Do Investors Fixate on ESG Ratings? Evidence from Investor Responses to Mechanical Changes in ESG Ratings

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Abstract

We examine the portfolio allocation of institutional investors in response to a mechanical increase in environmental, social, and governance (ESG) ratings that is orthogonal to firms' actual ESG performance. We find that the mechanical increase in ESG ratings affects portfolio allocation of mutual funds with an ESG mandate at the extensive margins, while there is no effect at the intensive margins. Specifically, we show that actively managed Non-ESG funds are more likely to sell companies that have received a higher ESG rating not granted by changes in underlying ESG performance. In contrast, ESG funds, and in particular those that follow an index, are more likely to invest in new stocks that received a higher mechanical increase in ESG ratings. Our results suggest that passive portfolio selection based on commercial ESG ratings might lead to portfolio allocation that does not reflect actual ESG performance.

Keywords: environmental, social, and corporate governance (ESG), sustainability, ESG rating, ESG rating agencies, Real effects.

I. INTRODUCTION

As a firm's environmental, social, and governance (ESG) performance becomes more prominent, financial institutions are increasingly incorporating ESG factors into their investment decisions. A recent survey by Deutsche Bank shows that these entities are relying on an aggregated measure of ESG ratings as a main source of information to assess an company's sustainability profile, along with other sources such as firms' non-financial reporting, bulk data from information vendors, and direct interaction with issuers. Specifically, 70 percent of respondents answered that they use commercial ESG ratings as a major (26 percent) or minor (44 percent) input factor.[1] The average annual spending on ESG ratings, data providers, and consultants amounts to $487,000.[2]

At the same time, however, there are many concerns raised about commercial ESG ratings. ESG ratings are often backfilled (Berg et al., 2020a), and there is a substantial disagreement across different rating agencies regarding what rating to give to individual firms due to differences in their scope, measurement, and aggregation method (Berg et al., 2022; Christensen et al., 2022). Also, ESG ratings are mostly backward-looking, evaluating past performance, and do not satisfy investors' needs to evaluate firms' future performance. Given that rating agencies often provide corporate ratings on an annual basis, ESG ratings do not provide timely information for those investors making a real-time investment decision[3]. Another issue of commercial ESG ratings is that the rating can often change due to methodological reasons rather than the changes in firms' ESG fundamentals.[4]

Despite the growing importance and potential issues of commercial ESG ratings, however, it is still largely unknown how exactly investors are using the ratings. Some concerns that, in the rush to meet the demand for ESG investment products, commercial ESG ratings may be a quick fix for financial institutions that either don't have enough internal resources and ESG expertise for

[1] https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000520951/ESG_Survey__What_corporates_and_investors_think.PDF

[2] Costs and Benefits of Climate-Related Disclosure Activities by Corporate Issuers and Institutional Investors, ERM

[3] https://www.sustainability.com/globalassets/sustainability.com/thinking/pdfs/sustainability-ratetheraters2020-report.pdf

[4] To increase transparency and reliability of ESG ratings, on 13 June 2023, the European Commission published a proposal for regulating ESG rating providers.

fundamental research or just want to check a box. The U.S. Securities and Exchange Commission (SEC) also expressed its concern on the mutual funds' overreliance on commercial ESG ratings in the April 2021 ESG *Risk Alert* bulletin where the SEC specified that overreliance on 3rd-party ESG ratings is an indication of inadequate due diligence and poor fund-level compliance [5].

In this paper, we examine the investors' use of commercial ESG ratings. Specifically, we investigate whether ESG-focused mutual funds fixate on the face value of commercial ESG ratings and over-rely on the ratings. Empirically testing investors' overreliance on commercial ESG ratings is important but challenging since the benchmark is unobservable. In other words, it is hard to identify the case of "over"-reliance on and proper use of ratings. Therefore, although several related studies show a positive association between ESG-focused investors' ownership and firms' commercial ESG ratings (Gibson Brandon et al., 2022; Raghunandan and Rajgopal, 2022), it is hard to make a causal argument since ESG ratings are reflects firms' ESG fundamentals. We overcome this empirical challenge by exploiting the case when a firm's ESG rating changes due to a non-performance-related reason (i.e., ESG rating agency's coverage change).

Responding to the growing demand for firms' ESG information, ESG ratings agencies have been expanding their coverage gradually. For example, Figure 1 shows the history of how Thomson Reuters Refinitiv has expanded its coverage until now. Figure 2 shows the changes in the number of U.S. firms in Refinitiv's coverage over time. Refinitiv initially focused on large companies in each stock exchange (e.g., S&P 500 and NASDAQ 100) and added Russell 1000 by the end of 2011. The biggest expansion was in 2015 when Refinitiv expanded its coverage to Russell 3000 firms. As a result of Renifitiv's coverage expansion, some newly added firms received external ESG ratings for the first time, allowing the stakeholders of such firms to make more informed decisions (Darendeli et al., 2021). The coverage expansion, however, could also affect the firms that had already been in Refinitiv's coverage, i.e., the existing firms. Specifically, existing firms' ESG rating could be mechanically changed by the addition of new firms.[6]

[5] https://www.sec.gov/files/esg-risk-alert.pdf

[6] In this paper, we define "mechanical" rating changes as the changes in ESG ratings that are not related to changes in firms' ESG fundamentals.

We highlight two unique features of Refinitiv's coverage expansion that could result in mechanical rating changes. First, Refinitiv adopts relative performance evaluation as a scoring methodology, and thus the coverage expansion changes the size and the composition of the peer group, i.e., the benchmark that the existing companies' performances are compared. Second, Refinitiv takes the approach of index-based coverage expansion adding smaller firms into its coverage over time, which makes a systematic difference between the existing firms and new firms. As larger firms often have more resources and greater incentives to improve ESG fundamentals, large firms generally exhibit better ESG performance. Thus, the coverage expansion could increased the number of worse-performing peer firms for the existing firms, shifting their relative position to the right of the distribution and mechanically increasing their ESG ratings.

We begin our study by examining the validity of our setting, i.e., whether there were mechanical increases in the existing firms' ratings around the coverage expansion. Specifically, we investigate how the existing firms' ESG ratings changed around Refinitiv's coverage expansion to Russell 2000 firms. We choose this expansion since it was the largest change in Refinitiv's US firm coverage as shown in Fig. 2. First of all, we compare existing firms' Refinitiv ratings in the pre and post of coverage expansion and find that the existing firms' ESG ratings increased by 19.3 percent point on average. When we compare the same firms' ratings from other ESG rating providers (i.e., Sustainalytics and KLD), which did not significantly change their coverage around the same period, we do not find such a dramatic increase in ratings. Second, we replicate Refinitiv's scoring methodology, assuming that the coverage is not expanded, to estimate the portion of rating changes attributable to the coverage change. We find that the actual Refinitiv ratings and our own estimated ratings start to diverge from 2015 when Refinitiv started to expand its coverage.

We further look into whether the effect is heterogeneous depending on firms' relative position in the pre-expansion period. Some firms could be benefited more from the coverage expansion than others. Specifically, the effect of coverage expansion on existing firms' ratings might be more pronounced for those firms that showed relatively poorer ESG performance in the pre-expansion period (i.e., those in the lower tier in each industry) than for firms with better ESG performance

because poor ESG companies now have peers who are worse than them. The effect, however, may not be monotonically increasing with firms' pre-expansion ESG performance since new firms' ESG fundamentals are not necessarily worse than the ESG fundamentals of existing firms, especially when two companies are comparable.

Consistent with our predictions, we find that, in general, the effect is more pronounced for firms that were in the lower tier in their respective industries in the pre-expansion period than for firms in the upper tier. In addition, we find that the effect is not monotonically increasing with firms' pre-expansion ESG performance. Existing firms with right below the median of industry average ratings seem to benefit more from the addition of new firms in Refinitiv's coverage compared to firms in the bottom or above the median. To summarize, Refinitiv coverage expansion mechanically boosted existing firms' ratings in general, but there are a few firms that have worse ESG fundamentals than new firms and thus experienced a rating decrease. In our regression analysis, we drop such firms to avoid unnecessary complications and focus on existing firms whose ratings mechanically increased following the coverage expansion.

After confirming the mechanical rating changes around the rating agency's coverage change, we exploit this setting to empirically test the investors' use of commercial ESG ratings. It is ex-ante unclear whether investors respond to mechanical rating changes. On the one hand, investors may not be influenced by the mechanical ratings changes if they fully understand the ERA's scoring process and the impact of coverage on ratings. They may be able to undo the mechanical changes in ESG ratings in this case. Investors may supplement commercial ESG ratings with other inputs from various sources including public data on real environmental and social activities (e.g., GHG emission data from EPA and workplace injury data from OSHA). If investors do not see any indication of improvement in a firm's real activity but only see an increase in its ESG rating, they could detect that the rating changes are driven by non-fundamental-related reasons. On the other hand, investors might simply follow the commercial ESG rating and, thus, cannot differentiate between performance-driven and non-performance-driven ESG rating changes, responding to mechanical increases in ratings.

