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Does Socially Responsible Investing Change Firm Behavior?

Finance Working Paper N° 762/2021
February 2022

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Abstract

Using novel micro-level data, we examine the impact of socially responsible investment (SRI) funds on corporate behavior. SRI funds select firms that pollute less, have greater board diversity, higher employee satisfaction, and higher workplace safety. Yet, both in the broad cross-section and using an exogenous shock to SRI capital, we find no evidence that SRI funds improve firm behavior. The results suggest SRI funds operate through a selection effect, not a treatment effect: SRI funds invest in a portfolio consistent with the fund's objective, but they do not significantly improve corporate conduct.

Keywords: Corporate Social Responsibility (CSR), Environmental, Social, and Governance (ESG), Institutional Investors, Socially Responsible Investing (SRI)

JEL Classifications: G12, G14

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ABSTRACT

Using novel micro-level data, we examine the impact of socially responsible investment (SRI) funds on corporate behavior. SRI funds *select* firms that pollute less, have greater board diversity, higher employee satisfaction, and higher workplace safety. Yet, both in the broad cross-section and using an exogenous shock to SRI capital, we find no evidence that SRI funds *improve* firm behavior. The results suggest SRI funds operate through a selection effect, not a treatment effect: SRI funds invest in a portfolio consistent with the fund's objective, but they do not significantly improve corporate conduct.

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I. Introduction

Over the last two decades, there has been a significant increase in the popularity of investment funds that have a stated objective about the environmental or social behavior of the firms they invest in. Yet, despite the increasing popularity of these socially responsible investment (SRI) funds, it is unclear whether SRI funds simply *select* portfolio firms with "good" environmental or social behavior or whether they work to *improve* their portfolio firms' behavior. In this paper, we provide some of the first evidence on whether SRI funds operate primarily by selecting companies or by influencing companies.

We assemble a novel set of outcome variables that measure whether SRI affects different firm stakeholders along environmental or social dimensions.[1] On the environmental dimension, we examine seven measures of pollution using data from the Environmental Protection Agency (EPA); on the social dimension, we examine seven measures of employee satisfaction using data from Glassdoor, Inc., two measures of workplace safety using data from the U.S. Department of Labor Occupational Safety and Health Administration (OSHA), and two measures of diversity on the board of directors using data from BoardEx and ISS. We find that SRI funds do *select* companies with better environmental and social conduct, but SRI funds do not *improve* the environmental or social behavior of their portfolio firms.

To date, it is unclear how SRI funds are related to the behavior of their portfolio firms. There are three main possibilities. First, SRI funds might not behave differently than non-SRI funds in their portfolio choices or the way in which they interact with firms (i.e., "green-

[1]Berg, Koelbel, and Rigobon (2019) document that E&S ratings often differ significantly for the same firm across different rating agencies, and Cohen, Gurun, and Nguyen (2020) provide evidence that E&S ratings may not accurately measure behavior. Moreover, Berg, Fabisik, and Sautner (2020) show that firms seem to modify their data ex-post, such that the rewritten data better matches the firm's ESG-related performance. We avoid this issue by focusing on outcome variables, instead of E&S ratings. Yet, our conclusions are unchanged if we instead use E&S ratings (see Appendix H).

washing"). Second, SRI funds might select companies that focus on environmental and social issues, but not engage with them (i.e., a selection effect). Finally, SRI funds might actively work to improve the environmental and social conduct of their portfolio companies (i.e., a treatment effect). In fact, 66% of SRI funds have an explicit stated objective of improving the behavior of their portfolio companies through direct engagement.[2]

Theoretically, the recent increase in the size of SRI funds could make them more effective at influencing firm behavior through engagement and coordination with activists (Dimson, Karakaş, & Li, 2015), or the threat of exit (Edmans, 2009; Edmans & Manso, 2010). Consistent with the engagement channel, a recent survey suggests that SRI funds do view engagement as a tool for addressing climate risks (Krueger, Sautner, & Starks, 2020).[3] On the other hand, for the threat of exit to have an impact it should be capable of significantly changing the cost of capital of affected firms. Yet, Berk and van Binsbergen (2021) argue that the impact of SRI funds on the cost of capital is too small to meaningfully affect real investment decisions. Further, the cost of engaging with portfolio firms and changing their behavior is likely higher than the cost of pure portfolio selection based on observable E&S performance; thus, funds may lack the incentive to engage (Davies & Van Wesep, 2018). Finally, SRI funds might not have the expertise, resources, or stewardship personnel to effectively engage with their portfolio firms (Bebchuk & Tallarita, 2020). In sum, there are several mechanisms through which SRI funds could affect firms; whether they do or not is an open empirical question.

[2]See the Forum for Sustainable and Responsible Investing (2021), where many subscriber funds claim to improve firm behavior. For example, BlackRock's Investment Stewardship team claims to regularly engage with companies to understand how material environmental factors are considered from the perspective of risk and opportunity (BlackRock, 2020). Similarly, Domini Social Equity Fund (2021) claims to influence corporations through shareholder activism: "*In pursuing our clients' sustainability objectives, we seek to influence the actions of corporations on a wide range of social, environmental and governance issues.*"

[3]Moreover, Chowdhry, Davies, and Waters (2019) show that impact investors can, theoretically, change corporate behavior depending on the structure of stakeholders' financial claims.

Empirically, examining the impact of SRI is challenging because holdings by SRI funds may be endogenously related to firm characteristics. First, different firm policies attract different types of investors, making it difficult to determine if SRI funds change behavior at their portfolio companies or merely select companies that behave differently. Second, firm characteristics, such as managerial quality, may jointly affect ownership by SRI funds and responsible behavior. As a result, there are concerns of both reverse causality and omitted variable bias in this setting. Accordingly, our main analyses use two different empirical designs: the first set uses ordinary least squares (OLS) regressions to establish whether SRI fund ownership is related to firm behavior, in general. The second set uses uses exogenous variation in the amount of capital allocated to SRI funds to examine whether SRI funds change firm behavior. Combined, our analyses let us disentangle selection effects from treatment effects.

We begin by examining the raw correlations between SRI investing and subsequent changes in firms' E&S behavior. We find no association between SRI fund investment and subsequent changes in firms' E&S behavior, not even for firms with high SRI fund ownership. While these analyses have the advantage of not relying on any assumptions imposed by our research design and they help address external validity concerns, these broad patterns could be consistent with several potential interpretations (as discussed above). In particular, our findings could indicate: (i) greenwashing (i.e., no selection or treatment effects) or (ii) selection but no treatment effects.[4] To more cleanly distinguish between these interpretations, we then test for selection and/or treatment effects.

We next examine SRI funds' portfolio selection with cross-sectional OLS regressions. First, we examine the relation between SRI fund investment and firm-level pollution using

[4]It is also possible that there could be selection and treatment effects that offset each other, leading to the appearance of no effect.

data from the EPA. Survey evidence in Krueger et al. (2020) indicates that institutional investors believe climate risks have financial implications for their portfolio firms. As a result, many investors state that they consider firm-level emissions when making holding decisions. Consistent with this, we find that SRI fund investment is strongly related to lower pollution at the firm level. Specifically, more SRI ownership is associated with lower air and water pollution, and higher investments in pollution abatement technologies. Moreover, the results are economically large. At the intensive margin, a one-standard deviation increase in SRI ownership is associated with 24.5 percent lower annual total emissions.

Next, we examine whether SRI fund investment is related to employee satisfaction, which has been shown to be related to shareholders' returns (Edmans, 2011). We use data on self-reported employee reviews about their firms from Glassdoor, Inc. and workplace safety data from OSHA. Consistent with our pollution results, we find that SRI fund ownership is associated with better firm-level outcomes for stakeholders. Employees at firms with more ownership by SRI funds rate their firm better and experience fewer workplace injuries.

We also examine broader social dimensions such as gender and racial diversity on the board of directors. Many institutional investors actively support board diversity and many companies have publicly committed to increase it (Krouse, 2018). We find that firms with more SRI ownership have more women on their board of directors. A one-standard deviation increase in SRI ownership is associated with 0.6 percent more women on the board.

One of the unique contributions of our study is that we examine 18 different environmental and social outcomes and we find consistent results across them. However, given the large number of outcome variables we examine, we would expect some outcomes to be statistically

significant by chance (a Type I error).[5] Thus, we apply the Romano and Wolf (2005) adjustment for multiple hypothesis testing. Our conclusions are largely unchanged. Together, our results provide evidence that SRI funds are not green-washing since they select firms with better E&S practices. However, it is still unclear whether SRI funds improve the behavior of their portfolio companies. To examine this, we use our second research design that exploits Morningstar "star ratings" as an exogenous shock to SRI fund capital.

Morningstar is an investment research company that provides independent ratings of investment funds. Each period, 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. These star ratings are widely used by investors, and they have been shown to strongly affect the amount of investor capital allocated to a given fund (Guercio & Tkac, 2008; Reuter & Zitzewitz, 2021). Importantly, it is nearly impossible for funds to manipulate their rating each period, and the discontinuities in the "star rating" leads to sharp discontinuities in capital allocation.[6]

We construct a set of matched treated and control funds that have different star ratings but are indistinguishable on their observable characteristics – including, crucially, the inputs into their Morningstar star ratings. Treated funds are SRI funds that received a high star rating; control funds are non-SRI funds that received a lower star rating in the same fund category and with near-identical lagged returns. While treated and control funds had similar assets and flows in the years prior to treatment, afterward they diverge sharply, with the

[5] In our setting, the probability of making at least one Type I error using a critical value of 5% is $1-(1-5\%)^{18} = 60\%$, where 18 is the number of outcomes (assuming independence of tests and all of the null hypotheses are true).

[6] Duong and Meschke (2020); S. H. Kim (2021) examine whether funds can manipulate their star ratings and find that year-end manipulation disappeared after 2002 because of SEC scrutiny. Our sample focuses exclusively on year-end ratings in the period after 2002 when manipulation is not a concern.

assets of treated funds increasing by 22.9% relative to control funds. We use these relative changes in SRI assets, multiplied by the funds' *pre-treatment* portfolio weights, to construct plausibly exogenous flows of SRI investment into portfolio firms.

Again, we start by examining pollution. While we find that SRI funds tend to hold companies that pollute less, we find no evidence that SRI funds *change* a firm's environmental behavior. Specifically, an exogenous increase in SRI capital by 22.9% leads to zero change in total pollution or investment in pollution abatement. Next, we examine measures of employee well-being. We find some evidence of improvements for employees. In particular, we find a slight improvement in employees' views about career opportunities, the company outlook, and the employees' assessment of the CEO. Further, we observe a 0.5 percent increase in the fraction of women on boards. However, while these results are consistent with a treatment effect, only two of them (employees' assessment of the CEO and the fraction of women on boards) are significant at the 5% level out of 18 different outcome variables. As more outcomes are examined, it is likely that more results will be found due to chance. Accordingly, we again apply the multiple hypothesis testing correction (Romano & Wolf, 2005). This time, we find that the results do not survive after adjusting for the number of hypotheses tested. Taken together, the results show that SRI funds do select companies that behave in a relatively more environmentally and socially responsible manner, but they do not improve the environmental or social conduct of their portfolio firms. Put differently, we find consistent evidence of a selection effect, but not a treatment effect.

As noted in Abadie (2018), "...rejection of a point null often carries very little information, while failure to reject may be highly informative." However, while our non-results on the impact of SRI may be highly informative, there are three main concerns that need to be addressed. Specifically, our non-results could be due to: (1) the limited size of investment

by SRI funds, (2) limited statistical power, (3) a short time horizon, or (4) heterogeneous treatment effects.

On the first concern, it is possible that our findings of zero treatment effects are because SRI funds do not yet own large enough stakes in their portfolio firms to influence firm policies. SRI fund capital has been rising rapidly through our sample period. Yet the total ownership represented by SRI funds is still relatively small, representing less than 1% of most firms' market capitalization, which might not be sufficient to drive change. On the other hand, SRI funds could still affect firms even with small ownership positions. For example, they could coordinate engagement actions with other blockholders (Dimson et al., 2015), and/or they could submit shareholder proposals. Those actions do not require holding large positions. In fact, there are a few examples of SRI investors driving change despite holding a minimal stake, via engagement and consensus.[7] To investigate this, we split our sample firms on the ex ante level of SRI fund investment. In the highest tercile of firm-years, average SRI fund holdings are on the order of 1% of market capitalization, which is large enough to affect firm policy on other issues (McCahery, Sautner, & Starks, 2016). In this subsample, we again find zero treatment effects on environmental policies and employee welfare, and small effects on board gender diversity.

To address the second concern, we compute the minimum detectable effect size (MDES) as in Bloom (1995) for each of our treatment-effect estimates. The MDES measures the magnitude of treatment effect that a given estimator could reliably detect. Throughout our analyses, the MDES indicates that we have enough power to reliably detect a meaningful change in real outcomes. On the third concern, we examine longer-run effects on firm outcomes using data two and three years post-treatment. Even at longer horizons, we find

[7] E.g., the case of Exxon, Inc. and Engine No.1 (link).

no evidence of a treatment effect.

