-0.04
			(-0.45)	(-0.58)
Observations	927	927	927	927
R-squared	0.48	0.50	0.48	0.50
Panel B: Covid-19				
Ownership × Covid-19	0.66	0.65		
	(1.43)	(1.15)		
Ln($Ownership) × Covid-19			0.06	0.05
			(1.43)	(1.11)
Ownership	1.30*	1.17		
	(2.11)	(1.80)		
Ln($Ownership)			0.08	0.08
			(1.58)	(1.36)
Observations	1,379	1,379	1,379	1,379
R-squared	0.22	0.23	0.22	0.22
Constant & controls	Yes	Yes	Yes	Yes
Controls × Post	No	Yes	No	Yes
Quarter-year FE	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes

Figure A1: Effect of changes in sustainability performance on managerial ownership

This graph shows in binned scatter plots the effect of changes in peer-adjusted sustainability score on quarter-ahead *Ln($Ownership)*. The graph controls for fund characteristics (fund size, fund family size, expense ratio, turnover, fund flows, returns, volatility, and team and female indicators) and family and year-quarter fixed effects.



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