To investigate investors' reactions to mechanical changes in firms' ESG ratings, we study how ESG-focused mutual funds change their portfolios in response to the rating changes. We identify ESG funds based on Morningstar's annual *Sustainable Funds U.S. Landscape Report*. We also investigate whether different types of investors respond to mechanical rating changes differently by separating ESG funds based on their investing style: passive ESG funds and active ESG funds. In our regression model, treated firms are the existing firms that experienced mechanical rating increases and control firms are new firms added in the first year of coverage expansion (i.e., 2015). We choose early-added firms since they are more comparable to our treatment sample than late-added firms. We also drop new firms that received first-time-ever external ESG ratings as a result of Refinitiv's expansion in 2015 to control for the effect of receiving first-time external ESG ratings. Our research design compares the changes in the probability and percentage of ESG funds' shareholding for treated vs. control firms around the coverage expansion compared to non-ESG funds.[7]

We find that ESG funds are more likely to hold firms that experienced mechanical rating increases compared to non-ESG funds. In addition, we find that the documented results are mostly driven by passive ESG funds. Given that mutual funds' shareholding involves two-step decision making, (i) selection of portfolio firms and (ii) allocation of weight within the portfolio, we investigate in which process the mutual funds use commercial ESG ratings. Our extensive and intensive margin analyses show supporting evidence that ESG funds use ESG ratings mostly in the selection process rather than the weighting process. In other words, our results suggest that mechanical rating increases help ffirms to exceed the threshold and get into the ESG funds' portfolio but the funds on average do not consider ESG ratings once they finalize their portfolio constituents. Our results are consistent with the SEC's concerns that some mutual funds seeking socially responsible investing are over-relying on commercial ESG ratings and performing inadequate due diligence.

[7] Berg et al. (2020a) find that Refinitiv's ratings are often backfilled. Our fund flow analyses do not subject to this issue for the following two reasons: (1) we use ESG ratings to identify treated firms (i.e., firms whose ratings bumped up due to the coverage change) rather than directly incorporating the ratings in our regression model, and (2) our specifications include firm-year-quarter fixed effects, which sweep out any time-specific (time-variant) firm characteristics such as a firm's ESG rating.

An alternative explanation on our documented effects could be contemporaneous changes in firms' ESG fundamentals around the coverage change. In other words, the coverage change affected firms' ESG fundamentals and thus ESG funds respond to ESG fundamental changes rather than the rating changes. To examine this possibility, we investigate changes in firms' real ESG activities around the coverage expansion using various proxies. Specifically, we investigate the amount of a firm's toxic releases, GHG emissions, E&S violations, negative ESG incidents, board-level racial and gender diversity, board independence, CEO duality, poison pill provision, and entrenchment index. Across different proxies of real ESG outcomes, we find no evidence that mechanical ESG rating changes have real effects on firms' ESG fundamentals.

Although ESG funds increase the shareholding of firms with mechanical rating increases, one may argue that being aware of the issue of mechanical rating changes, such investors could still do their due diligence by taking monitoring actions through other channels, such as voting. To examine this possibility, we investigate changes in the voting outcomes around the coverage change. We find that there is no change in the number of environmental (E) and social (S) items either proposed by all shareholders or specifically by ESG funds. We do not find any change in the number and proportion of the E&S items passed and we find weak evidence that the number of withdrawn E&S items decreases. Although we cannot directly observe shareholders' private engagement, it is unlikely that shareholders privately engaged with corporate managers for the following two reasons. First, we find that the number of withdrawn shareholder proposals decreases rather than increases. Considering that private engagement often results in the withdrawal of shareholder proposals, private engagement is unlikely a channel in this setting. Second, we find that there is no change in treated firms' ESG fundamentals around the coverage expansion. If private engagement was an effective monitoring channel, we would expect to see changes in firms' real ESG outcomes. Our results on voting outcomes are consistent with that ESG funds are not aware of mechanical rating changes.

This paper contributes to the literature on ESG ratings. There are several recent academic research (Berg et al., 2022; Christensen et al., 2022) that question the cross-sectional comparability

of firms' ESG ratings noting the high degree of disagreement among data providers. In addition to that, this paper emphasizes that the time-series comparability of ESG ratings from a single ESG rating agency might be limited due to the changes in the rating agency's coverage. To the best of our knowledge, this is the first paper showing the existence of mechanical ESG rating changes.

This paper also contributes to the literature on the consequences of the ESG rating agency's coverage expansion. Darendeli et al. (2021) investigates the role of ESG information in supply-chain contracting by exploiting Refinitiv's coverage expansion from Russell 1000 to Russell 3000 as a setting. Using a difference-in-differences design with the previously covered Russell 1000 supplier firms being the control group, they find that treated suppliers with low ESG ratings experience reductions in the number of contracts and the number of corporate customers. This study complements Darendeli et al. (2021) by examining the consequence of coverage expansion from the existing firms' perspective. Thus, this study provides additional empirical evidence to assess the implication of coverage expansion in a broader sense.

Finally, this paper sheds light on how investors rely on ESG ratings. Raghunandan and Rajgopal (2022) document that ESG mutual funds select stocks with higher ESG scores. They find no evidence that ESG funds actually pick stocks with better "E" and "S" fundamentals, measured by federal violations related to environmental and labor laws and carbon emissions. The authors suggest their evidence might be an indication that ESG funds rely on ESG scores rather than performing their own due diligence about firms' environmental and social practices. By explicitly estimating the mechanical increases in ratings that are attributable to coverage changes rather than firms' underlying ESG performance, this paper provides more direct evidence on the question of whether investors simply follow commercial ESG ratings or perform their own due diligence by undoing the mechanical changes in ratings. Our findings are consistent with the SEC's concern about mutual funds' over-reliance on commercial ESG scores .[8]

[8] https://www.sec.gov/files/esg-risk-alert.pdf

II. INSTITUTIONAL BACKGROUND AND PREDICTION

Coverage expansion of Refinitiv

Thomson Reuters Refinitiv is a key ESG rating provider offering one of the most comprehensive ESG databases in the industry. Its ESG ratings have been used in more than 1,500 academic articles since 2003 (Berg et al., 2020a) and its ESG data are employed by major asset managers, such as BlackRock, to manage ESG-related investment risks.[9] Refinitiv has been expanding its global coverage gradually as shown in Fig 1. Fig 2 shows how Refinitiv has expanded its U.S. firm coverage over time. It initially covered S&P 500 firms in the early 2000s and expanded to Russell 1000 firms by the early 2010s. The largest expansion was in 2015 when Refinitiv started to expand its coverage of U.S. firms from Russell 1000 to Russell 3000. Since the coverage expansion was index-based, it resulted in a massive influx of smaller companies into Refinitiv's coverage. Among Russell 2000 companies that were newly added after 2015, relatively larger companies were added in the first year of expansion and smaller companies were added in the latter two years.[10]

The relative degree of coverage expansion varies by industry. As of the end of 2017 when the coverage expansion to Russell 3000 was completed, 86.2 percent of firms were newly added companies in Pharmaceuticals & Medical Research industry, while only 20 percent of firms were newly covered firms in Industrial Conglomerates industry. The coverage expansion to Russell 3000 companies was the most large-scale expansion in Refinitiv's history. Inspecting other rating provider's data manuals (i.e., KLD and Sustainalytics), we do not find indication of significant concurrent changes in the other ESG rating agencies' coverage during this period. This suggests that the coverage expansion was Refinitiv's own decision rather than other external forces, such as rated firms or investors, driving such decision.

Refinitiv's coverage expansion provided for the first time external ESG ratings for some of Russell 2000 firms that had never been covered by any other ESG rating agencies (Darendeli et al.,

[9] https://www.responsible-investor.com/blackrock-taps-asset4/

[10] The averages of the log market capitalization of new firms added in 2015, 2016, and 2017 are 14.2, 13.2, and 12.7, respectively.

2021).[11] The coverage expansion, however, could also influence the ratings of the previously covered Russell 1000 firms since Refinitiv adopts industry-based relative performance evaluation to generate scores. We explain Refinitiv's scoring methodology and how the coverage can affect final ratings in more detail in the following sub-section.

Scoring methodology of Refinitiv

As shown in Fig. A.1, Refinitiv's scoring process is step-wise and a series of aggregating granular data points into composite scores. In their database, Refinitiv has more than 500 data points. Among the 500+ ESG metrics, 186 comparable measures are used as inputs in the ESG scoring, which are then grouped into 10 category scores. The category scores are rolled up into three-pillar scores (environmental, social, and governance scores) and ultimately into the final ESG score.[12]

To calculate firms' category scores, Refinitiv adopts industry-based relative performance evaluation (RPE) using its own industry classification (i.e., TRBC: Thomson Reuters Business Classification).[13] Specifically, Refinitiv's scoring methodology is based on three factors: in each industry-year (i) how many companies are worse than the focal firm, (ii) how many companies have the same value, including the focal firm itself, and (iii) how many companies have a value at all.

$$\text{Score} = \frac{\text{\# firms with worse value} + 0.5 \times \text{\# firms with the same value}}{\text{\# firms with a value}}, \tag{1}$$

Relative scores ranging from 0 to 1 are generated with this calculation. Refinitiv interprets relative scores below 0.25 as an indication of "poor" performance, scores from 0.25 to 0.5 as "satisfactory", scores from 0.5 to 0.75 as "good", and scores above 0.75 as "excellent" performance.