Finally, it is possible that heterogeneous treatment effects mask the true effect (if treatment effects in some firms are offset by opposite effects in other firms) and/or lead to biased estimates (See Borusyak, Jaravel, and Spiess (2017); Goodman-Bacon (2018); Sun and Abraham (2020)). To address this, we first perform a variety of sample splits based on pre-existing levels of each firm's E&S conduct. We find some evidence for heterogeneous treatment effects on gender diversity on the board of directors. However, we find little evidence for other outcome variables. We also examine the impact of heterogeneous treatment effects using the approach of Sun and Abraham (2020). The implicit weighting function in our setting does not suggest cause for concern, and Sun and Abraham (2020)'s proposed robust estimator produces similar results to our baseline estimates. We conclude that heterogeneous treatment effects are not an issue in our setting.

Overall, our results suggest that despite their stated objective to engage with firms and affect their behavior, SRI funds do not have real effects on their portfolio companies.[8] Dikolli, Frank, Guo, and Lynch (2021) document that SRI funds are more likely to vote in favor of E&S shareholder proposals compared to non-SRI funds. However, Michaely, Ordonez-Calafi, and Rubio (2021) find that SRI funds behave strategically: they vote in favor of E&S proposals when they are unlikely to pass, but they vote against them when their vote is more likely to be pivotal. Taken together, the evidence suggests SRI funds primarily operate through portfolio selection rather than by changing firm behavior. This result seems consistent with incentives: funds' investors seem to prefer their capital being invested in green companies (Hartzmark & Sussman, 2019). This boosts SRI funds assets under management

[8]Recent work by S. Kim, Kumar, Lee, and Oh (2021) documents similar results for ESG bonds. They find that issuers of ESG bonds tend to have better ESG scores, but these scores do not improve after the bonds are issued.

(AUM) and fund managers' compensation, and avoids costly effort by fund managers and firm managers.

Our paper makes a number of contributions. We provide some of the first evidence on the relation between SRI funds and corporate behavior. We show that SRI funds primarily operate through a selection channel, not a treatment channel. They choose to hold firms that have better environmental and social behavior, but they do not significantly improve firms' behavior. To do this, we develop a novel research design that exploits Morningstar star ratings to isolate exogenous variation in mutual fund flows. Moreover, we create a comprehensive database of 18 different environmental and social measures which allows us to examine the relation between SRI funds and real-world outcomes that affect a wide-variety of stakeholders. Together, our empirical and methodological innovations can be used in future studies that examine the behavior of institutional investors and/or social responsibility.

II. Background and Data

A. Literature and contribution

Friedman (1970) popularized the view that corporate managers should work to maximize shareholder value. More recently, this view has been challenged. Bénabou and Tirole (2010) and Hart and Zingales (2017) argue that corporations should instead seek to maximize shareholder *welfare* and that socially responsible investment (SRI) funds should play a role in addressing environmental and social issues. While this debate remains unsettled, it is clear that investors care about SRI funds. The amount of capital allocated to SRI funds has more than doubled over the last decade (see Figure 1) and a SRI fund recently launched by BlackRock attracted more than $600 million in its first week of activity (Coumarianos, 2020).

Similarly, Bialkowski and Starks (2016) document an increase in investor demand for SRI funds, Hartzmark and Sussman (2019) document a large capital flow into highly rated SRI funds following the 2016 introduction of Morningstar sustainability ratings, and Gantchev, Giannetti, and Li (2020) find that institutional investors change their holdings to boost their Morningstar sustainability ratings. Consistent with this, survey data in Riedl and Smeets (2017) show that investors are willing to forgo financial performance to invest in accordance with their social preferences.[9] Similarly, Bauer, Ruof, and Smeets (2021) conduct a survey at a major pension fund and find that the majority of investors want the fund to invest in a sustainable manner, even if it leads to a reduction in performance.

Our results are consistent with the theoretical predictions in Davies and Van Wesep (2018), Edmans (2009), and Friedman and Heinle (2021). Davies and Van Wesep (2018) show that most managerial compensation contracts reward long-run profitability and, as a result, it is unlikely that SRI fund holding decisions will significantly change managerial incentives to engage in E&S policies. Indeed, they show that SRI fund holding decisions may even decrease incentives to invest in E&S policies. This is also consistent with Edmans (2009), who shows that the threat of exit is less relevant if a firm manager's wealth is tied to long-term firm value, which implies that fund exit decisions may not affect E&S policies. Finally, Friedman and Heinle (2021) show that, due to free riding incentives between funds and their investors, funds prefer to invest in firms that have managers with E&S preferences similar to those of the funds' investors instead of investing in costly efforts to influence firm behavior.

Our paper also relates to the broad literature on the effects of institutional investors (see

[9]Benson and Humphrey (2008) show that SRI fund flows are less sensitive to returns than conventional funds, and Bollen (2007) finds that cash outflows from SRI funds are less sensitive to lagged negative returns, indicating that investors do appear to derive utility from more than just performance.

Edmans and Holderness (2017) for a complete survey of the literature), and in particular investors interested in environmental and social issues. Dimson et al. (2015) examine activists who engage with firms on environmental and social concerns and find that those engagements are followed by improved performance. Chu and Zhao (2019), Akey and Appel (2019), and Naaraayanan, Sachdeva, and Sharma (2020) find that firms targeted by activist investors improve environmental behavior.[10] Azar, Duro, Kadach, and Ormazabal (2021) find that the Big 3 passive fund families concentrate their engagement activities in large portfolio firms with higher emissions. However, both activist hedge funds and the funds managed by the Big 3 families have varying objectives (and most are not SRI funds). Our paper differs in that we specifically focus on SRI funds. Chen, Dong, and Lin (2020) examine the relation between institutional investors and third party environmental and social (E&S) ratings using Russell index rebalancing as in Appel, Gormley, and Keim (2016). They find that higher institutional ownership leads to higher E&S ratings in portfolio firms. However, using a different methodology that corrects for biases that results from the methodology in Appel et al. (2016), Glossner (2021) finds no evidence that institutional investors change E&S ratings. We do not examine third party E&S, as a growing literature suggests they may be unreliable. Further, we are the first to examine the social impact on multiple groups of stakeholders, in addition to firms' environmental practices.

Finally, Dyck, Lins, Roth, and Wagner (2019), Gantchev, Giannetti, and Li (2019), Dimson, Karakaş, and Li (2021) and Gibson, Glossner, Krueger, Matos, and Steffen (2021) examine international evidence and find that institutional ownership is associated with better aggregate environmental and social performance. Our results are consistent with theirs, as we find that ownership by SRI funds is associated with better environmental and social

[10]Similarly, Brav, Jiang, and Kim (2015) show that activist hedge funds do change firm-level behavior.

performance in a number of dimensions. However, we provide an important new fact: the relation between SRI ownership and outcomes is driven primarily by selection, not treatment. Perhaps, compared to Europe, engagement and collaboration could be more difficult in the U.S. due to regulatory barriers.

B. Data

To examine the relation between socially responsible investing and environmental and social corporate behavior, we combine micro-level data from a wide variety of public and private sources, as discussed below. Detailed definitions of all our variables and their construction are presented in the Appendix in Sections A and B.

We construct a firm-year panel of firms held by U.S. open-end mutual funds for the period from 2010 to 2019.[11] From the Morningstar database we collect all mutual funds with available star ratings. To identify an SRI fund, we use data from three sources: Bloomberg, Morningstar, and the US Sustainable Investment Forum (US SIF) membership list. First, using the Bloomberg terminal, we hand-collect mutual funds that identify themselves as "social responsible" or "SRI" funds. Second, we obtain data from Morningstar Socially Conscious data set, which indicates if a fund identifies itself as selectively investing based on certain non-economic principles. These funds may make investments to improve corporate behavior on such issues as environmental responsibility, human rights, or religious views. An SRI fund identified in this list can take a proactive stance by selectively investing in, for example, environmentally friendly companies or firms with good employee relations. This list also includes funds that may avoid investing in companies in the defense industry or companies involved in promoting alcohol, tobacco, or gambling. Third, the Forum for

[11] The beginning and ending of our sample period varies for some tests based on the availability of data. We provide more details about each source of data below.

Sustainable and Responsible Investment (US SIF) is a U.S.-based membership association that advances impact investing across all asset classes. We manually match institutions in the union of the three lists with those in the Center for Research in Security Prices (CRSP) Mutual fund holdings database, from which we retrieve information about each fund's asset under management (AUM), turnover ratio, management fees, expense ratio, and portfolio holdings, which allow us to measure the percentage of a firm's ownership held by SRI funds (*SRI Investment*).

Figure 1 shows the substantial growth in SRI funds' number and AUM over time. While the trend is strongly upward and shows a growing interest in socially responsible investing, we note that the total assets under management in SRI funds remains modest, approximately $240 billion as of December 2019. The average firm-year in our sample has 0.27 percent of its market capitalization owned by SRI funds (Table I).

We aim to examine corporate behavior on environmental and social issues. Hence, we collect firm-year level data from several different data sources. Our paper is among the first to use novel micro-level data to examine firm behavior. To examine firm environmental behavior, we obtain detailed plant-chemical level pollution data from the Environmental Protection Agency (EPA)'s Toxic Release Inventory database. Also, from the EPA Pollution Prevention database, we collect information about a facility's yearly investments in pollution reducing activities.

In Table I we report descriptive statistics for the EPA data. On average, firms in our sample release 1.5 million pounds of chemicals per year: 470 thousand pounds into the air, 130 thousand pounds into the water, 680 thousand pounds into the land. Furthermore, firms in our sample invest in 3.6 abatement activities every year, on average, and 43 percent of firm-years show a nonzero investment in pollution reducing activities. Finally, we examine a

holistic measure of firms' exposure to climate risk using data from Sautner, van Lent, Vilkov, and Zhang (2020) (*CCExposure*). This measure is based on machine learning algorithm that identifies a firm's annual climate change exposure from earnings conference calls. Our sample mean (1.00) is consistent with Sautner et al. (2020).

We also aim to examine each firm's social behavior. To do so, we use four different data sources with micro-level data. To measure employee satisfaction, we obtain data on employee reviews from Glassdoor, Inc., which is a worldwide leader in providing insights about jobs and companies. From the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), we obtain data on workplace safety. In Table I, we find that firms report an average of 1.86 employees' injuries that require hospitalization, and 0.52 employees' injuries that require amputations. We use BoardEx data to measure gender diversity on the board of directors, and from Institutional Shareholder Services (ISS) database we retrieve data on racial diversity on the board. In our sample, firms have on average 16 percent of their board represented by women and 11 percent of their board represented by non-caucasian directors (Table I).

III. Research Design

A. Selection vs. Treatment

Disentangling a *selection* effect from a *treatment* effect is difficult because of the possibility of an omitted variable or reverse causality. To address this, we make use of funds' Morningstar star ratings. Each month Morningstar assigns each fund an integer number of stars, from 1 to 5. The star rankings are a complex nonlinear function of each fund's percentile ranking, within its category, on the basis of their returns over a three, five, and ten

year lagged basis, adjusted for the fund's return volatility over the same period.[12] Crucially, these are the *only* inputs that determine funds' star ratings.

The mapping from lagged returns to Morningstar stars allows us to construct a matched set of funds that are indistinguishable on all observable characteristics – including their investment category and lagged returns in the Morningstar database – but had different Morningstar star ratings. We select all U.S. equity funds in the Morningstar database with at least $50 million in AUM, in December of each year from 2012 to 2018.[13] Our matched sets of treated and control funds satisfy the following requirements: The treated fund is an SRI fund, as defined in Section II.B. The treated fund is matched with a control fund that: (1) is a non-SRI fund; (2) is in the same Morningstar category as the treated fund; (3) has assets under management within +/- 50% of the treated fund; (4) has lagged three, five, and ten year adjusted returns that are within +/-50 basis points of the treated fund; (5) is assigned *one fewer* star than the treated fund in January of the following year. When a treated fund has multiple candidate control funds that satisfy the requirements above, as happens in the majority of cases, we pick up to three control funds with the closest three, five, and ten year adjusted returns to the treated fund, weighted equally.

Figure 2 compares treated versus control funds. We see that the two groups of funds are very closely matched in terms of the 3-year, 5-year, and 10-year Morningstar returns – the inputs that determine the Morningstar star ratings. The differences in means between the two groups are 8, 10 and 9 basis points respectively, and the differences are not statistically significant. Appendix Section C presents formal tests of the match quality between the matched samples on a variety of fund characteristics, as well as tests of conditional indepen-

[12]For a detailed primer on the assignment of Morningstar stars, see Reuter and Zitzewitz (2021).

[13]Our data runs from 2010 to 2019. We select cohorts from 2012 to 2018 so that each cohort has three years of pre-treatment observations and at least one year of post-treatment observations.

dence of treatment status. We find that treated and control funds are indistinguishable on all characteristics we examine, including AUM, turnover, expense ratio, and 3-year, 5-year, and 10-year returns.

B. Exogenous Changes in Fund Assets

Having established that treated and control funds are indistinguishable, ex ante, on observable characteristics, we next examine how Morningstar ratings affect investments into treated and control funds. Figure 3 shows the AUM for treated and control funds in event time relative to the cohort-year. We find that the two groups of funds have similar pre-treatment trends in their AUM, while post-treatment their AUMs diverge sharply. In particular, the AUM of treated funds (which receive a higher star rating) increases on average, while the AUM of control funds (which receive a lower star rating) decreases on average post-treatment. The results show investors differentially allocate capital based on Morningstar star ratings *despite* the funds' similar underlying fundamentals.