For each data point, the percentile score is calculated following the above equation. After

[11] In our sample, out of 632 unique control firms that were newly added to Refinitiv coverage in 2015, 502 firms had already been covered by alternative ERAs (i.e., Sustainalytics and/or KLD), while remaining firms (130 unique companies) had not been covered by those two alternative ERAs. In our later analyses, we drop those 130 firms to control for the effect of receiving first-time external ESG ratings.

[12] Under the environmental pillar, there are three categories: Resource use, Emissions, and Innovation. The social pillar includes four different categories: Workforce, Human rights, Community, and Product responsibility. Finally, there are three different categories under the governance pillar: Management, Shareholders, and CSR strategy.

[13] Scores for 7 categories under the environmental and social pillar are calculated following this approach, while governance-related category scores are measured against the country of incorporation.

deriving percentile scores at an individual data point level, percentile scores are summed up at a company level by category. Refinitiv then applies the percentile scores formula once again to derive the category score. To calculate each pillar and overall ESG scores, category weights per industry are applied. In other words, the E/S/G pillar scores and the overall ESG score are weighted sums of the category scores. The category weights vary by the industry for the environmental and social categories. For the governance categories, the weights remain the same across all industries.[14]

Coverage change and existing firms' ESG ratings

The eq.1 suggests that the changes in the ERA's coverage influence firms' ESG ratings in two ways. First, the coverage expansion affects the existing firm's rating by expanding the boundary of its peer group (i.e., the denominator effect). At the same time, depending on the characteristics of newly added firms, coverage change could also affect the number of worse-performing peer firms (i.e., the numerator effect). In the case of Refinitiv, its index-based coverage expansion resulted in the inclusion of smaller firms into the coverage. Since smaller firms tend to show poorer ESG performance due to lower public scrutiny or lack of relevant resources (Watts and Zimmerman, 1986; Cormier and Magnan, 2003; Thorne et al., 2014), the coverage expansion might increase the existing firm's percentile rank, thus mechanically increasing its relative ESG scores. In other words, the coverage expansion could make existing firms look better even without any improvement in their ESG fundamentals by allowing them to beat a greater number of peer firms. As a validation of our setting, we first investigate whether there were mechanical changes in existing firms' ESG ratings around the Refinitiv's index-based coverage expansion.

We also make a prediction on the degree of such mechanical rating changes. Specifically, we examine, among existing firms, which firms are more likely to experience greater rating increases. On the one hand, the effect of coverage expansion on existing firms' ratings might be more pronounced for firms that showed relatively poorer ESG performance in the pre-expansion period (i.e.,

[14]Refinitiv describes that the "Category weights are calculated based on an objective and data-driven approach to determine the relative importance (materiality) of each theme to each individual industry group". Category weights matrix is publicly available at: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

those in the lower-tier in each industry). Better ESG firms (i.e., those in the higher-tier) could be already getting higher ratings, and thus they may have a smaller room to increase their ratings further. Firms with relatively worse ESG fundamentals, however, could have more room to increase their ratings, and the marginal effect of having one more worse-performing peer could be greater for those firms. Therefore, the effect of adding new firms to the coverage may be greater for such firms. On the other hand, the effect might be less pronounced for worse ESG firms given that their ESG fundamentals are not necessarily better than the fundamentals of newly added firms. If the existing firms do not beat new firms, their ratings could decrease rather than increase. Thus, we expect that the effect would be increasing with firms' pre-expansion ESG performance but it is not monotonically increasing.

Investor responses to mechanical rating increases

The fact that the ERA's coverage change might result in a mechanically increase in existing firms' ESG ratings raises a concern that the users of such ratings could be misled by non-performance related rating changes. Investors are one of major users of commercial ESG ratings. It is, however, ex ante unclear whether investors are misled by mechanical rating changes. As the SEC is concerned, if investors are fixated on the face value of commercial ESG ratings, they could not be able to differentiate the rating changes attributable to coverage change from the changes driven by fundamental changes. As a results, investors would respond to mechanically increased ESG ratings by increasing their shareholdings for firms with higher ratings regardless of whether the rating increase is due to firm fundamentals or something else.

However, there are several reasons why investors are unlikely to respond to mechanical changes in ESG ratings. First, investors have an access to the universe of the rating agency coverage and thus can easily notice any changes in the coverage. To the extent that investors understand the scoring process and how the coverage affects the firms' ESG ratings, they could easily undo the mechanical changes. Also, investors might supplement commercial ESG ratings with other information rather than simply relying on the ratings. Especially, there are several public data on

firms' real ESG activities, such as toxic release and greenhouse gas emission data from EPA and workplace injury data from OSHA. If investors do not see any indication of improvement in a firm's real ESG activities but only see an increase in its ESG rating, they could detect the rating changes driven by non-performance-related reasons.

In addition, different types of investors might respond to mechanical rating changes differently. Specifically, the effect can vary depending on the investing style, i.e., active vs. passive. Heath et al. (2021) document that ESG funds select firms with better E&S fundamentals and those firms are more likely to receive higher E&S ratings. They also find that most ESG funds are actively managed funds. Thus, if ESG funds can see through mechanical rating changes, it is more likely that active ESG funds do so with intense internal research, and their own KPIs and scoring methodologies. On the other hand, however, passive ESG funds may not able to adjust mechanical rating changes either because of a lack of resources or because of methodological reasons. Some passive ESG funds explicitly mention their reliance on commercial ESG ratings as an initial screening. [15] For example, Thomson Reuters Global ESG Index filters out firms based on their category-level ESG ratings. If the ratings are greater than the threshold value (e.g., 0.5), ESG filter is passed. There is no specific minimum or maximum number of constituents. Thus, once the ESG filter is passed, any and all candidates can become constituents, and weight is assigned either based on market capitalization or constituents are equally weighted. To the extent the mechanical rating changes help firms on the margin exceed the threshold, passive ESG funds could be affected by mechanical rating changes.

In sum, it is ex-ante unclear whether mechanical ESG rating changes associated with the ERA's coverage expansion influence investors and, if so, which types of investors are affected. As such, this paper examines the effect of mechanical increases in ESG ratings following the coverage expansion on investors. Our setting allows a rare opportunity to test investors' overreliance on commercial ESG ratings. Empirically testing investors' overreliance on commercial ESG ratings is

[15] For example, MSCI ESG Select Index and MSCI KLD 400 Social Index (previously, Domini Social 400 index) rely on the MSCI ESG Ratings, Dow Jones Sustainability World Index and the S&P 500 Environmental & Socially Responsible Index are based on the S&P Global ESG Score, the FTSE4Good Index Series use FTSE Russell ESG Scores, and finally, Thomson Reuters Global ESG Index depends on Thomson Reuters Refinitiv ESG ratings.

important but challenging since the benchmark is unobservable. We overcome this empirical challenge by examining investors' responses when firms' ESG ratings change for the non-performance-related reason (i.e., coverage change).

III. DATA AND RESEARCH DESIGN

In the regression analysis, our treatment group is Russell 1000 firms that existed in Refinitiv's coverage before the coverage expansion (i.e., existing firms) and experienced a mechanical increase in their Refinitiv ESG rating in 2015. Although most of the existing firms experienced rating increases as a result of coverage expansion, there are several firms that experienced rating decreases. We drop such cases. We use Russell 2000 firms that added in the Refinitiv coverage in the first year of expansion (i.e., 2015) as the control group since those firms are more comparable to our treatment group than those firms added in the later two years of coverage expansion. To control for the effect of first-time receiving external ESG ratings, we drop firms that had no external ratings before Refinitiv's expansion from our control sample. Finally, we drop treatment firms whose Refinitiv rating is lower than control firms in 2015. With these processes, we identify 979 unique firms with 547 treated and 432 control firms.

To investigate investors' reactions to mechanical changes in firms' ESG ratings, we study how ESG-focused mutual funds change their portfolios in response to the rating changes. We obtain information on ESG-focused mutual funds from Morningstar's annual *Sustainable Funds U.S. Landscape Report*. This report provides a comprehensive list of all ESG-oriented funds available for investors in the United States. Importantly, the list is based on firms' self-reported ESG status rather than Morningstar's evaluation as to whether the fund qualifies as an "ESG" mutual fund (Raghunandan and Rajgopal, 2022). We downloaded this list from Morningstar's website, which provides the list of all ESG mutual funds as of December 31, 2021. We then hand-match these funds with CRSP identifiers (i.e., "portno" and "fundno") based on the fund name. The list also provides basic descriptive information about these funds, including assets under management (AUM), inception date, and ESG start date. We code the ESG fund indicator as one for the periods

following the ESG start date. If the ESG start date is missing, we assume the fund described itself as an ESG fund from the date of inception and use the inception date as the ESG start date.

We merge the ESG fund list with CRSP Mutual Funds Holdings data to identify the shareholding of ESG funds and non-ESG funds. For each fund-year quarter, we keep the last calendar month's data. We then create all possible combinations of fund-firm pairs for our treatment and control firms and those funds existed as of the end of 2015. We expand our sample to eight quarters which include four quarters pre- and post- of the event. We merge CRSP Mutual Funds Holdings data with the fund-firm-year-quarter data and replace missing values as zero. We keep the cases of zero shareholdings in our regressions to examine the changes in the probability of shareholding. To construct the sample of treated and control firms with comparable ESG fundamentals, we use firms' pre-period KLD ratings and keep those firms whose pre-period KLD ratings fall in the range of 1 s.d. around the mean. These processes generate our final sample of 50,580,088 fund-firm-year quarter observations, which pertain to 6,953 unique funds where 101 funds are ESG and 6,852 funds are non-ESG funds.

To investigate whether ESG funds are influenced by the mechanical changes in ESG ratings, we estimate the following model:

$$DV_{i,j,t} = \beta_1(Post_t \times ESG\ Fund_j) + \beta_2(Treat_i \times Post_t \times ESG\ Fund_j) + FE_{i,t} + FE_{i,j} + \epsilon_{i,j,t} \tag{2}$$

where *DV* is either *Prob. Holding*, the probability of holdings, or *Perc. Holding*, the percentage holdings within a mutual fund's portfolio, for fund *j* in firm *i* in year-quarter *t*. *Treat* equals one for Russell 1000 firms that existed in Refinitiv's coverage before the coverage expansion and experienced a mechanical increase in their Refinitiv ESG rating in 2015, and zero for Russell 2000 firms newly added to the Refinitiv coverage in 2015 with other ESG ratings available.[16] We examine four quarters before and after the event period. Specifically, our *Post* variable equals one for four

[16]Coverage expansion was staggered over three years, indicating that three different batches of Russell 2000 firms were added each year. Therefore, those firms added in the first year (i.e., control firms in our sample) can also be treated as a result of the addition of the second batch of Russell 2000 firms. To cleanly identify treated and control firms and to avoid unnecessary complexity, we focus on the first year of coverage expansion in our regression analyses.

quarters of 2016, and zero for four quarters of 2015. We include firm-year-quarter fixed effects to control for the time-specific firm characteristics. We also include fund-firm fixed effects to perform within fund-firm pair analyses.[17] The terms *Treat*, *Post*, *ESG Fund*, *Treated* $\times$ *Post*, and *Treated* $\times$ *ESG Fund* are not shown, because their coefficients are absorbed by the fixed effects. Standard errors are clustered at the fund level.

This specification results in a "triple-differences" regression that is akin to a comparison of the difference-in-differences ("DiD") estimates from two separate DiD designs. In this triple-differences specification, our identification of the treatment effect comes from a comparison of (1) the difference in the change (around mechanical rating increases) in the shareholding of ESG funds for treated firms compared to non-ESG funds (the first difference-in-differences) to (2) the same comparison for control firms (the second difference-in-differences). The difference between 1 and 2 is the third difference-in-differences. In the regression model, β_2 captures the first difference-in-differences and β_1 captures the second difference-in-differences. To the extent that ESG-oriented mutual funds' investment decision is influenced by mechanical changes in ESG ratings, we expect β_1 to be indistinguishable from zero and β_2 to be significantly positive.

Berg et al. (2020a) find that Refinitiv's ratings are often backfilled. Our fund flow analyses do not subject to this issue for the following two reasons. First, we use ESG ratings to identify treated firms (i.e., firms whose ratings bumped up due to the coverage change), rather than including the ratings in our regression model. Second, our specifications include firm-year-quarter fixed effects, which sweep out any time-specific firm characteristics such as a firm's ESG rating.

IV. RESULTS

Mechanical ESG rating changes following the coverage expansion

We begin our analyses by examining the validity of our setting. Specifically, we investigate whether there were mechanical changes in ESG ratings following the coverage change. First of all, we

[17] In untabulated tests, we also include fund-year-quarter fixed effects to control for potential time-variant fund characteristics and find qualitively similar results.

compare existing firms' several different ESG ratings in the pre- and post- of coverage expansion. The blue solid line in Fig 4 shows the average Refinitiv ESG ratings for our sample of existing firms over time. As a comparison, we also plot the average Sustainalytics and KLD ratings for the same set of companies in red dotted line and green dash-dot line, respectively. By plotting three different ESG ratings where one of the rating providers expanded its coverage while the others did not significantly change its coverage, we provide initial evidence on how the coverage change affects firms' ESG ratings. As shown in Fig 4, existing firms' Sustainalytics and KLD ratings are quite stable over time, while the same firms' Refinitiv ratings show a stark increase since 2015 when Refinitiv initiated its work to add Russell 2000 companies to its coverage. Since different ESG rating agencies have different scopes, their ratings are not directly comparable (Berg et al., 2022). Nevertheless, Fig 4 suggests that the stark difference in time-series ESG ratings from different rating providers is at least partly driven by coverage changes.

In Table 1 Panel A, we compare the mean and median values of Refinitiv ratings in the pre and post of its coverage expansion.[18] We find that existing firms' Refinitiv ratings are significantly higher in the post-expansion period compared to their ratings in the pre-period. On average, existing firms experienced a 19.3 percent point increase in their ESG ratings following the coverage expansion. We perform placebo tests using Sustainalytics ratings (untabulated). We expect that our sample firms' average Sustainalytics ratings do not change dramatically around Refinitiv's coverage expansion since Sustainalytics did not change its coverage significantly around this time period. We find firms' Sustainalytics ratings are slightly lower in the post-period than in the pre-period and the magnitude of differences is moderate.

As an alternative way to examine the presence of mechanical rating increases, we replicate Refinitiv's scoring methodology and estimate the portion of rating changes that is attributable to index-based coverage expansion. Specifically, we drop firms that are newly added after 2015 from the Refinitiv coverage and calculate the percentile rank score with the remaining firms.[19] In other

[18]The numbers of observations in the pre and post-period do not necessarily the same since several firms are dropped from Refinitiv's coverage for several reasons such as M&A.

[19]We apply the percentile scores formula to Refinitiv final ESG scores instead of individual data points since we were not able to access the entire data points used. Thus, our estimation of mechanical rating changes may be subject

words, we estimate the existing firm's ESG rating assuming that the coverage was not expanded. We argue that the estimated rating captures the *normal* portion of the ESG rating and the difference between the *actual* rating as reported by Refinitiv and our own estimation of the *normal* rating captures the *abnormal* (mechanical) portion of the ESG rating that is attributable to the expanded coverage. An illustrative example of the calculation process is given in Fig 3.

Fig 5 shows the average values of *actual* rating and *normal* rating over time. In the pre-event period, the difference between the *actual* rating and *normal* rating seems negligible, suggesting that, although it is not perfect, we are quite successfully replicating Refinitiv's scoring process. The difference between these two ratings starts to increase following the coverage expansion in 2015. In the untabulated t-tests, we find the difference between *normal* rating and *actual* rating to be indistinguishable from zero in the pre-period (t-stat = 0.91) and to be significantly positive in the post-period (t-stat = 17.90). This figure implies that there were mechanical increases in existing firms' ESG ratings as a result of coverage expansion and that our estimated proxy captures such mechanical portions of rating changes.

We further investigate whether there is a heterogeneous effect depending on firms' relative position in the pre-expansion coverage. Specifically, we split our sample of existing firms into decile ranks of average pre-period ESG ratings and compare mean and median values of ratings in the pre and post-expansion separately for each decile rank. We present the results in Panel B of Table 1. Consistent with our prediction in Section II.3, the effect of coverage expansion on existing firms' ESG ratings is greater for firms that were in the lower tier in each industry in the pre-period. More specifically, ESG ratings for firms in the top decile increased by 1.3 percent points in the post-expansion period, while the ratings for firms in the bottom decile increased by 22.7 percent points. Interestingly, we do not find a monotonic increase across different decile ranks. Firms with just below the median of industry average ratings (e.g., firms in the decile ranks 2 and 3) seem to benefit the most from the addition of new firms in Refinitiv's coverage compared to firms in the bottom decile. This is consistent with our earlier prediction that not all existing firms beat newly

to measurement error problems.

added firms. Firms in the bottom decile may not necessarily outperform newly added Russell 2000 firms in terms of ESG fundamentals since they are similar in many aspects such as firm size.

Investor responses to mechanical rating changes

Next, we move to our main research question and examine whether investors respond to mechanical rating changes. We present the results of estimating Eq.2 in Panel A of Table 3. The dependent variable is *Prob. Holding*, the probability of shareholdings. We present the results with the entire sample in Columns (1). Controlling for the time-variant firm characteristics and time-invariant fund-firm characteristics, we find that ESG funds are more likely to hold firms that experienced mechanical rating increases. Specifically, the coefficient on *Treat* $\times$ *Post* $\times$ *ESG Fund*, 1.020, is statistically significant and implies an average increase of 1.02% in the probability of ESG funds' shareholding for treated firms compared to non-ESG funds following the coverage expansion. Importantly, the coefficient on *Post* $\times$ *ESG Fund*, is insignificant, meaning that the probability of ESG funds' shareholding for control is not statistically different from the probability of non-ESG funds' shareholding for the same companies.