Table II, Column 1 shows the corresponding regression estimate of the treatment effect on funds' AUM. We estimate cohort difference-in-differences regressions that compare fund AUM for treated versus control funds, three years pre-treatment to three years post-treatment. Formally, we examine regressions of the form:

$$logAUM_{i,t} = \beta_(Treated \times Post) + FE_i + FE_t + \epsilon_{i,t},$$

The estimates include both fund-by-cohort fixed effects, which sweep out any non-time-varying differences across funds, and year fixed effects which sweep out common trends

in fund assets.[14] The results show that treated funds have AUM that is 22.9 log points higher (t=3.2) than control funds because of the difference in their star ratings. These additional investment dollars, driven by the discontinuous cutoffs in the Morningstar ratings, are plausibly unrelated to the treated funds' performance or objectives.[15]

B.1. Placebo Specification

To further ensure that our research design is capturing investments into treated funds driven only by the Morningstar ratings and not by some omitted variable, we repeat the exact matching exercise described in Section III.A above, but we require treated and control funds to have the *same* Morningstar star rating. This serves as a placebo (or falsification) test since we compare funds that had similar underlying fundamentals, as in our main specification, but that had the *same* Morningstar star rating. Table II, Column 2 shows the resulting difference-in-differences estimate. In contrast to our first specification, shown in Column 1, we find there is no significant difference in AUM between treated and control funds post-treatment, either economically or statistically (0.8 log points, t=0.1).

B.2. Removing Aggregate Trends in Fund Assets

One possible concern for our research design is that our results may reflect aggregate trends in fund assets over time, rather than the pure effect of the Morningstar star ratings on fund assets. For example, because SRI funds are increasing their assets throughout the

[14]Note that this specification also sweeps out any differences in the Morningstar assignment variables – that is, controls for funds' lagged returns or category-by-year fixed effects would be collinear with the fund-by-cohort fixed effects.

[15]For every fund that gets one more star, there will be a fund that gets one fewer star. This could result in flows that cancel out at the stock-level; if so, then Morningstar rating changes would not change ownership by SRI funds. In Section C.1 of the Internet Appendix we show that this is not the case. Our setting does lead to meaningful changes in SRI ownership at the stock-level

sample (both in absolute terms and relative to non-SRI funds), perhaps they were more likely to have higher AUM in later (post-treatment) years independent of their Morningstar rating.

To examine this possibility, we orthogonalize each funds' log(AUM) to yearly trends within each Morningstar category, separately for SRI and non-SRI funds. To do this, we demean each fund's log(AUM) by its Morningstar category, interacted with the year, interacted with SRI fund status. Thus, the "Residualized" log(AUM) removes year-by-year trends in assets under management, within each Morningstar investment category each year, for SRI and non-SRI funds separately. Table II, Column 3 shows the main difference-in-differences estimate, where the outcome variable is the residualized fund AUM. The results are nearly identical to our first specification, shown in Column 1. Namely, we observe a large difference in AUM between treated and control funds (21.3 log points, t=3.3) post-treatment.

B.3. Heterogeneous Treatment Effects in a Staggered Event-Study Setting

Finally, a recent set of papers point out potential issues with difference-in-differences regressions in the presence of heterogeneous treatment effects over time (Borusyak et al., 2017; Goodman-Bacon, 2018; Sun & Abraham, 2020). Since the treatment effects of Morningstar ratings on investments into SRI funds could plausibly vary over time, we investigate this possibility using the approach of Sun and Abraham (2020). The results are shown in Appendix G. The implicit weighting function does not suggest cause for concern, and Sun and Abraham (2020)'s proposed robust estimator produces similar results to our baseline estimates. We conclude that there is little cause for concern that heterogeneous treatment effects may be biasing our estimates.

C. Exogenous Changes in SRI Investment

Our results show that the discontinuous assignment of Morningstar ratings leads to a relative increase in assets under management for our treated funds. However, one concern is that after an exogenous increase in AUM, fund managers may *choose* which stocks to invest the additional capital in, and this choice could lead to an omitted variable bias. Accordingly, we project the treatment effect of 22.9% of assets (Table II Column 3) onto treated funds' holdings as of the December just prior to treatment. That is, for each fund in the matched set, we compute the fitted value of the difference-in-differences estimate for fund assets, and multiply that change by that fund's pretreatment holdings of each U.S. firm in the merged CRSP/Compustat data.[16] The resulting value, fund-by-firm-by-year, is the projected change in investment by that fund in that firm, holding the fund's portfolio composition fixed after treatment (i.e., with no look-ahead bias). For a control fund, this value is zero for all firms and years. For a treated fund, this value is zero in pre-treatment years, and a positive fraction of firm value in post-treatment years.

Summing the fitted values by firm-year, we obtain a *single* fitted value for each firm-year. The value is zero for firms that were never held by a treated fund, and for firms that were held by any treated fund in pretreatment years. The value is a positive fraction of firm value for firms that were held by at least one treated fund in post-treatment years. Thus, the fitted value, which we denote by $\Delta SRI\widehat{Investment}$, represents the predicted change in SRI investment for each firm in the sample, that flows from our matched funds difference-in-differences setting. Put differently, it is a difference-in-differences estimator at the firm-year level, with a continuous treatment intensity for each firm-year. We then use this to examine

[16] This approach assumes that inflows into treated funds were, on average, allocated *pro rata* to the fund's existing portfolio. We examine this assumption in Appendix Section D, and confirm that this is the case.

regressions of the form:

$$y_{j,t} = \beta * \Delta SRI\ \widehat{Investment}_{jt} + FE_j + FE_t + \epsilon_{j,t},$$

where $y_{j,t}$ is a measure of environmental or social behavior. All estimates include firm fixed effects, which sweep out any non-time-varying differences across firms, and year fixed effects which sweep out time trends.

IV. Results

We examine the environmental and social impact of SRI funds by conducting three types of analysis. First we examine the unconditional correlation between SRI investment and changes in E&S behavior at the firm level. Second, we examine the portfolio selection choices of SRI funds. Third, we examine the treatment effects of SRI funds on the E&S behavior of their portfolio firms. Our analyses are centered around three E&S pillars: the environment, employee satisfaction and safety, and gender and racial diversity.

A. Correlations

To start, we present a high-level analysis on the relation between SRI investing and changes in E&S behavior at portfolio firms. Specifically, we examine the unconditional correlations between SRI investment and changes in a firm's E&S conduct. These analyses do not require the assumptions implicit in our difference-in-differences research design and help address external validity concerns. The downside is that they are potentially confounded and not able to distinguish between between selection or treatment effects.

Figure 4 Panel A presents a scatterplot of yearly changes in the EPA total emissions at

the firm level (the change in firm's total emissions from year t to year $t+1$) on the vertical-axis, against total holdings by SRI funds in year t as a fraction of the firm's total market capitalization on the horizontal-axis. The blue line shows the local polynomial best-fit line. At all levels of SRI fund investment, ranging from 0% to over 8% of the firm's market capitalization, there is zero association with subsequent changes in the firm's EPA emissions. Figure 4 Panel B and Panel C present the same broad comparisons for employee welfare (overall Glassdoor rating) and gender diversity on the board of directors. The conclusion is the same; across all levels of SRI fund investment, there is zero association with subsequent changes in the firm's E&S behavior, not even for firms with high levels of SRI fund investment. Yet, a caveat of this analysis is that these broad patterns could be consistent with any of the three potential interpretations: Greenwashing (no selection or treatment effects); Selection but no treatment effects; or selection and treatment effects that offset each other. To more cleanly distinguish between these interpretations, we turn to our estimates of selection and treatment.

B. Selection Effects

B.1. SRI Funds and Firm-level Environmental Behavior

Based on their stated objective, SRI funds should select firms with lower emissions. In this section, we examine micro data on firms' emissions from the EPA Toxic Release Inventory data, which allows us to understand whether a firm's actual pollution is an input in SRI portfolio selection strategies. The EPA data provides granular information about firm-level emissions at the production facility (on site), about the emissions transferred on a different location (off site), as well as disaggregated information broken out into air, ground, and water pollution. We use OLS regressions with year fixed effects to examine the association

between SRI investment and emissions. The results are reported in Table III.

We find strong evidence that SRI funds select firms that pollute less. A one standard deviation increase in SRI ownership is associated with 24.5 percent lower total emissions (scaled by total sales, Column 1). To put this number in perspective, this relation implies that firms owned by SRI funds have an average of 334 thousand pounds less of toxic chemicals releases per year, which is approximately 22 percent of the unconditional mean of total releases across firms. This result indicates that SRI funds provide investors with a portfolio of firms that pollute significantly less than the average firm.

The granularity of the EPA data allows us to go a step further and examine different pollution mechanisms – namely air, water and ground. Most industrial pollution involves air emissions, although in terms of pounds produced, ground emissions represent the largest share given the different chemicals emitted (see Table I for more details). We examine the relation between SRI funds and different types of emissions in Columns 2 to 4 of Table III. We find that SRI funds invest in firms that produce less air and water emissions.

In addition to on-site releases into the air, land, and water, we also examine firm investments in pollution reducing activities (i.e., investments in abatement technologies). This analysis allows us to shed light on the channels that drive portfolio selection by SRI funds. Firms document their investments to reduce emissions in their annual fillings to the EPA. The EPA does not require firms to report the dollar amounts spent on these investments, but firms must disclose what types of actions they take according to seven categories of pollution reduction. We combine these disclosures into two variables: *Abatement*, which takes the value of one if the firm reports an abatement activity across any category and is zero otherwise, and *logAbatements* which is the log of abatement actions that a firm discloses in a given year. Columns 5 and 6 of Table III show the association between SRI ownership and

firms' investment in pollution abatement activities. At the extensive margins, we observe that SRI funds tend to hold firms that are 2.2% more likely to invest in pollution abatements.

Finally, we examine a holistic measure of firms' exposure to climate risk. Sautner et al. (2020) use machine learning algorithms to measure exposure to climate change risk at the firm-year level. We examine the relation between SRI ownership and their measure of climate change exposure, *CCExposure*; the results are shown in Table III Column 7. We find that SRI ownership is strongly negatively associated with a firm's exposure to climate risk. Sautner et al. (2020) show firms with higher carbon intensity are more exposed to climate risk. Consistent with this finding, we observe that SRI funds select firms that pollute less and those firms have 6.1 percent lower climate risk exposure.

One concern related to statistical inference is that we examine the association between SRI ownership and firm behavior across a large number of outcome variables. If uncorrected, this multiple-testing can lead to a large number of false positive findings (Heath, Ringgenberg, Samadi, & Werner, 2021). To account for this, we present both naive (i.e. unadjusted) p-values for each estimate as well as p-values adjusted for multiple testing using the Romano-Wolf procedure (Romano & Wolf, 2005). We see that after adjustment for multiple testing, some of the more detailed tests become insignificant. However, the main associations of SRI with the key measures of total pollution (Column 1), airborne and water pollution (Columns 2 and 3) and climate risk exposure (Column7) remain significant at conventional levels. Taken together, our results show robust evidence that SRI funds select firms that pollute less.

B.2. SRI Funds and Employee Well-being

Next, we examine whether SRI funds select firms with better employee well-being. We begin by looking at workplace safety and employee satisfaction, which has been shown to be positively correlated with shareholder returns (Edmans, 2011). In our analysis, we use private data on several dimensions of employee satisfaction provided by Glassdoor, Inc. and public data on workplace accidents available through the Department of Labor – Occupational Safety and Health Administration (OSHA). The results are shown in Table IV Panel A.

Across the board, we find positive relations, both overall and in regard to career opportunities, confidence in senior leadership, work/life balance, corporate culture, confidence in the CEO, and future outlook. These positive associations are statistically significant at conventional levels for 3 of the 7 measures individually, while after adjustment for multiple testing it is only significant for the association with employees' future outlook. Thus, while the evidence is weaker statistically than for environmental behavior, the evidence is still suggestive that SRI funds do tend to invest in firms with higher employee satisfaction.

Furthermore, we examine the relation between SRI fund ownership and workplace safety. For accidents that resulted in either hospitalizations (Column 8) or amputations (Column 9) we observe negative associations. The association with fewer hospitalizations is statistically significant both individually and after adjustment for multiple testing. Thus, we conclude that SRI funds invest in firms with significantly better workplace safety.

Finally, we examine gender and racial diversity in the workplace. The results are shown in Table IV Panel B. We examine corporate diversity on the board of directors since board diversity is one of the most controversial topics in corporate governance given the recent considerable attention on the composition of boards of directors in terms of gender quotas (Lublin & Krouse, 2017). Although some research suggests that imposing gender quotas may

have significant negative effects on firm value and performance (Ahern & Dittmar, 2012), many institutional investors actively support board diversity and publicly commit to increase it (Krouse, 2018). Similarly, NASDAQ is considering a proposal to advance diversity through a new listing requirements[17], and some states have enacted legislation requiring gender or racial diversity for companies headquartered or operating in their states (Greene, Intintoli, & Kahle, 2020).