Next, we separate the type of ESG funds depending on their investing style (i.e., Passive vs. Active) to see whether different types of investors are differently influenced by mechanical rating changes. We present the results with passive funds in Columns (2), and the results with active funds in Columns (3). We find that the documented treatment effect is mostly driven by passive ESG funds. Specifically, passive ESG funds are 3.44% more likely to hold treated firms compared to passive non-ESG funds. Again, the change in the probability of ESG funds' shareholding for control firms is not significantly different from non-ESG funds. Although we find similar results with active funds, the magnitude and statistical significance of the coefficient is smaller.

In Panels B and C of Table 3, we present the results for ESG funds and non-ESG funds, separately. Since we separate ESG and non-ESG funds and run regressions respectively, our variable of interest is *Treat* $\times$ *Post* in these specifications. We include fund-firm fixed effects to perform within fund-firm pair analysis and year-quarter fixed effects to control for general time trends. We

find that ESG funds are more likely to hold treated firms than control firms in the post periods. In particular, the probability of passive ESG funds' shareholding is higher for treated firms than for control firms by 3.13%. On the other hand, we find that non-ESG funds are less likely to hold treated firms relative to control firms in the post periods. Especially, the probability of active non-ESG funds' shareholding is lower for treated firms than for control firms by 0.12%, suggesting that active non-ESG funds sell shares in response to the demand from passive ESG funds. Overall, these results are consistent with that mutual funds over-rely on commercial ESG ratings and cannot discern fundamental-driven vs. non-fundamental-driven changes in ESG ratings.

Our results to this point suggest that ESG funds rely on commercial ESG ratings and change their portfolio in response to rating changes even when the rating change does not reflect changes in firms' ESG fundamentals. To further speak to how ESG funds rely on ESG ratings, we perform extensive vs. intensive margin analyses. Mutual funds' shareholding involves two-step decision-making. First, funds need to decide which firms to include in their portfolio (i.e., selection). Next, the funds need to allocate the weight for each portfolio constituent (i.e., weighting). We investigate whether the mutual funds use commercial ESG ratings in either or both of the processes.

For the extensive margin test, we focus on those funds that did not hold treated and control firms before the coverage change and predict the probability of holding in the post periods to examine whether the mechanical rating increases led those funds to start to include firms. In these analyses, we focus on ESG funds. We present the results of extensive margin analyses in Panel A of Table 4. We find supporting evidence that ESG funds use ESG ratings in the selection process. Specifically, the probability of ESG funds' shareholding for treated firms increased by 0.54% in the post periods relative to control firms. By running regressions separate for passive ESG funds and active ESG funds, respectively, we find that passive ESG funds are 1.26% more likely to hold treated firms and active ESG funds are 0.71% more likely to hold treated firms compared to control companies.

Next, we turn our focus to the intensive margin and investigate whether the mechanical rating changes affect firms' weight within the fund's portfolio once they get into the portfolio. For the intensive margin test, we restrict our analyses to those funds that held treated and control firms in

the pre-period and see whether the funds change the percentage holdings of portfolio companies in response to the mechanical rating changes. We present the results in Panel B of Table 4. In general, we find no evidence of ESG funds changing their portfolio weight in response to the non-performance-related rating changes. Overall, the results in Table 4 suggest that mechanical rating increases help firms to exceed the threshold and get into the ESG funds' portfolio but the funds on average do not consider ESG ratings once they finalize their portfolio constituents.

Reviewing the index methodologies of some passive ESG funds, we find some anecdotes consistent with our results. For example, *Refinitiv Global ESG Equal Weight Index* applies an ESG filter in the selection process where the index drops all candidates companies that do not have ESG scores greater than the threshold value (.5 or 50%). There is no specific minimum or maximum number of constituents and, thus, all candidates passing the ESG filter can become constituents. [20]

V. ADDITIONAL TESTS

Real effects of mechanical rating changes on rated firms

A potential alternative explanation of our documented results would be contemporaneous changes in firms' ESG fundamentals around the coverage change. In other words, the ESG rating agency's coverage change might have a real effect on rated firms and ESG funds could be influenced by concurrent changes in firms' ESG fundamentals rather than the mechanical rating changes. Although our estimation of mechanical rating changes somewhat addresses this issue since we only isolate the effect of coverage change. However, this may not be perfect since there could be a time lag for the fundamental changes to be realized in the ratings and there might be ESG fundamental changes going on but not yet captured by ESG ratings. If this is the case, ESG funds would change their shareholding anyway even without the rating changes. To examine this possibility, in this section, we directly test whether the mechanical rating changes had real effects on rated firms.

However, it is ex ante unclear whether and in which direction Refinitiv's coverage expansion af-

[20] https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/global-esg-equal-weighted-index-methodology.pdf

fect firms' real ESG activities. First, given that performance evaluation plays a key role in shaping an agent's incentive, mechanical changes in ESG ratings might distort firms' incentive to improve their real ESG performance. In other words, mechanical increases in ESG ratings might demotivate firms, negatively affecting firms' ESG performance. On the other hand, ERA's coverage expansion might provide a richer context to interpret firms' ESG performance by broadening the boundary of the benchmark group, bringing more investor attention on ratings and firms' ESG performance. In this case, firms may be motivated to improve their ESG performance further. Newly covered firms could be motivated to improve their ESG performance with increased visibility, which in turn could influence existing firms' incentives. Since the mechanical changes in ratings do not persist permanently, firms' ESG performance might get worse in the short term but improve in the long run. Finally, it is also possible that the mechanical increases in ESG ratings do not affect firm behavior at all since it is just one of several ESG ratings.

To examine whether mechanical rating changes have a real effect on firms, we investigate changes in several real ESG outcomes around coverage expansion. Specifically, we estimate the generalized difference-in-difference model as follows:

$$ESG\ Outcome_{i,t} = \beta_1(Treat_i \times Post_t) + \delta X_{i,t} + FE_i + FE_t + \epsilon_{i,t} \tag{3}$$

where *ESG Outcome* is one of our ESG outcome variables in each specification. Specifically, for the firms' environmental performance, we examine firms' pollution levels (*Toxic Release* and *GHG Emission*), the probability and monetary penalty of environmental violations (*Prob. Violation* and *$ Violation*), and the number of negative environmental incidents (*# Neg News*). For the firms' social performance, we examine board-level gender and racial diversity (*Racial Diversity* and *Gender Diversity*), the probability and monetary penalty of social violations (*Prob. Violation* and *$ Violation*), and the number of negative social incidents (*# Neg News*). Finally, for the governance-related activities, we consider the ratio of independent directors on board (*Board Independence*), whether the CEO also serves as a chairman of its board of directors (*CEO Duality*), the

existence of poison pill provision (*Poison Pill*), the entrenchment index of Bebchuk et al. (2009) (*E Index*), and the number of negative governance-related incidents (*# Neg News*).

Treat is defined the same as in Eq.2. We examine two years before and after the initiation of coverage expansion, excluding event year. Specifically, *Post* equals to one for the fiscal years 2016 and 2017, and equals to zero for the fiscal years 2013 and 2014. To address the back-filling issue of Refinitiv data, we include firm level control variables that are documented as determinants of rating changes (Berg et al., 2020b). Specifically, we include variables for profitability (*CumRet*), firm size (*Size* and *MarketCap*), growth opportunities (*Sales Growth*), capital expenditure (*Capex*), Cash (*Cash*), debt exposure (*Lev*), earnings (*EBIT*), property, plant, and equipment (*PP&E*), and research and development costs (*R&D*). We include the firm fixed effects to control for time-invariant firm characteristics and the year fixed effects to control for general time trends. Standard errors are clustered at the firm level. Table A.1 provides definitions and data sources for all variables.

Table 5 reports the results of estimating Eq. (3) with different ESG outcomes as a dependent variable. Specifically, we present the results of environmental, social, and governance-related activities in Panels A, B, and C, respectively. Controlling for time-invariant and time-variant firm characteristics and general time trends, we find no evidence that mechanical changes in ESG ratings affect a firm's ESG activities. For all different measures of ESG activities, the coefficient estimate is not statistically significantly different from zero. We show that our non-results are not due to low statistical power. To examine this possibility we compute the minimum detectable effect size (MDES) as in Bloom (1995). The MDES is a measure of the magnitude of treatment effect that a given estimator can reliably detect. Throughout our analyses, the MDES indicates that we have enough power to reliably detect a meaningful change in real outcomes.

Fig 6 plots event-study estimates from a two-way fixed effects regression of the real effects tests. We do not find significant differences in firms' real ESG activities both in the pre and post-expansion periods. Fig 6 shows evidence consistent with the parallel trends assumption. In sum, we do not find evidence that mechanical rating changes have a real effect on rated firms' ESG

fundamentals.

Mutual funds' other monitoring activities

Our results in Section II.4 show that ESG funds' shareholding is significantly and positively associated with mechanical rating changes. This, however, does not necessarily mean that those funds are fooled by non-fundamental-related rating changes. For methodological reasons, some ESG funds have to add certain firms if the filter condition is met even if the mechanical rating increases allow a firm to meet the condition. ESG funds could still be aware of the mechanical rating changes and choose to take other monitoring actions to compensate for increased shareholdings. To examine this possibility, we investigate changes in shareholders' voting behavior around the coverage change. Specifically, we estimate the generalized difference-in-difference model as follows:

$$Voting\ Outcome_{i,t} = \beta_1(Treat \times Post) + \delta X_{i,t} + FE_i + FE_t + \epsilon_{i,t} \tag{4}$$

where *Voting Outcome* is one of our voting outcome variables in each specification. Specifically, we investigate the number of shareholder proposals related to environmental and social issues both collectively (*# ES Items*) and separately (*# E Items*, and *# S Items*). We also consider the number of environmental and social items proposed by ESG funds (*# ES Items by ESG Funds*), the number and fraction of environmental and social proposals that pass (*# ES Items Passed* and *% ES Items Passed*), and the number and fraction of environmental and social proposals withdrawn (*# ES Items Withdrawn* and *% ES Items Withdrawn*). *Treat* and *Post* are defined the same as in Eq. (3). Firm-year level control variables, firm fixed effects and year fixed effect are included and standard errors are clustered at the firm level.

Table 6 presents the results of estimating Eq. (4) with different voting outcomes as a dependent variable. We find that there is no change in the number of environmental or social items that are proposed by any shareholders (Columns 1-3) or the number of environmental and social items proposed by ESG funds (Column 4). Moreover, we also find that there is no change in the number

and proportion of the environmental and social items that are proposed and passed (Columns 5-6). Finally, we find weak evidence that the environmental and social items that are proposed are less likely to be withdrawn (Columns 7-8).

These results indicate that ESG funds do not act to improve firm behavior using shareholder proposals on either the extensive or intensive margin. One could still argue that ESG funds could affect their portfolio firms in other ways, such as via private engagement with their portfolio firms. However, our results on the real effects suggest this is not the case. If the private engagement was an effective monitoring channel, we would expect to see some improvements in firms' real ESG outcomes. Furthermore, private engagement often results in the withdrawal of shareholder proposals. A significant decrease in the number of environmental and social shareholder proposals withdrawn indicates that private engagement with management is not effective in this setting.

Intensity of treatment

As a robustness test, in this subsection, we examine the treatment effect with the self-constructed measure of *abnormal* rating to allow the different levels of treatment. Specifically, we replace an indicator for treated firms in Eq. (2), *Treat*, with a rank variable of abnormal ratings, *High Abn Rating*, and estimate the following model:

$$\begin{aligned} DV_{i,j,t} = \beta_1(Post_t \times ESG\ Fund_j) + \beta_2(High\ Abn\ Rating_i \times Post_t \times ESG\ Fund_j) \\ + FE_{i,t} + FE_{i,j} + \epsilon_{i,j,t} \end{aligned} \tag{5}$$

where *DV* is either *Prob. Holding*, the probability of holdings, or *Perc. Holding*, the percentage of holdings, for fund *j* in firm *i* in year-quarter *t*. *Treat* and *Post* are defined the same as in Eq.2. *High Abn Rating* is a rank variable equals to two (one) for treated firms with above (below) median abnormal ratings and zero for control firms. Although our own measure of *abnormal* rating captures mechanical rating increases on average as shown in Fig 5, it still can potentially be subject to measurement error. Thus, we transform the continuous variable into the rank variable. As in Eq. (2), we include firm-year-quarter fixed effects to control for the time-specific firm characteristics

and fund-firm fixed effects to perform within fund-firm pair analyses. Standard errors are clustered at the fund level.

We present the results of estimating Eq.5 in Panel A of Table A.2. Allowing the different levels of treatment, we find similar results. We also replicate Panels B and C of Table 3 and Table 4 with a rank variable capturing the intensity of treatment (*High Abn Rating*) and present the results in Panels B and C of Table A.2 and Table A.3, respectively. In general, we find that our results are robust.

VI. CONCLUSION

We examine the portfolio allocation of institutional investors in response to a mechanical increase in environmental, social, and governance (ESG) ratings that is orthogonal to firms' actual ESG performance. In 2015, Refinitiv expanded its coverage of firms, from Russell 1000 to Russell 3000. As a result of Renifitiv's coverage expansion, some firms that were already in Refinitiv's coverage received a higher rating but their actual ESG performance did not change accordingly. We study this exogenous change in ESG ratings and find that the mechanical increase affects portfolio allocation of mutual funds with an ESG mandate. More specifically, we show that actively managed Non-ESG funds are more likely to sell companies that have received a higher ESG rating not granted by changes in underlying ESG performance. In contrast, ESG funds, and in particular those that follow an index, are more likely to invest in new stocks that received a higher mechanical increase in ESG ratings.

Our results relate to the literature on ESG funds (Heath et al., 2021; Raghunandan and Rajgopal, 2022; Gibson Brandon et al., 2022) and suggest that passive portfolio selection based on commercial ESG ratings might lead to portfolio allocation that does not reflect actual ESG performance. Our findings also relate to recent studies that raise concerns about the quality of commercial ESG ratings (Berg et al., 2022, 2020b,a) and call for greater attention to how the process underlying commercial ESG ratings.

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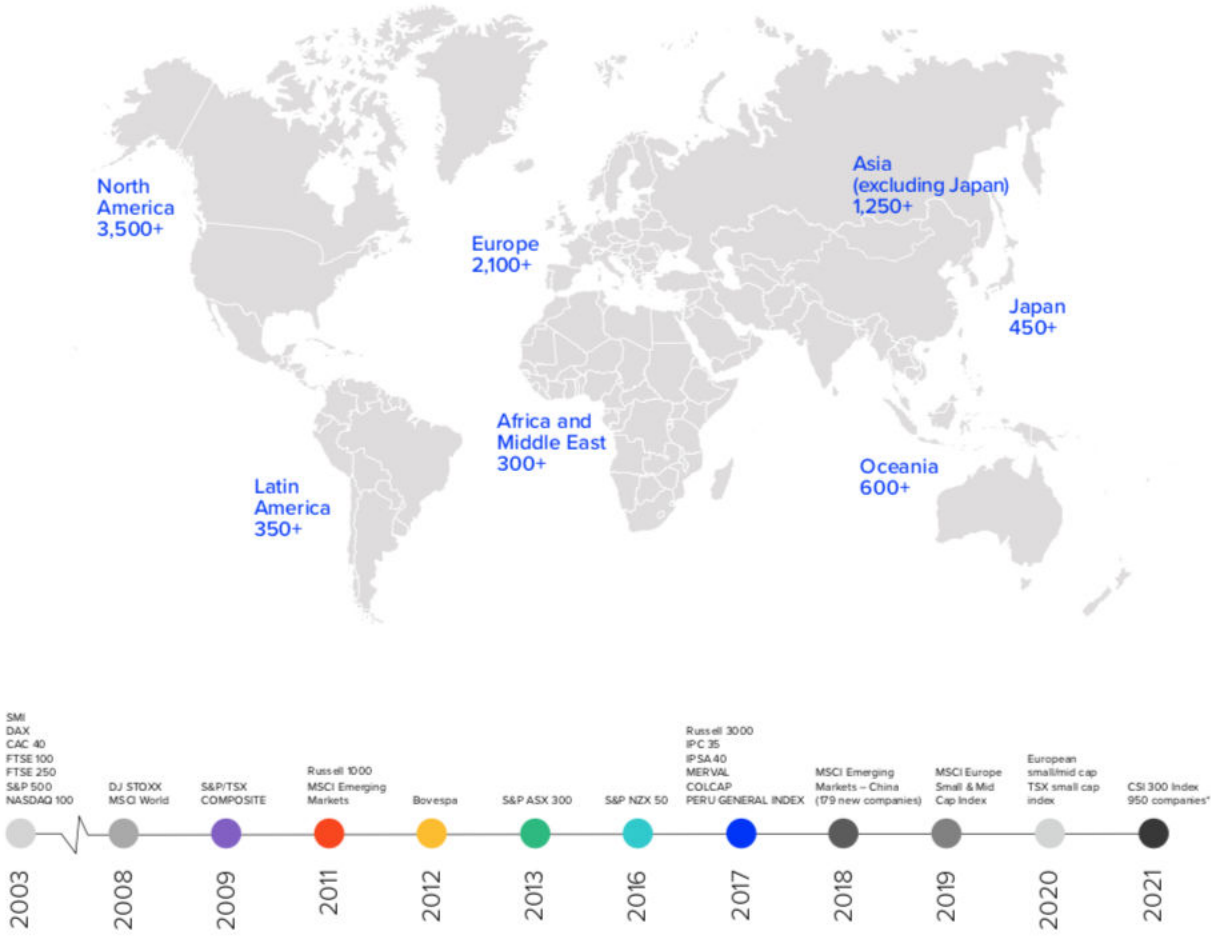
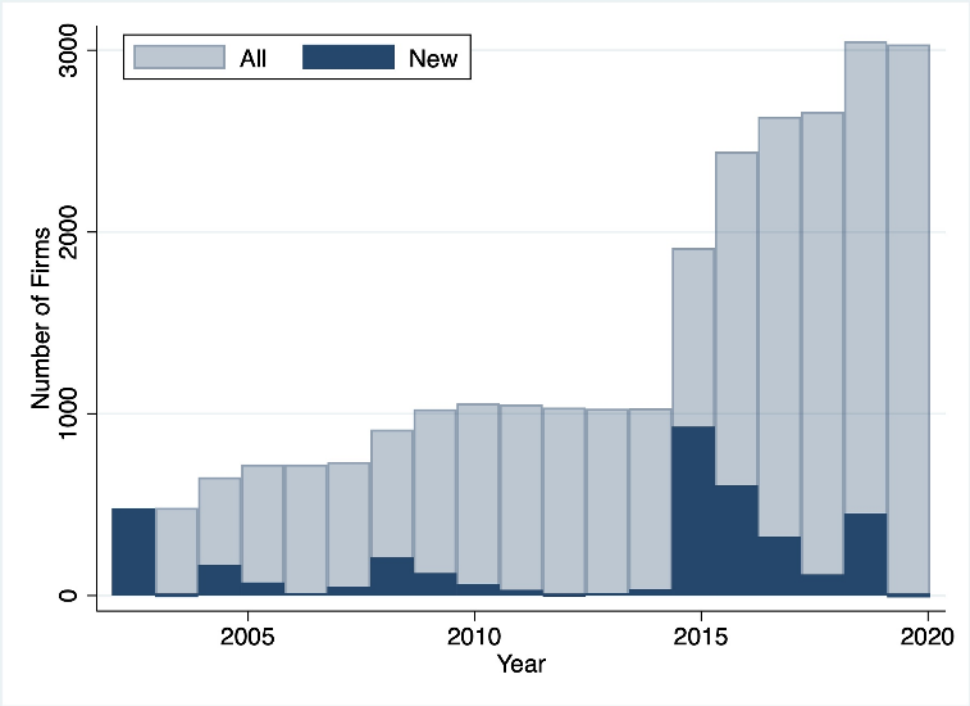
APPENDIX