In Table IV Panel B, we find that SRI funds select firms with more women on the board of directors. A one standard deviation increase in SRI ownership is associated with 0.6 percentage points more women on the board, but is not associated with more non-Caucasian board members. The association of SRI investing with gender diversity is statistically significant both individually and after adjustment for multiple testing. The findings are consistent with Gow, Larcker, and Watts (2020) who show that shareholders are more likely to support gender diverse candidates than racially diverse candidates. While the economic magnitudes of these findings may seem small, the effects are meaningful relative to the unconditional mean values (in our sample, 16% of board members are women).

Overall, our findings show that SRI funds invest in firms with greater employee welfare (their satisfaction and workplace safety) as well as gender diversity on the board of directors. This confirms our prior findings: SRI funds offer their investors a portfolio of firms with stronger environmental and social conduct, consistent with those funds' stated objective.

C. Treatment Effects

Our results so far show that SRI fund ownership is strongly associated with better firm behavior on environmental and social dimensions. However, it remains unclear whether

[17] https://www.nasdaq.com/press-release/nasdaq-to-advance-diversity-through-new-proposed-listing-requirements-2020-12-01

SRI funds actually affect the behavior of their portfolio firms. In other words, the positive association could be due to selection or treatment effects. In this section, we examine whether SRI funds produce real effects.

C.1. SRI Funds and Firm-level Environmental Behavior

In Table III we found that SRI fund ownership is associated with lower emissions. Now, we examine whether SRI fund ownership *causes* changes in pollution. Table V implements our difference-in-differences design that uses exogenous variation in SRI fund ownership to examine EPA pollution data. For all four measures of toxic releases, the point estimate of the effect of SRI investment is positive, inconsistent with emissions reduction. Moreover, none of the estimates is statistically significantly different from zero.

It is possible that significant reductions in pollution take time to occur. Accordingly, we also examine whether SRI ownership leads to investments in pollution abatement activities, which might happen more quickly. If SRI funds aim to reduce pollution in their portfolio firms, then we should observe greater investments in abatement technologies of SRI funds' portfolio firms. The results show no effect of SRI funds ownership on abatements at the extensive margin (Column 5) or at the intensive margin (Column 6). We also find no significant effect on climate risk exposure (Column 7).

In general, we observe that the point estimates in Table V are all small in magnitude. One important question for our difference-in-difference estimates is whether our research design is adequately powered to detect a significant treatment effect. If not, then our finding that SRI fund investment has no effect on emissions could be due to our estimates being underpowered. To examine this possibility, for each of our estimates we compute the minimum detectable effect size (MDES) following Bloom (1995). The MDES is a simple measure of the magnitude

of treatment effect that a given estimator can reliably detect. The MDES of our estimates suggests that our research design is adequately powered to detect meaningful effects on the average firm's total emissions. For example, in the case of the log number of pollution abatements (Column 6), our research design could reliably detect a treatment effect on the order of 11.4% or larger. The number of abatements in our sample has a mean of 3.6 and a standard deviation of 15.4 – in logs, it has a mean of 0.70 and a standard deviation of 1.01. Thus, our research design could reliably detect a treatment effect of a magnitude less than 1/10 of one sample standard deviation. We conclude that our research design is well-powered for all seven outcomes examined in the table.

Importantly, the MDES is also much smaller in magnitude than the selection effects documented in the previous section. For example, a one standard deviation increase in SRI investment is associated with 24.5% lower total firm emissions on average (Table III Column 1), compared to the MDES for the treatment effect of 11.4% (Table V Column 1). Thus, both economically and statistically, we can rule out that the associations found in Table III are driven by treatment effects of SRI fund ownership on pollution, abatements, or climate risk.

Another concern related to statistical inference is that we simultaneously look for the effects of increased SRI ownership on firm behavior across a large number of outcome variables. If uncorrected, this approach can lead to an inflation in the number of false-positive findings, because individual significance tests do not take into account the reuse of the same natural experiment (Heath, Ringgenberg, et al., 2021). To account for this issue, we present both naive (unadjusted) p-values for each estimate as well as p-values adjusted for multiple testing using the Romano-Wolf procedure (Romano & Wolf, 2005). We observe that under *both* approaches, none of the pollution-based measures show a statistically significant effect.

While our main analyses examine dependent variables measured over the year that immediately follows treatment, it is possible that SRI funds change firm behavior at longer horizons. To account for this possibility, we examine changes in firm behavior at longer (two- and three-year) horizons. The results are shown in Table A3. The MDES again suggests that our estimates are well powered, and we again find zero significant effects on firm-level pollution. In other words, even at the two- and three-year horizon, we find no evidence that SRI funds change firm-level behavior.

Our results so far suggest that SRI funds select firms that pollute less. Yet, SRI funds do not improve firm-level pollution. In other words, we do not observe any changes in the environmental behavior of firms due to ownership by SRI funds. Our results are consistent with Bartram, Hou, and Kim (2019), who show that some firms shift emissions and plant ownership from California to other states to avoid stringent regulation on plant emission. In our setting, the fact that firms do not reduce pollution nor do they change their in investment in pollution abatements suggest that the marginal cost of further pollution reduction is higher than the marginal benefit, which includes attracting SRI funds.

C.2. SRI Funds and Employee Well-being

Next, in Table VI we examine whether SRI fund investment leads to improved employee well-being. First, we examine employee satisfaction and workplace safety in Panel A. Then we examine diversity on the board of directors in Panel B. In Panel A, we find that an exogenous increase in SRI fund ownership is followed by insignificant or small positive changes in employee satisfaction. All seven measures of employee satisfaction increase on average following treatment.

Once again, the MDES calculations suggest that our research design is adequately pow-

ered. Before adjusting for multiple testing, the treatment effect is statistically significant for three measures, reflecting an improvement in career opportunities, confidence in the CEO, and overall firm outlook. However, the magnitudes of all of these effects are small, and after adjusting for multiple testing none of them is statistically significant at conventional levels as shown by the Romano-Wolf p-values. Overall, we cannot reject the null that SRI fund ownership has no causal effect on employee satisfaction and safety. Put differently, while SRI funds invest in firms with higher employee satisfaction and safety, SRI funds do not cause improvements in these outcomes.

As in our selection analyses, we also examine the board of directors' gender and racial diversity. In Table VI, Panel B, we find that an exogenous increase in SRI fund ownership is followed by an increase in women on the board of directors, but no significant changes in racial diversity. Again, the MDES calculations suggest that our research design is adequately powered. For example, the MDES for gender diversity is 0.4 percent, so our research design could and does reliably detect a change in board diversity of 0.5 percent. Yet this effect is small economically, and after adjusting for multiple testing, the Romano-Wolf p-value is not significant at conventional levels. Hence, while SRI funds select firms with more diverse boards in order to fulfill their social goals, they do not increase the proportion of women directors at their portfolio firms.

C.3. Heterogeneous Treatment Effects of SRI funds Ownership

In our final set of tests, we examine potential heterogeneity in our treatment effect. While the AUM of SRI funds has substantially increased over the last ten years (see Figure 1), the average level of SRI fund ownership in each stock is still relatively small (0.27% of shares outstanding in our sample). It is possible that our non-results indicate that SRI funds are not

large enough to influence company-level policies. However, there is variation in the position sizes of SRI funds – with SRI funds in the top decile holding approximately 1% of shares outstanding in a company. To examine whether our non-results are due to the small average position size of many funds, we test for heterogeneity in the treatment effect by splitting firms into terciles of SRI ownership prior to the shock. In other words, we examine whether the effect of SRI ownership is different for firms with higher versus lower preexisting levels of SRI fund ownership.

The results are reported in Table VII, Panel A; for brevity, we present estimates for a subset of the main outcomes examined in our prior analyses, however the findings are similar across all of our outcomes variables. We continue to find no significant effect of SRI funds ownership on the EPA total releases. In contrast, we do find an effect on overall employee satisfaction and the fraction of women on boards for firms in the top terciles of SRI funds ownership. Yet, the F-test for heterogeneity in the treatment effect show no significant differences between funds with large versus small position sizes for overall employee satisfaction, but significant differences for women on boards. Taken together, these results suggest that our non-results in Tables V and VI are unlikely to be caused by the small size of SRI funds, and that SRI funds perhaps focus on firm policies that are easier to change and have greater visibility, like having more women on boards. Of course, an SRI fund with a *much* larger ownership stake is likely to change corporate policies, but in modern capital markets with diffuse ownership, our results suggest that SRI funds typically do not own enough shares to affect change. These findings are broadly consistent with Teoh, Welch, and Wazzan (1999) who show that shareholder divestitures protesting apartheid in South Africa had little effect despite the widespread attention they received.

A further concern may then be that SRI funds do not change firm policies because they

hold companies that already outperform in terms of E&S practices. In other words, we cannot expect employee satisfaction to be improved any further in a company that reports the highest employee ratings. In Table VII, Panel B we address this concern. We test for heterogeneity in the treatment effect, by conditioning on a firm's environmental or social performance in the year prior to the shock to SRI ownership. In other words, we examine whether the effect of SRI ownership is different for firms that already have high versus low E&S performance. We continue to find no effect of SRI funds ownership on the EPA total emissions, or overall employee satisfaction. Consistent with our main findings, we do find an effect on the fraction of women on boards. However, the F-tests for heterogeneity in the treatment effect show no significant differences between funds with high versus low pre-existing levels of women on board.

Finally, it is possible that many of the SRI funds in our sample are passively managed funds that do not intend to change firm behaviour. Heath, Macciocchi, Michaely, and Ringgenberg (2021) show that passively managed funds are, on average, less effective at monitoring and changing firm behavior than actively managed funds. Put differently, perhaps actively managed SRI funds do change behavior, but our sample is dominated by passively managed SRI funds. To explore this possibility, rows 2 and 3 of Table I examine the portion of SRI funds that are actively managed versus passively managed. The results show that virtually all SRI ownership at the firm level is by *actively* managed SRI funds. As of 2019, the last year in our sample, passively managed SRI funds were a small minority both by number (80 of 602 total SRI funds) and by assets under management ($25 billion of $240 billion total AUM in SRI funds).[18] Thus, the two recent booms in passive investing and socially responsible investing (SRI) are almost entirely *disjoint* from each other.

[18]In addition to accounting for only one-tenth of SRI fund assets, passive funds invest in a more diversified portfolio on average, so they account for even *less* of the average SRI ownership by firm.

V. Conclusion

While there is an active debate about the role of institutional investors in society (Hart & Zingales, 2017), to date there is little evidence on whether socially responsible investing actually affects corporate behavior. We provide novel evidence on the actions of SRI funds. We find that SRI funds are significantly more likely than non-SRI funds to hold firms with good environmental and social conduct. SRI funds tend to hold companies that pollute less, have better workplace safety, have greater board diversity, and have better employee satisfaction. However, despite this, we find little evidence that SRI funds succeed in changing corporate behavior. In particular, we find no evidence that SRI contributes in reducing firms' pollution, improving employee satisfaction, improve workplace safety, or racial diversity on corporate boards. We do find some evidence that SRI funds improve gender diversity on corporate boards. Our results suggest that while SRI funds are successful in providing their investors with a portfolio of environmentally and socially responsible firms, they do not significantly change corporate behavior of their portfolio firms. Hence, investors who want to change real world behavior might be investing in the wrong firms. Put differently, it may be difficult to reduce pollution in a company that is already polluting less than other firms. Instead of investing in the best behaving companies, SRI investors might have a bigger impact if they invested in the worst behaving companies and worked to improve their conduct.[19] Future research should explore the best way for socially responsible investing to generate positive outcomes along environmental and social dimensions.

Of course, there are several possible explanations for our results. First, it is possible that SRI is successful at changing corporate behavior, but only over horizons longer than

[19]Consistent with this, Cohen et al. (2020) show that oil, gas, and energy-producing firms (which tend to have the worst ESG scores) are key contributors to the invention of environmentally friendly technology.

the time period examined in this paper. However, we note that while some outcomes such as emissions and corporate culture may take a long-time to change, other outcomes such as corporate diversity, and employee satisfaction and safety may change over a shorter period of time, as boards are elected annually and employee complaints are filed daily. We find no evidence of a change for employee satisfaction and safety, and some changes in board gender diversity, which is consistent with SRI funds perhaps focusing on firm policies that are easier to change and have greater visibility.

It is also possible that SRI funds indirectly cause firms to behave differently via entry or exit. For example, a firm could reduce its pollution in order to attract capital from SRI funds. While it is inherently challenging to examine whether firms change their behavior because of the *threat* of exit, we find little evidence that catering, as a strategy, is valuable for firms. In Table A4 of the Appendix, we show that SRI funds do not allocate more (or less) capital to firms that recently change their environmental or social policies. Put differently, even if we cannot rule out the possibility that firms could change their behavior to attract SRI funds, such a strategy does not appear to pay off. Overall, our results add important evidence to the debate on corporate social responsibility: we show that the main effect of SRI funds is selection, not treatment. They choose to invest in better behaving companies, but on average, they do not cause improvements in firm behavior.