FIGURE 1
History of Refinitiv's Coverage Expansion



This figure shows the history of Refinitiv's coverage expansion. The figure is from https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf.

FIGURE 2
Number of US firms in Refinitiv's Coverage



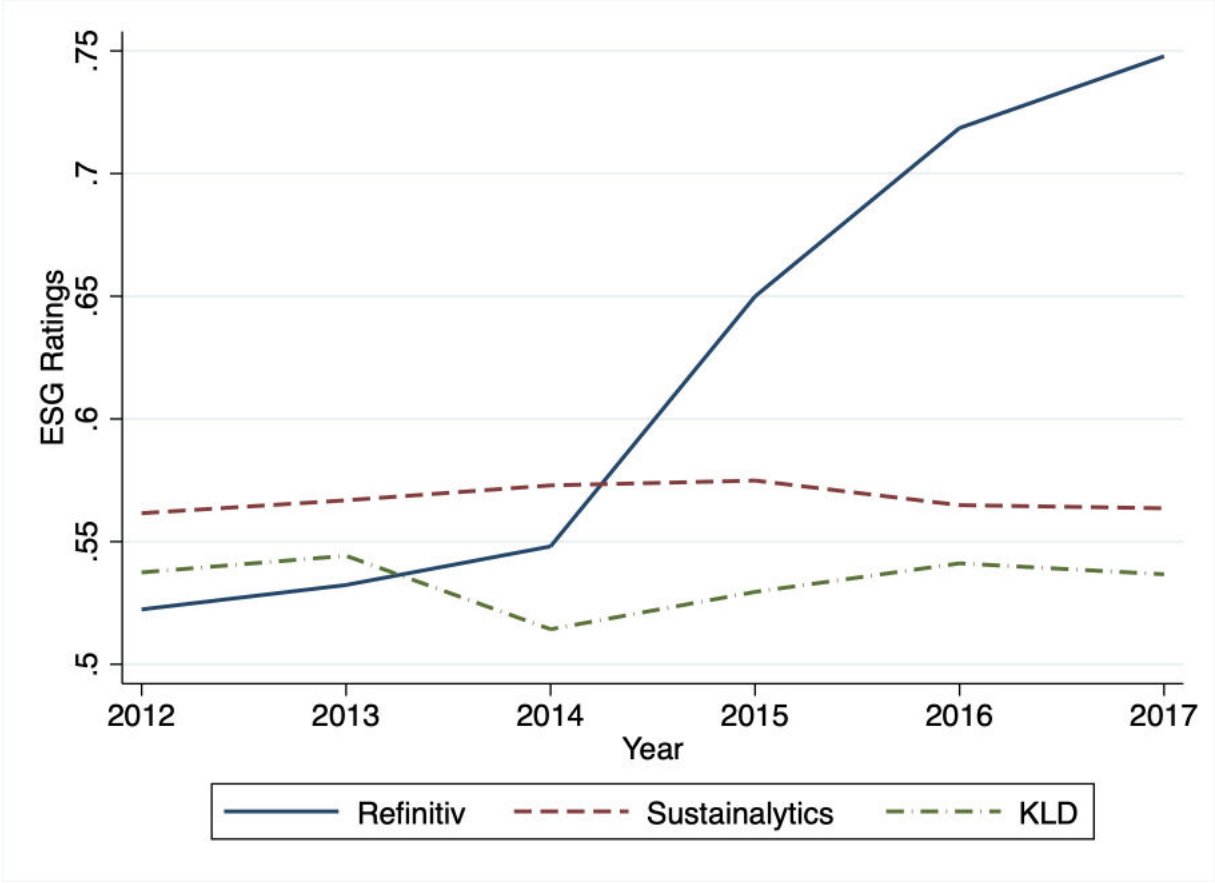
This figure shows the number of US companies in Refinitiv's coverage over time. Light-shaded bar presents the number of all companies whose ESG rating is provided by Refinitiv for a given year. Dark-shaded bar shows the number of new companies that first appears in Refinitiv's coverage in a given year.

FIGURE 3
Illustrative Example of Estimating Normal Ratings

Company	Year	EIKON Codes	Value	Raw Score	Calculation	Est Score	Calculation	Δ Score
JKL	2017	TR.AnalyticHazardousWaste	0.00963835	0.917	(5+(1/2))/6	0.875	(3+(1/2))/4	0.042
ABC	2017	TR.AnalyticHazardousWaste	0.22033562	0.750	(4+(1/2))/6	0.625	(2+(1/2))/4	0.125
LMN	2017	TR.AnalyticHazardousWaste	0.25027273	0.583	(3+(1/2))/6	0.375	(1+(1/2))/4	0.208
PQR	2017	TR.AnalyticHazardousWaste	0.38947305	0.417	(2+(1/2))/6	0.125	(0+(1/2))/4	0.292
ENR	2017	TR.AnalyticHazardousWaste	0.92718673	0.250	(1+(1/2))/6	-		
MSE	2017	TR.AnalyticHazardousWaste	65.3295052	0.083	0+(1/2))/6	-		