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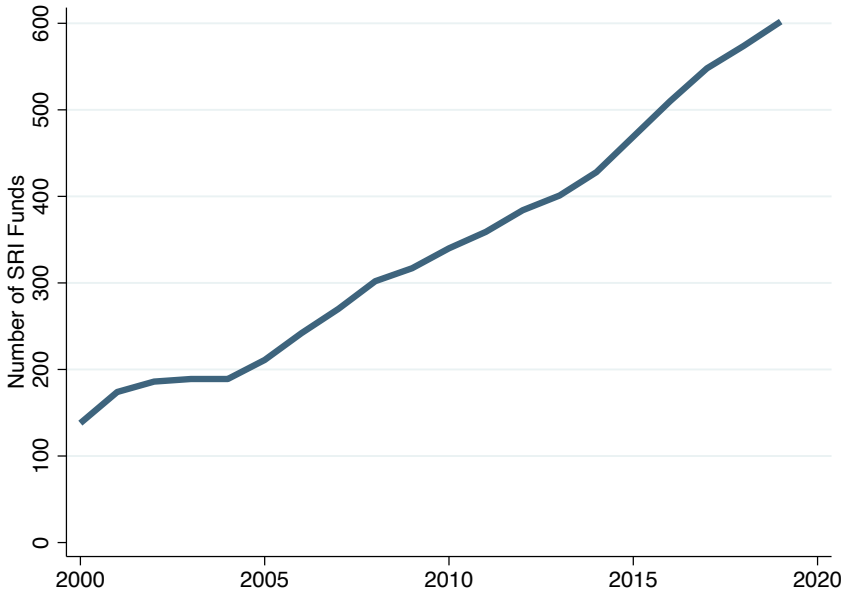
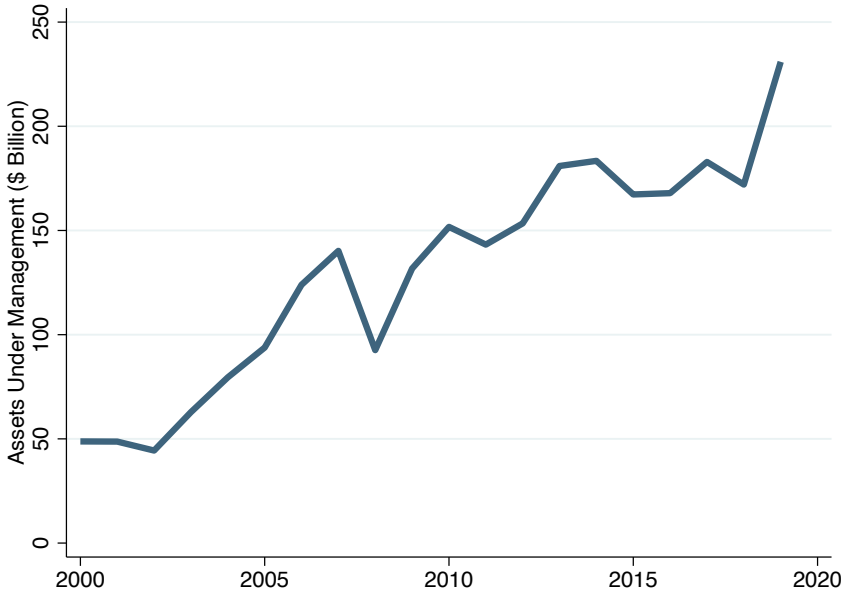


Panel A: Number of SRI funds



Panel B: SRI Assets Under Management

Figure 1. Growth in SRI Funds and Assets over Time
The figure plots the number of SRI funds (Panel A) and the total assets under management in those funds (Panel B) in the CRSP Mutual Fund Database, as of December of each year.

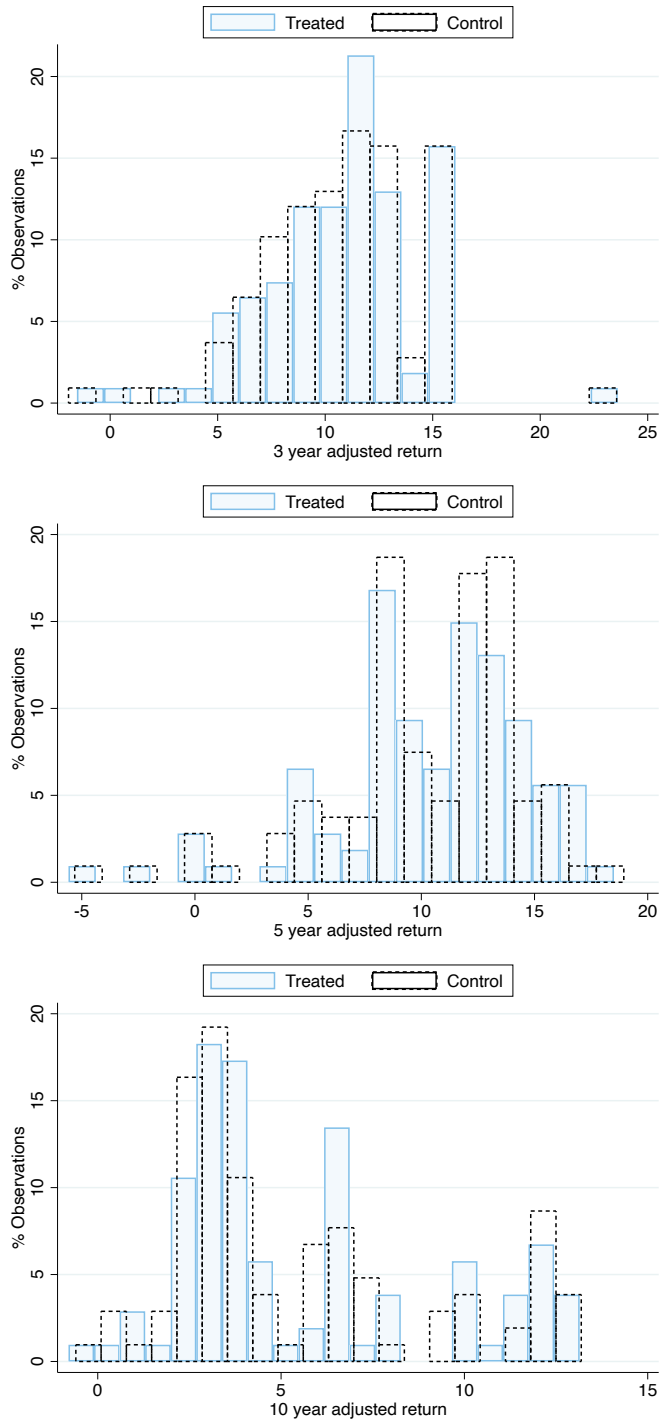


Figure 2. Treated vs. control fund lagged returns

The figure plots the distribution of the variables that determine Morningstar star ratings (3 year, 5 year and 10 year adjusted returns) for the treated and control funds, measured as of the December prior to the treatment year.

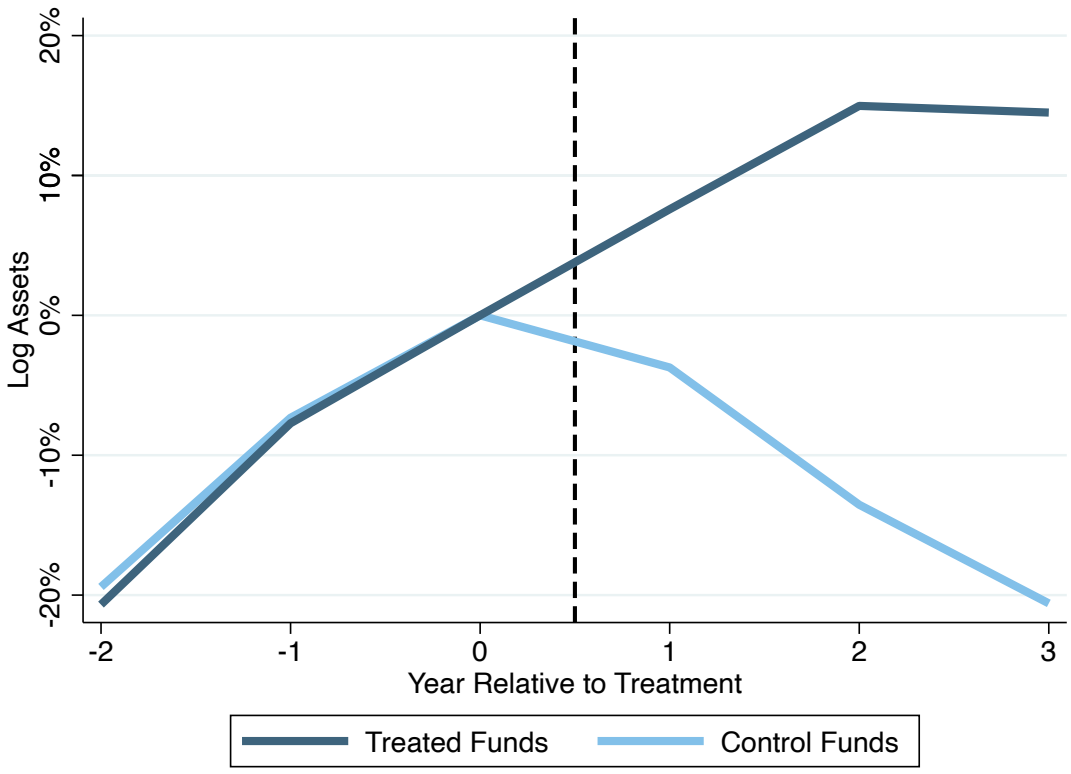
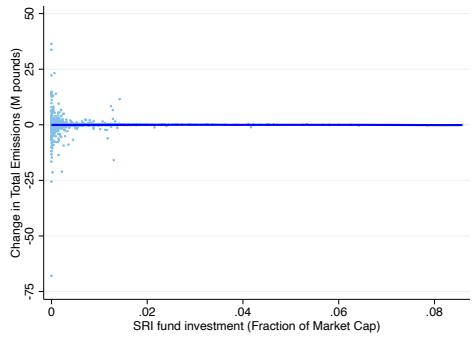
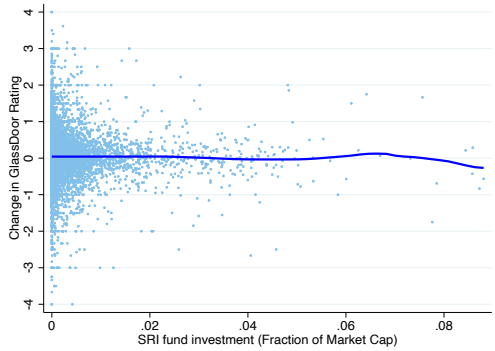


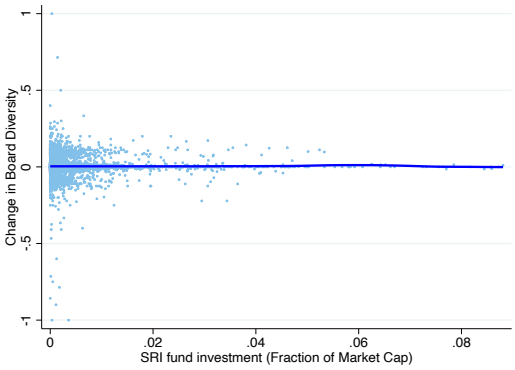
Figure 3. Treated vs. control fund assets, pre- versus post-treatment
The figure plots average log fund assets, for treated and control funds separately, in event-time for three years before and after the cohort year. Both series have been aligned at zero as of the cohort year (year 0, the last pretreatment year) for ease of comparison.



Panel A: Change in EPA Total Emissions



Panel B: Change in Glassdoor Overall Ratings



C: Change in Board Gender Diversity

Figure 4. Yearly Changes in Firm SRI Outcomes and SRI Fund Investment
The figure plots the yearly change (from t to $t+1$) for three major categories of firm E&S performance, against the total level of SRI fund investment in the firm at time t. Panel A plots changes in total EPA emissions in millions of pounds of pollutant. Panel B plots changes in the overall employee rating on Glassdoor. Panel C plots changes in board gender diversity. The blue lines present the local polynomial best-fit.

Table I
Summary statistics

The table presents summary statistics for key variables used in our analyses. For each variable, we present the mean, the standard deviation, the 1st decile, the median, and the 10th decile. Definitions and constructions for all variables are in the Appendix Sections A and B.

Variable	Mean	St. Dev.	p10	Median	p90
	(1)	(2)	(3)	(4)	(5)
SRI Investment (%)	0.27	0.66	0.00	0.05	0.67
SRI Investment (Active) (%)	0.26	0.66	0.00	0.04	0.67
SRI Investment (Passive) (%)	0.00	0.01	0.00	0.00	0.01
Total releases (M pounds)	1.51	5.25	0.00	0.04	3.06
Air (M pounds)	0.47	1.68	0.00	0.01	0.90
Water (M pounds)	0.13	1.11	0.00	0.00	0.05
Land (M pounds)	0.68	4.04	0.00	0.00	0.39
Num_abatements	3.64	15.37	0.00	0.00	8.00
Abatement	0.43	0.49	0.00	0.00	1.00
CCExposure	1.00	2.67	0.00	0.27	1.93
Overall	3.27	0.68	2.49	3.28	4.00
Careeropps	3.02	0.66	2.25	3.00	3.79
Srleader	2.92	0.73	2.03	2.91	3.83
Worklife	3.30	0.68	2.50	3.32	4.04
Culture	3.22	0.75	2.33	3.24	4.07
CEO	0.29	0.41	-0.19	0.32	0.82
Outlook	0.24	0.41	-0.25	0.25	0.75
Hospitalization	1.86	2.63	0.00	1.00	4.00
Amputation	0.52	1.05	0.00	0.00	1.00
Gender Div.	0.16	0.11	0.00	0.14	0.30
Racial Div.	0.11	0.12	0.00	0.10	0.25

Table II
Difference-in-differences regression of fund assets

The table presents results for the effects of the Morningstar star ratings on fund assets. Specifically, we estimate regressions of the form:

$$y_{i,t} = \beta(Treated \times Post) + FE_i + FE_t + \epsilon_{i,t},$$

Treated is an indicator that equals one for treated funds, and zero otherwise. Treated funds are SRI funds that have a Morningstar star rating that is one star higher than the matched control fund in January of the treatment year. *Post* is an indicator that equals one after treatment, and zero otherwise. FE_i is a fund-by-cohort fixed effect, and FE_t is a year fixed effect. *Placebo* is an indicator that equals one for treated funds in our placebo test, for which treatment funds are defined as SRI funds that have a Morningstar star rating equal to the matched control fund in January of the treatment year. Robust standard errors, clustered at the fund level, are shown in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	log(AUM)	Falsification log(AUM)	Residualized log(AUM)
	(1)	(2)	(3)
Treated × Post	0.229***		0.213***
	(0.072)		(0.064)
Placebo × Post		0.008	
		(0.059)	
Observations	1,161	1,778	1,088
Adjusted R-squared	0.909	0.918	0.923
Fund × Cohort FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Table III
Selection Effects: SRI funds and corporate environmental behavior

The table presents estimates of the relation between SRI fund investment and firm total pollution (*Total releases*), air pollution (*Air*), water pollution (*Water*), land pollution (*Land*), investments in pollution abatement (*Abatement* and *logAbatements*), and climate change exposure (*CCExposure*). *SRI Investment* is the percentage of a firm's ownership held by SRI funds (to facilitate the interpretation of the results, the measure is standardized). Definitions for all variables are in the Appendix Section B. Robust standard errors, clustered at the firm level, are shown in parenthesis with raw and Romano and Wolf (2005) p-values shown below. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Total releases	Air	Water	Land	Abatement	logAbatements	CCExposure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SRI Investment	-0.245	-0.251	-0.684	-0.342	0.022	0.032	-0.061
	(0.094)	(0.092)	(0.162)	(0.286)	(0.012)	(0.040)	(0.023)
Unadjusted p	0.010***	0.007***	0.001***	0.233	0.067*	0.421	0.009***
Romano-Wolf p	0.081*	0.077*	0.004***	0.435	0.229	0.435	0.081*
Observations	3,759	3,584	1,885	1,222	3,579	1,526	15,004
Adjusted R-squared	0.005	0.006	0.038	-0.000	0.015	0.013	0.002
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table IV
Selection Effects: SRI funds, employee welfare, and board diversity

The table presents estimates of the relation between SRI fund investment and a firm's employee welfare using data provided by Glassdoor, Inc. and OSHA (Panel A), and board gender and racial diversity (Panel B). *SRI Investment* is the percentage of a firm's ownership held by SRI funds (to facilitate the interpretation of the results, the measure is standardized). Definitions for all variables are in the Appendix Section B. Robust standard errors, clustered at the firm level, are shown in parenthesis with raw and Romano and Wolf (2005) p-values shown below. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Employee welfare

	Overall (1)	Careeropps (2)	Srleader (3)	Worklife (4)	Culture (5)	CEO (6)	Outlook (7)	Hospitalization (8)	Amputation (9)
SRI Investment	0.004	0.008	0.006	0.006	0.013	0.007	0.012	-0.042	-0.009
	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)	(0.004)	(0.004)	(0.014)	(0.007)
Unadjusted p	0.511	0.179	0.390	0.319	0.082*	0.058*	0.001***	0.002***	0.192
Romano-Wolf p	0.778	0.642	0.697	0.682	0.452	0.387	0.078*	0.091*	0.642
Observations	12,113	12,038	12,032	12,042	10,701	11,566	10,628	1,251	1,251
Adjusted R-squared	0.035	0.027	0.013	0.011	0.012	0.010	0.014	-0.001	-0.001
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Board diversity

	Gender Div. (1)	Racial Div. (2)
SRI Investment	0.006	0.000
	(0.001)	(0.002)
Unadjusted p	0.001***	0.997
Romano-Wolf p	0.025**	0.997
Observations	15,624	9,870
Adjusted R-squared	0.115	0.005
Year FE	Yes	Yes

Table V

Treatment effects: SRI funds and corporate environmental behavior

The table presents estimates of the effect of SRI fund investment on firm total pollution (*Total releases*), air pollution (*Air*), water pollution (*Water*), land pollution (*Land*), total off-site pollution (*Off-site*), one time pollution (*One-time*), investments in pollution abatement (*Abatement* and *logAbatements*), and climate change exposure (*CCExposure*). $\Delta SRI\,\widehat{Investment}$ is the predicted change in SRI investment for each firm in the sample from our paired fund-level difference-in-differences regression (to facilitate the interpretation of the results, the measure is standardized). MDES is the minimum detectable effect size (Bloom, 1995). Definitions for all variables are in the Appendix Section B. Robust standard errors, clustered at the firm level, are shown in parenthesis with raw and Romano and Wolf (2005) p-values shown below. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Total releases (1)	Air (2)	Water (3)	Land (4)	Abatement (5)	logAbatements (6)	CCExposure (7)
$\Delta SRI\,\widehat{Investment}$	0.030	0.018	0.077	0.034	0.013	0.019	-0.000
	(0.042)	(0.041)	(0.064)	(0.098)	(0.016)	(0.040)	(0.023)
MDES	±0.119	±0.116	±0.181	±0.278	±0.046	±0.114	±0.065
Unadjusted p	0.481	0.658	0.230	0.729	0.420	0.628	0.998
Romano-Wolf p	0.959	0.985	0.811	0.985	0.959	0.985	0.996
Observations	3,728	3,555	1,869	1,183	3,551	1,456	14,973
Adjusted R-squared	0.887	0.892	0.888	0.906	0.508	0.718	0.857
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table VI
Treatment effects: SRI funds and employee welfare and board diversity

The table presents estimates of the effect of SRI fund investment on a firm's employee welfare using data provided by Glassdoor, Inc. and OSHA (Panel A), and the effect of SRI fund investment on board diversity (Panel B). $\Delta\widehat{SRIInvestment}$ is the predicted change in SRI investment for each firm from our paired fund-level difference-in-differences regression (to facilitate the interpretation of the results, the measure is standardized). MDES is the minimum detectable effect size (Bloom, 1995). Definitions for all variables are in the Appendix Section B. Robust standard errors, clustered at the firm level, are shown in parenthesis with raw and Romano and Wolf (2005) p-values shown below. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Employee Welfare

	Overall	Careeropps	Srleader	Worklife	Culture	CEO	Outlook	Hospitalization	Amputation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta\widehat{SRIInvestment}$	0.015	0.019	0.011	0.010	0.016	0.013	0.014	0.048	-0.028
	(0.011)	(0.011)	(0.011)	(0.010)	(0.013)	(0.006)	(0.008)	(0.034)	(0.029)
MDES	±0.030	±0.030	±0.032	±0.028	±0.035	±0.017	±0.024	±0.097	±0.081
Unadjusted p	0.150	0.071*	0.336	0.303	0.194	0.026**	0.088*	0.159	0.333
Romano-Wolf p	0.665	0.563	0.774	0.774	0.710	0.458	0.589	0.665	0.774
Observations	12,017	11,939	11,933	11,944	10,592	11,451	10,512	963	963
Adjusted R-squared	0.364	0.330	0.333	0.371	0.401	0.343	0.338	0.823	-0.097
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Board Diversity

	Gender Div.	Racial Div.
	(1)	(2)
$\Delta\widehat{SRIInvestment}$	0.005	0.002
	(0.001)	(0.002)
MDES	±0.004	±0.004
Unadjusted p	0.002***	0.295
Romano-Wolf p	0.368	0.774
Observations	15,610	9,779
Adjusted R-squared	0.773	0.773
Year FE	Yes	Yes
Firm FE	Yes	Yes

Table VII
Evidence of Heterogeneity in Treatment Effects

The table presents estimates of the heterogeneity of the effect of SRI funds investment on firm's environmental and social behavior. In Panel A, we interact the fitted values of SRI fund ownership ($\Delta\widehat{SRI\ Investment}$) with terciles of lagged SRI fund ownership ($SRI\ Investment_{t-1}$). In Panel B, we interact the fitted values of SRI fund ownership ($\Delta\widehat{SRI\ Investment}$) with terciles of the given outcome variable as of the previous year. Robust standard errors, clustered at the firm level, are shown in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Heterogeneity by pretreatment SRI fund holdings

	Total Releases (1)	Overall (2)	Gender Div. (3)
Low $SRI\ Investment_{t-1}$	0.117	0.029*	0.001
$\times\ \Delta\widehat{SRI Investment}$	(0.123)	(0.017)	(0.002)
Mid $SRI\ Investment_{t-1}$	0.046	0.033**	0.003
$\times\ \Delta\widehat{SRI Investment}$	(0.066)	(0.014)	(0.002)
High $SRI\ Investment_{t-1}$	0.029	0.024*	0.004***
$\times\ \Delta\widehat{SRI Investment}$	(0.048)	(0.013)	(0.002)
F-stat [High = Low]	0.50	0.14	3.93**
Observations	3,231	10,588	13,307
Adjusted R-squared	0.888	0.380	0.781
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

Panel B: Heterogeneity by lagged E&S outcome

	Total Releases (1)	Overall (2)	Gender Div. (3)
Low OutcomeVar_{t-1}	0.062	0.015	0.005**
$\times\ \Delta\widehat{SRI Investment}$	(0.075)	(0.016)	(0.002)
Mid OutcomeVar_{t-1}	0.056	0.016	0.002
$\times\ \Delta\widehat{SRI Investment}$	(0.069)	(0.011)	(0.002)
High OutcomeVar_{t-1}	-0.028	0.020	0.005***
$\times\ \Delta\widehat{SRI Investment}$	(0.053)	(0.014)	(0.002)
F-stat [High = Low]	0.99	0.11	0.01
Observations	3,153	9,785	13,187
Adjusted R-squared	0.888	0.427	0.781
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

Appendix

A. Detailed Data Description

We aim to examine environmental and social corporate practices. Hence, we collect firm-year level data from various databases. To examine environmental behavior, from the Environmental Protection Agency (EPA) we obtain data from (1) the Form R of the Toxic Release Inventory (TRI database) and (2) from the EPA Pollution Prevention (P2) database. The EPA TRI database contains facility-year level data on the chemical emissions of firms operating in regulated industries that meet a requirement on the minimum number of employees. Facilities in the U.S. are required to report to the EPA the pounds of chemical (grams for dioxin and dioxin-like compounds) released on-site, which are comprised by releases into the ground, air, water, and the total amount of releases transferred off-site.

We use the TRI database to create six measures of pollution at the parent company-year level. Our aggregated measure is *Total releases*, which is the total on-site and off-site releases. On site releases are the total quantity of the toxic chemicals released to air, water and land on-site at the facility. We measure *Air*, which is the total quantity of the chemical released as air emissions at the reporting facility; *Water*, which is the total quantity of the chemical released on-site as surface water discharges; an *Land*, which is the total quantity of the chemical injected on site at the facility to underground injection wells, on-site landfills, surface impoundments, or other.

From the EPA P2 database, we collect information about a facility's yearly investments in pollution reducing activities. Investment data is available from 2011 to 2018 and is divided into two categories: (1) the number of activities each facility undertakes in order to reduce pollution–for example operating process modifications, taking actions to prevent spills and

leaks, and redesigning products to reduce pollution, etc.; and (2) the number of facilities that implemented pollution reducing activities. From the P2 database we create two measures of a firm's propensity and frequency to invest in pollution reducing activities. *logAbatements*, which is the log of the number of abatement actions that a firm discloses in a given year, and *Abatement*, which is an indicator variable equal to 1 if the firm reports an abatement activity across any category, and 0 otherwise.

The EPA data is at the facility-chemical year level. For each facility, the EPA reports the name of the parent company, which is defined as highest-level corporation that owns at least 50 percent of voting shares. In order to merge the EPA data with our sample of funds and portfolio firms, we first combine all the EPA data at the parent-year level. Second, we combine data from the EPA P2 database with data from the EPA TRI database. Finally, we match the EPA parent name with Compustat firm name and retrieve the company gvkey by conducting a fuzzy match (we remove common suffixes like "Company", "Corp", "Incorporated", "LLC" etc.).

In Table I we report descriptive statistics for the EPA data. We observe that on average firms in our sample release 1.5 million pounds of chemicals per year: 470 thousand pounds into the air, 130 thousand pounds into the water, 680 thousand thousand pounds into the land, 220 thousand pounds off-site, and 4,210 pounds of releases due to non-routine production process. Furthermore, firms in our sample invest in 3.6 abatement activities every year, on average, which result in 43 percent of our sample firms investing in pollution reducing activities. Finally, we examine a holistic measure of firms' exposure to climate risk using data from Sautner et al. (2020) (*CCExposure*).[20] This measure is based on machine learning algorithm that identifies a firm's annual climate change exposure from earnings conference

[20]We thank the authors for providing their data online, see https://osf.io/fd6jq/

calls. We observe that our sample mean (1.00) is consistent with Sautner et al. (2020).

We also aim to examine each firm's social behavior. To do so, we use four different data sources with micro-level data about a company's employee satisfaction, workplace safety, and board demographics.[21]

To measure employee satisfaction, we obtain data on employee reviews from Glassdoor, Inc., which is a worldwide leader in providing insights about jobs and companies.[22] Glassdoor, Inc. collects employee feedback, company ratings and reviews, CEO approval ratings, salary reports, interview reviews and questions, and benefits reviews from a large spectrum of companies worldwide. From Glassdoor, we obtain nine measures of employees reviews of their companies. First, we obtain six different measures of employee satisfaction that each take on numerical values between 0 (bad) and 5 (good). These ratings are (1) the overall company rating (*Overall*), which shows a mean of 3.27 for our sample firms; (2) the rating for the career opportunity within a corporation (*Careeropps*), which has a mean of 3.02, (3) the rating for compensation benefits (*Benefits*), with a mean of 3.37; (4) the rating for senior leadership (*Srleader*), with a mean of 2.92; (5) the rating for the corporation's work-life balance (*Worklife*), with a mean of 3.30; and (6) the rating for the corporate culture (*Culture*), with a mean of 3.22. We also obtained an indicator variable *Rec_frd*, which is equal to one if an employee would recommend her company to a friend, and zero otherwise. Approximately 58 percent of the companies in our sample would be recommended by their employees. Finally, we obtain two variables that range from -1 to 1: *CEO*, which is the review for the company's CEO (-1 if the employee disapproves, 0 if no opinion, and 1 if she approves); and *Outlook*, which measures the company outlook (-1 if worse, 0 if same, and

[21] Similar to the process described above for the EPA data, we aggregate data at the parent company-year level (where necessary) and conduct a fuzzy name match with Compustat.

[22] See `www.glassdoor.com`.

1 if better). These two variables have a mean for the firms in our sample of 0.29 and 0.24 respectively.

From the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), we obtain data on the workplace safety. Starting in 2015, OSHA requires employers to report all severe work-related injuries, defined as an amputation or in-patient hospitalization. Accordingly, we create two variables. First, we measure *Hospitalization*, which is the annual number of work-related injuries that required hospitalization. Second, we measure *Amputation*, which is the annual number of work-related injuries that required amputation. In the regression models, to assure comparability across firms and consider scale issues, we scale *Hospitalization* and *Amputation* by the company's number of employees (in thousands). In Table I, we observe that the firms report an average of 1.86 employees' injuries that require hospitalization, and 0.52 employees' injuries that require amputations.

We combine these data with BoardEx, which we use to measure gender diversity on the board of directors. Specifically, we estimate the percentage of women on board (*Gender Div.*), which is the number of women on the board divided by the total number of board members. Next, from Institutional Shareholder Services (ISS) database we retrieve data on the board racial diversity (*Racial Div.*), which is the number of non-caucasian directors divided by the total number of board members. In our sample, firms have on average 16 percent of their board represented by women and 11 percent of their board represented by non-caucasian directors (Table I).

B. Variable Definitions

- *SRI investment* is the percentage of a firm's ownership held by SRI funds. Data is from Morningstar, Bloomberg and the U.S. Sustainable Investment Forum.

- $\Delta SRI\widehat{Investment}$ is the predicted change in SRI investment for each firm in the sample from our paired fund-level difference-in-differences regression. Data is from Morningstar, Bloomberg and the U.S. Sustainable Investment Forum.

- *Total releases* is the total on-site and off-site releases. To assure comparability across firms and consider scale issues, in the regression models (Tables III and V) we scale emissions by the company's annual sales and compute the log of the ratio. Data is from the Form R of the EPA Toxic Release Inventory (TRI) database.

- *Air* is the total quantity of the chemical released as air emissions at the reporting facility. To assure comparability across firms and consider scale issues, in the regression models (Tables III and V) we scale emissions by the company's annual sales and compute the log of the ratio. Data is from the Form R of the EPA Toxic Release Inventory (TRI) database.

- *Water* is the total quantity of the chemical released on-site as surface water discharges. To assure comparability across firms and consider scale issues, in the regression models (Tables III and V) we scale emissions by the company's annual sales and compute the log of the ratio. Data is from the Form R of the EPA Toxic Release Inventory (TRI) database.

- *Land* is the total quantity of the chemical injected on site at the facility to underground injection wells, on-site landfills, surface impoundments, or other. To assure compara-

bility across firms and consider scale issues, in the regression models (Tables III and V) we scale emissions by the company's annual sales and compute the log of the ratio. Data is from the Form R of the EPA Toxic Release Inventory (TRI) database.

- *logAbatements* is the log of the number of abatement actions (investments in pollution reducing activities) that a firm discloses in a given year. Data from the EPA P2 database.

- *Abatement* is an indicator variable equal to 1 if the firm reports an abatement activity across any category, and 0 otherwise. Data from the EPA P2 database.

- *CCExposure* is the relative frequency with which bigrams related to climate change occur in the transcripts of analyst conference calls. We count the number of such bigrams and divide by the total number of bigrams in the transcripts. We average values of the four analyst earnings conference calls during the year and multiply the ratio by 1,000. Data from Sautner et al. (2020).

- *Overall* is the overall employees' satisfaction score. Data from Glassdoor, Inc.

- *Careeropps* is the employees' score for career opportunities. Data from Glassdoor, Inc.

- *Srleader* is the employees' score for senior leadership. Data from Glassdoor, Inc.

- *Worklife* is the employees' score for work-life balance. Data from Glassdoor, Inc.

- *Culture* is the employees' score for corporate culture (i.e., cultural values). Data from Glassdoor, Inc.

- *CEO* measures the employees' CEO approval (-1 if disapprove, 0 if no opinion, and 1 if approve). Data from Glassdoor, Inc.

- *Outlook* measures the employees' company outlook (-1 if worse, 0 if same, and 1 if better). Data from Glassdoor, Inc.

- *Hospitalization* is the number of work-related injuries that required hospitalization scaled by the number of employees (in thousands). Data from the U.S. Department of Labor, OSHA.

- *Amputation* is the number of work-related injuries that required amputation scaled by the number of employees (in thousands). Data from the U.S. Department of Labor, OSHA.

- *Gender Div.* is the ratio of women directors on the board. Data from BoardEx.

- *Racial Div.* is the ratio of the number of non-caucasian directors on the board. Data from ISS.

C. Tests of Match Quality and Conditional Independence

This section presents additional tests of the hypothesis that our matched treated and control funds were indistinguishable ex ante on all characteristics except their Morningstar star rating.

Table A1 Panel A shows the comparison between the treated and control fund-cohort-years, measured as of December just prior to treatment. The first row illustrates the main idea behind our research design: Treated funds were assigned exactly a one-star higher rating than the matched control funds. Otherwise, as well as belonging to the same Morningstar fund category in each case, the two groups of funds are very closely matched in terms of their size and fundamentals. In particular, the mean differences in the three, five, and ten year Morningstar returns – the inputs that determine the Morningstar star ratings – are 8, 10 and 9 basis points respectively. None of these differences is economically or statistically significant, as is also evident in Figure 2.

Like a regression discontinuity design (RDD), in our setting unconfounded causal inference rests on conditional independence of treatment status. Because the Morningstar star ratings are determined by lagged fund returns, we cannot use fund ratings directly as our treatment variable. Instead, we construct matched pairs of funds near the star-rating thresholds. If the matched pairs are sufficiently similar ex ante, then lagged fund returns should not predict treatment status within the matched sample.

Table A1 Panel B examines this requirement. The first two columns regress the Morningstar star rating of each fund-year on the fund's lagged Morningstar returns using fund category-by-year fixed effects (the groups within which the star ratings are determined). We see that both in the full sample and our matched sample, the lagged Morningstar returns strongly predict a fund's Morningstar star rating, reflected by both their statistical signifi-

cance and the adjusted R^2 of the estimates. In contrast, in Column 3, the dependent variable is treatment versus control status within the matched sample. Here, the lagged Morningstar returns have *no* predictive power. The coefficients on the individual 3, 5 and 10 year lagged returns are economically small and statistically insignificant. Moreover, the adjusted R^2 of the model is substantially negative. We conclude that our matched funds are similar ex ante on all characteristics including, crucially, the lagged Morningstar returns that determine treatment assignment.

A third test is that if the difference in star ratings between treated and control funds was due *only* to the arbitrary breakpoints of the Morningstar star function, the funds should satisfy the parallel trends requirement – in the absence of their different star ratings, their AUM would have evolved similarly. To examine how our treated and control funds' assets evolve over time, we take each set of matched funds and examine their assets under management in event time for three years before and after the cohort-year. Figure 3 in the main paper shows evidence consistent with the parallel trends assumption.

C.1. Confounding by Funds below the Morningstar Cutoffs?

A subtle concern is that if our identifying assumptions are valid, then it should have been equally likely for any matched ESG fund to land just above or just below the given star cutoff. In fact, if we rerun our matching process for ESG funds on the lower side of the star cutoffs (that is, matching ESG funds that were just below the cutoff to funds that were just above the same cutoff), we match 139 ESG funds that were "treated" in the opposite direction to our main sample.

This is potentially a concern if downward-shocked SRI funds' holdings overlap with the holdings of our main sample funds whose assets are shocked upward. For example, if all SRI

funds held exactly the same portfolio, then the resulting shocks to SRI investment would (on average) net out to zero. On the other hand, if all SRI funds' holdings were disjoint from one other, then there would be no overlap in the effects of the Morningstar star assignments. SRI funds cover a wide range of fund sectors, and are almost all actively managed, so the latter possibility seems more plausible.

We examine this possibility in two ways. First, we check the overlap in holdings between upward-shocked (our main sample) and downward-shocked SRI funds. Out of 7,508 firm-years held by treated fund-years in our sample, 4,251 = 47% have any co-holdings at all with downward-shocked funds. Within those co-held stocks, the correlation between their portfolio weight in upward-shocked funds vs downward-shocked funds is insignificant and slightly negative, -0.013. Thus, SRI funds hold diverse portfolios both in terms of stock holdings and portfolio weights.

Second, we check the relevance of the treatment condition by regressing the realized level of SRI investment by firm-year on the predicted level of SRI investment from our diff-in-diff setup. That is, we regress $SRI\ Investment$ on $SRI\ \widehat{Investment}$. The estimated coefficient from this regression is 0.400 with standard error = 0.033 and t=12.1, corresponding to an F-statistic of 146.4. In other words, our predicted treatment effects are strongly predictive of the actual realized level of SRI investment, and we conclude that our diff-in-diff research design produces significant and relevant shocks to SRI investment.

Table A1
Comparison of treated and control funds

The table presents comparisons of treated versus control funds, measured as of the December prior to the treatment year. In Panel A, for each fund we examine Morningstar stars, fund assets, Morningstar returns, and fund turnover and fees. In Columns (1) and (3) we report the mean for treatment and control funds respectively, in Columns (2) and (4) we report the standard deviation for treatment and control funds respectively, and in Columns (5) and (6) we report the difference in means and the associated t-statistics. In Panel B, we report tests of the conditional independence of treatment status. We regress the Morningstar stars (*MS Star Rating* on their inputs (3, 5, and 10 years returns, and fund category-year fixed effects) in the whole sample (Column 1), and matched sample (Column 2). In Column (3) we regress the treatment status on the same inputs described above.

Panel A: Two-Sample Comparison

Variable	Treated Funds		Control Funds		Difference	t-stat
	Mean	St.Dev.	Mean	St.Dev.		
	(1)	(2)	(3)	(4)	(5)	(6)
MS Star Rating	3.88	0.65	2.88	0.65	1.00***	(11.28)
Fund Assets ($M)	952.45	1395.67	894.92	1492.70	57.53	(0.29)
3 year MS Return	10.81	3.59	10.72	3.55	0.08	(0.17)
5 year MS Return	10.35	4.34	10.25	4.28	0.10	(0.16)
10 year MS Return	5.59	3.56	5.50	3.56	0.09	(0.19)
Turnover Ratio	0.33	0.34	0.43	0.82	-0.10	(-1.13)
Management Fee	0.47	0.33	0.48	0.29	-0.01	(-0.21)
Expense Ratio	0.75	0.33	0.83	0.37	-0.08	(-1.58)
Observations	108		108			

Panel B: Testing Conditional Independence

	MS Star Rating	MS Star Rating	Treated
	(1)	(2)	(3)
3 year MS Return	0.09***	0.16**	0.01
	(0.00)	(0.07)	(0.07)
5 year MS Return	0.15***	0.20***	0.01
	(0.01)	(0.08)	(0.07)
10 year MS Return	0.17***	0.29***	0.06
	(0.02)	(0.08)	(0.07)
Funds	All	Matched	Matched
Observations	20,662	208	208
Adjusted R-squared	0.650	0.513	-0.175
MS Fund Category × Year FE	Yes	Yes	Yes

D. Effects on Treated Funds' Holdings

An important condition of our research design is that SRI funds do not change their portfolio allocation as a result of different star ratings. In particular, did treated funds increase their holdings *pro rata*, or did they channel the inflows into relatively low-ESG or relatively high-ESG portfolio firms? In this section, we examine the effects of exogenous changes in funds' AUM on treated funds' holdings.

Results are reported in Table A2. This analysis is conducted at the fund by cohort year by portfolio firm level. In Column 1, we regress an indicator variable for whether a firm held is a new holding (that is, a firm that the fund did not hold at all in the previous year) on post-treatment status for treated funds. We find no effect, i.e., funds did not add a new firm to their holdings in post-treatment years. Similarly, in Column 2 we observe that funds do not drop a firm from their holdings in post-treatment years. Thus, the inflows into treated funds are channeled into their existing holdings.

It is still possible that treated funds change the portfolio allocation of their existing holdings, by investing more in some of their portfolio firms and less in others. We examine this possibility in Columns 3-5. Here, the dependent variable is the fraction of the fund's total net assets that each portfolio firm represented. We find that both overall and for high- and low-ESG firms separately, the inflows into treated funds were not accompanied by any change in their weights in the fund portfolio.

Overall, we conclude that the inflows into treated funds due to their higher Morningstar star ratings were, on average, allocated *pro rata* to the fund's existing portfolio. This finding strenghten the validity of our research design.

Table A2
Effects on Treated Funds' Holdings

The table presents results examining the effects of the Morningstar ratings on fund holdings. Specifically, we estimate regressions of the form:

$$y_{i,t} = \beta(Treated \times Post) + FE_i + FE_t + \epsilon_{i,t},$$

where $Treated$ is an indicator that equals one for treated funds, and zero otherwise and $Post$ is an indicator that equals one after treatment, and zero otherwise, FE_i is a fund-by-cohort fixed effect, and FE_t is a year fixed effect. Treated funds are SRI funds that have a Morningstar rating that is one star higher than the matched control fund in January of the treatment year. Robust standard errors, clustered at the fund level, are shown in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Added Stock	Dropped Stock	% Total Net Assets		
	(1)	(2)	(3)	(4)	(5)
$Treated \times Post$	-0.001	-0.008	0.001	-0.006	0.003
	(0.010)	(0.008)	(0.011)	(0.013)	(0.014)
Firms	All	All	All	High ES	Low ES
Observations	378,354	378,354	218,941	85,879	77,211
Adjusted R-squared	0.023	0.029	0.437	0.378	0.566
Fund × Cohort FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

E. Evidence of Longer-Run Effects

One concern with our main estimates of the causal effects of SRI fund investment is that we regress the level of firms' E&S behavior on the predicted, exogenous change in SRI fund investment from the previous year. Firm policies are often slow to change, so it could be that one year is simply not enough time to observe a treatment effect.

In Table A3 we examine firm E&S behavior at longer horizons, namely two and three years post-treatment. To keep this analysis parsimonious, we focus on our main outcomes of interest. Again, we see zero treatment effects on total pollution releases, and overall employee ratings of the firm. We also continue to see a positive effect on board gender diversity in year 2, but the effect is smaller and insignificant by year 3. The economic magnitude of the coefficients remains tiny, and the minimum detectable effect size (MDES) suggests that our estimates remain well-powered to detect meaningful changes in corporate policy.

Table A3
Evidence of Longer-Run Effects

The table presents estimates of the effect of SRI fund investment on firm behavior over longer periods of time post-treatment. $\Delta\widehat{SRI\ Investment}$ is the predicted change in SRI investment for each firm in the sample from our paired fund-level difference-in-differences regression (to facilitate the interpretation of the results, the measure is standardized). MDES is the minimum detectable effect size (Bloom, 1995). Definitions for all variables are in the Appendix Section B. Robust standard errors, clustered at the firm level, are shown in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Total Releases		Overall Rating		Gender Div.	
Relative to treatment year:	$t+2$	$t+3$	$t+2$	$t+3$	$t+2$	$t+3$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{SRI\ Investment}$	0.036	0.015	0.008	0.003	0.003**	0.002
	(0.050)	(0.062)	(0.011)	(0.011)	(0.001)	(0.002)
MDES	±0.141	±0.174	±0.031	±0.030	±0.004	±0.004
Observations	3,231	2,744	10,588	9,070	13,307	10,997
Adjusted R-squared	0.888	0.886	0.380	0.395	0.781	0.793
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

F. Evidence of Dynamic Selection and Catering

In Table A4 we examine whether lagged changes in firms' E&S behavior are associated with subsequent changes in SRI fund investment. We find that in contrast to our very strong evidence of *static* selection in the paper – namely, that SRI fund investment is strongly associated with better E&S behavior by portfolio firms – there is zero association, precisely estimated, of SRI fund investment with firms' improvement in their E&S behavior. Thus, while we cannot rule out the possibility that firms attempt to cater to SRI funds with the intention of attracting SRI, the data suggest that such efforts (if they exist) are unsuccessful.

Table A4
Evidence of Dynamic Selection and Catering

The table presents estimates of the dynamic relation between firms' environmental and social behavior and investment by SRI funds. We regress changes in SRI funds ownership (Δ_t Investment by SRI Funds) on lagged changes in E&S behavior. Robust standard errors, clustered at the firm level, are shown in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable = Δ_tInvestment by SRI Funds		
	(1)	(2)	(3)
Independent Variable:	Total Releases	OverallRating	Gender Div.
ΔIndepVar$_t$	0.00	0.00*	0.00
	(0.00)	(0.00)	(0.00)
ΔIndepVar$_{t-1}$	0.00**	0.00**	0.00*
	(0.00)	(0.00)	(0.00)
Observations	2,613	7,873	10,776
Adjusted R-squared	-0.102	-0.077	-0.103
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

G. Heterogeneous Treatment Effects in a Staggered Event-Study Setting

A recent set of papers point out potential issues with differences-in-differences estimation, in particular in the presence of heterogeneous treatment effects over time (Borusyak et al., 2017; Goodman-Bacon, 2018). Sun and Abraham (2020) analyze the case of staggered event-study designs, which applies to our research design using stacked cohorts of treated and control funds. Since the treatment effects of Morningstar ratings on investor capital could plausibly vary over time, we investigate this possibility using the approach of Sun and Abraham (2020).

Figure A1 plots the implicit weighting function of our difference-in-differences estimate for the effect of Morningstar ratings on fund assets. We see that the implicit weights are well-behaved according to their recommended interpretation. In particular, the weights are of the same sign for all cohorts within each event-time group, with one small exception namely observations 2 years post-treatment for the 2017 cohort. Dropping this cohort from our estimates yields nearly identical results. Moreover, when we use the Sun and Abraham (2020) robust estimator, we recover a treatment effect of +0.156 (standard error = 0.061), which is similar in magnitude and significance to our baseline estimates. Thus, there is little cause for concern that heterogeneous treatment effects may be biasing our estimates.

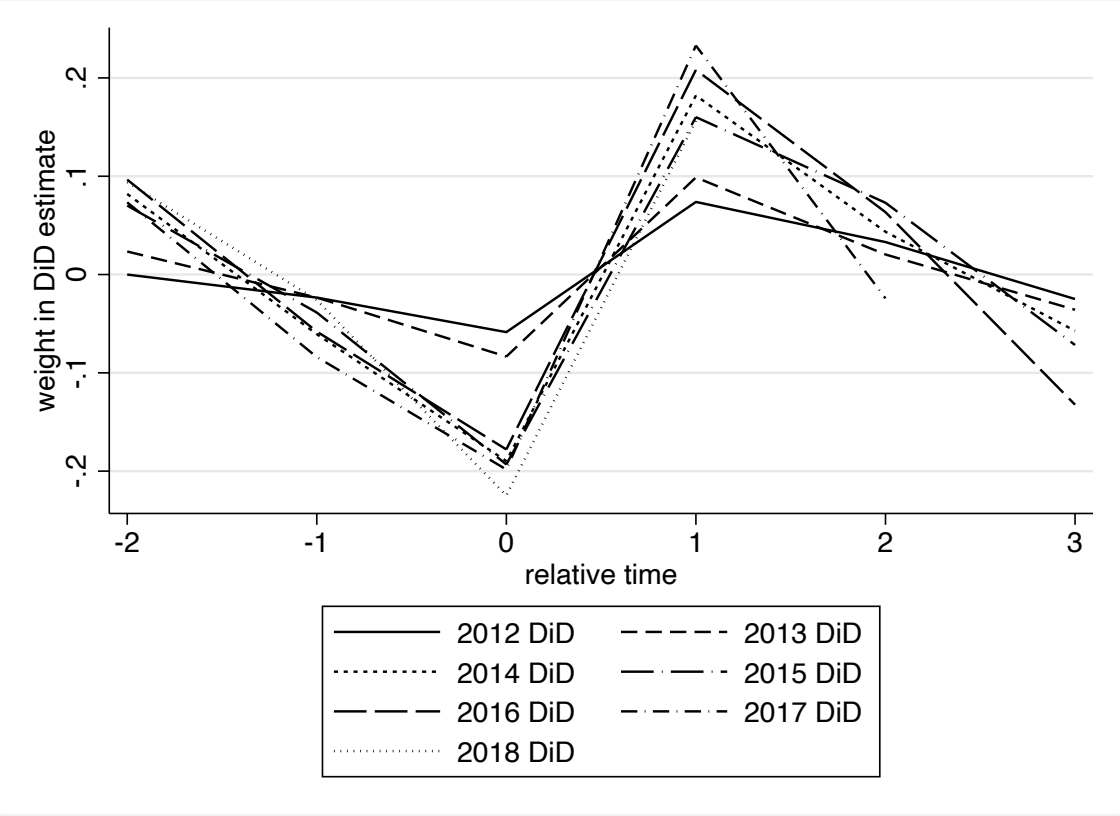


Figure A1. Implicit Weights in the Diff-in-Diff Estimate of Morningstar Star Ratings on Fund AUM

The figure plots the implicit weights estimated by the Sun and Abraham (2020) decomposition of our main difference-in-difference estimator in event time.

H. Selection and Treatment Effects on Firm E&S Ratings

In this section, we examine the selection and treatment effects of SRI investing on the firm-level E&S ratings from KLD. Given that micro-level data such as EPA pollution data, OSHA data, and employee satisfaction ratings by Glassdoor, Inc. are not issued in real time, it is unclear whether SRI fund managers directly observe the data that we examine at the firm-year level. It is therefore unclear a priori how SRI funds achieve the portfolio selection that we document, or whether they could reasonably be expected to have any treatment effect on outcomes they do not observe.

To examine this question, we repeat our main estimates using as outcome variables the firm-year sustainability ratings issued by KLD. Table A5 shows the results. Consistent with our main results, in Panel A we find a significant positive association between SRI fund investment and the aggregate KLD rating for environmental and social conduct of a firm (*ES_Index*). We also observe a positive association between SRI fund investment and *ES_Index* subcategories, *Env* and *Soc*. Furthermore, Panel B shows that again consistent with our main results, shocks to SRI fund investment are followed by zero, and indeed slightly negative, changes to firm E&S ratings.

Thus, the association of KLD ratings with SRI fund investment (strong positive selection effects, zero treatment effects) are consistent with our main findings. These results suggest two conclusions: First, the KLD firm-year ratings are meaningfully correlated with both the real outcomes that we examine and with funds' selection process; Second, third-party E&S ratings again confirm that SRI funds carry out portfolio selection, but have no real effects on their portfolio firms.

Table A5
Selection and Treatment Effects on Firm E&S Ratings

The table presents estimates of the effect of SRI fund investment on firm-year E&S ratings issued by KLD. $\Delta\widehat{SRI\,Investment}$ is the predicted change in SRI investment for each firm in the sample from our paired fund-level difference-in-differences regression (to facilitate the interpretation of the results, the measure is standardized). MDES is the minimum detectable effect size (Bloom, 1995). Definitions for all variables are in the Appendix Section B. Robust standard errors, clustered at the firm level, are shown in parenthesis with raw and Romano and Wolf (2005) p-values shown below. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Selection

	(1) ES_Index	(2) Env	(3) Soc
SRI Investment	0.018	0.004	0.014
	(0.005)	(0.001)	(0.005)
Unadjusted p	0.001***	0.001***	0.004***
Romano-Wolf p	0.001***	0.001***	0.007***
Observations	11,780	11,780	11,780
Adjusted R-squared	0.100	0.088	0.127
Year FE	Yes	Yes	Yes

Panel B: Treatment

	(1) ES_Index	(2) Env	(3) Soc
$\Delta\widehat{SRI\,Investment}$	-0.021	-0.014	-0.006
	(0.012)	(0.003)	(0.011)
Unadjusted p	0.082*	0.001***	0.555
Romano-Wolf p	0.113	0.001***	0.558
MDES	±0.034	±0.007	±0.031
Observations	11,637	11,637	11,637
Adjusted R-squared	0.555	0.547	0.527
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

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