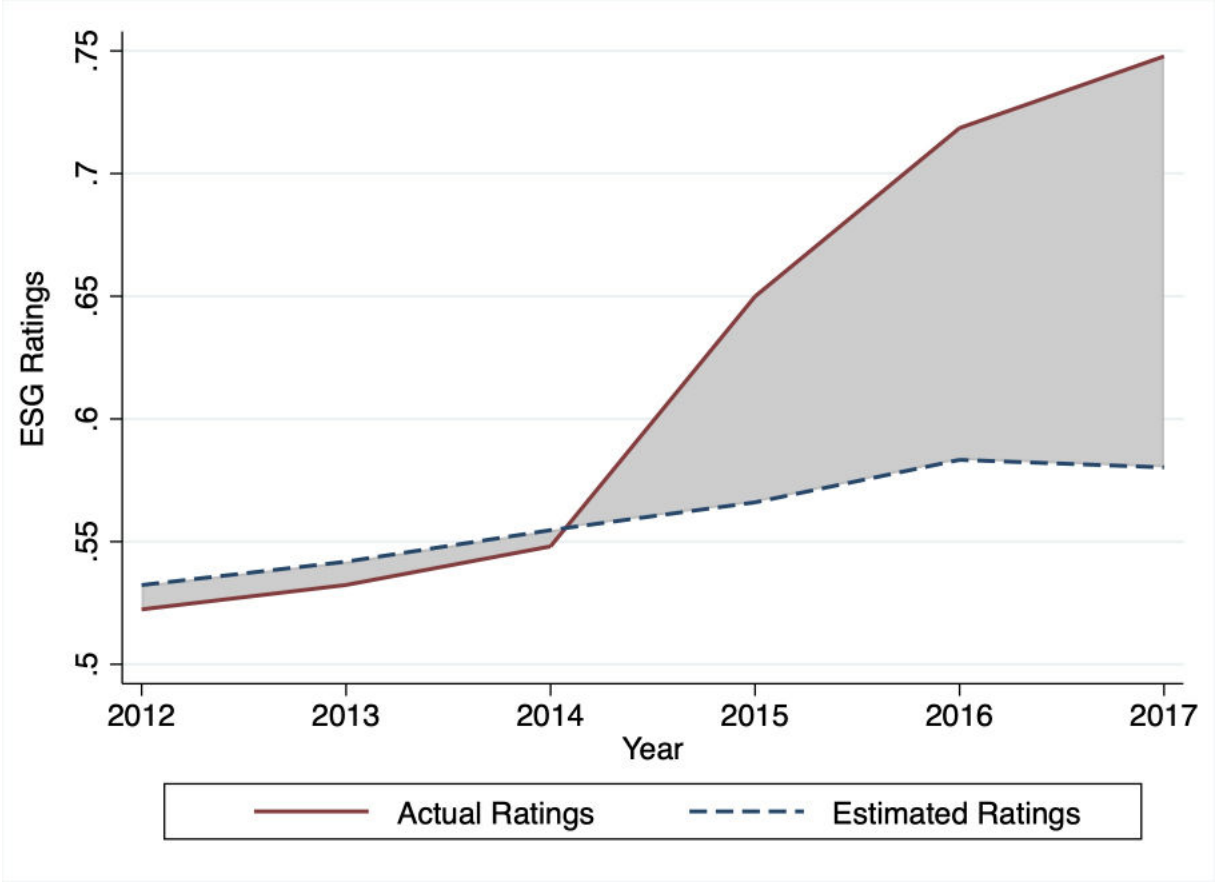
This figure shows an illustrative example of calculating normal ratings. Company names colored in red are new firms that are added in Refinitiv's coverage in 2017. *Raw score* is actual ESG ratings as reported by Refinitiv, calculated following their scoring methodology as shown in eq.1 with the all firms present in the coverage in a given year. *Est score* is estimated normal ratings assuming that the coverage did not change in 2017, calculated following the same method but only with old firms that were existed in the coverage before 2017. Δ *Score* show the difference between *Raw score* and *Est score* for each company, i.e., *Raw score - Est score*.

FIGURE 4
Existing Firms' ESG Ratings: Refinitiv vs. Others



This figure shows the average ESG ratings for existing firms over time, where existing firms are defined as firms that were covered by Refinitiv before its expansion to Russell 2000. Blue solid line shows firms' ESG ratings provided by Refinitiv whose coverage is expanded during the sample period. Red dash line and green dash-dot line show the same firms' ESG ratings provided by Sustainalytics and KLD, respectively, whose coverage did not change significantly over the same sample period.

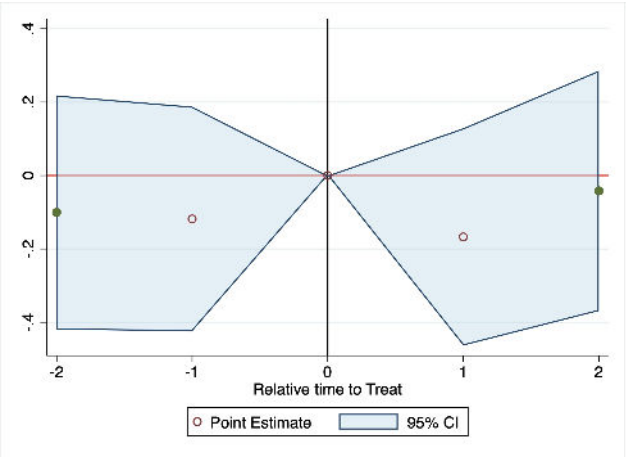
FIGURE 5
Existing Firms' ESG Ratings: Actual vs. Estimated Normal Ratings



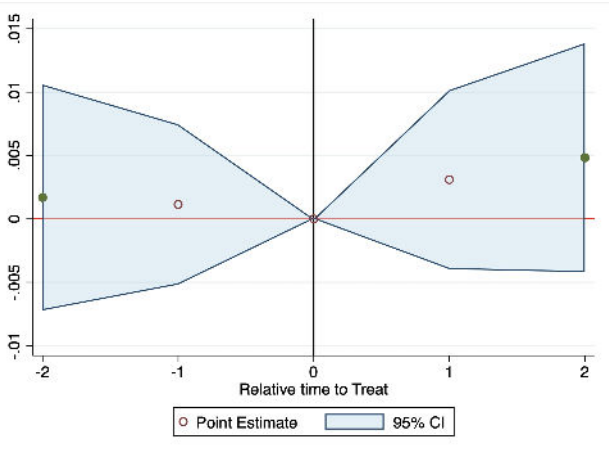
This figure shows the average of actual Refinitiv ratings and estimated normal ratings over time, where normal ratings are calculated as percentile ranks following the Refinitiv's scoring methodology but with the restricted sample of existing firms that are already being covered before the expansion in 2015-2017. Red solid line shows the average actual ratings, while blue dotted line shows the average normal ratings in each year. Grey shaded area shows the difference between actual ratings and estimated normal ratings, which reflects the mechanical changes in ratings caused by coverage expansion.

FIGURE 6
Event-study and TWFE DiD Estimate of the Effect of the Mechanical Rating Changes

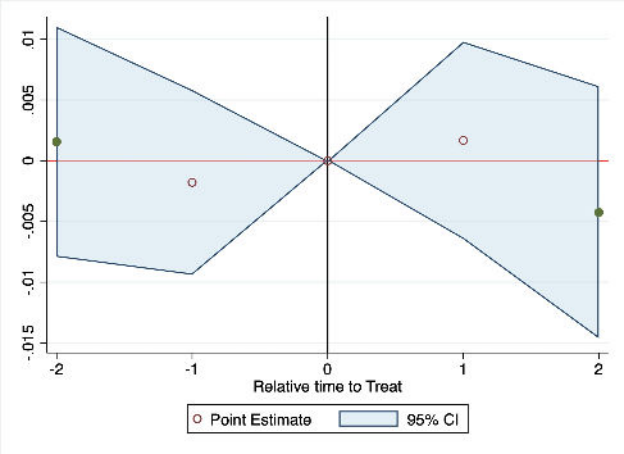
(a) Environmental Activities: Toxic Release



(b) Social Activities: Gender Diversity



(c) Governance-related Activities: Board Independence



This figure plots event-study estimates from a two-way fixed effects regression of the real effects of mechanical rating changes. The specification includes firm and year fixed effects. The 95% confidence interval is shaded around the coefficients. Standard errors are robust to clustering at the firm level.

TABLE 1
Existing Firms' ESG Ratings: Pre vs. Post

Panel A: Mean/median differences of *Refinitiv* ratings

	Pre		Post		Diff	
	(a) Mean	(b) Median	(c) Mean	(d) Median	(c)-(a)	(d)-(b)
Full sample	0.540	0.517	0.733	0.808	0.193***	0.187†††
Observations	1,926		1,729		3,655	

Panel B: Mean/median differences of *Refinitiv* ratings by decile rank

	Pre		Post		Diff	
	(a) Mean	(b) Median	(c) Mean	(d) Median	(c)-(a)	(d)-(b)
1 (lowest)	0.173	0.148	0.400	0.374	0.227***	0.205†††
2	0.262	0.217	0.550	0.554	0.288***	0.289†††
3	0.346	0.311	0.624	0.635	0.278***	0.293†††
4	0.423	0.366	0.670	0.674	0.248***	0.260†††
5	0.489	0.431	0.738	0.770	0.249***	0.267†††
6	0.589	0.564	0.788	0.806	0.199***	0.209†††
7	0.690	0.698	0.849	0.878	0.159***	0.151†††
8	0.779	0.787	0.890	0.910	0.111***	0.091†††
9	0.867	0.903	0.919	0.933	0.053***	0.028†††
10 (highest)	0.933	0.944	0.946	0.949	0.013***	0.005†††
Observations	1,926		1,729		3,655	

This table presents . Tests of differences in means and medians are a two-sample t-test assuming equal variances and the Mann-Whitney U test, respectively. ***, **, * († † †, ††, †) indicate significance at the 1%, 5%, and 10% levels, respectively, using a two-sample t-test with unequal variances. Variable definitions are available in Table A.1.

TABLE 2
Descriptive Statistics

Panel A: Summary statistics for the fund-firm-quarter sample

Variable	N	Mean	Median	SD	Q1	Q3
Prob. Holding	26,029,096	0.0072	0.0000	0.0845	0.0000	0.0000
Perc. Holding	26,029,096	0.0040	0.0000	0.0794	0.0000	0.0000
ESG Funds	26,029,096	0.0145	0.0000	0.1197	0.0000	0.0000
Passive Funds	16,767,144	0.1172	0.0000	0.3217	0.0000	0.0000

Panel B: Summary statistics for the firm-year sample

Variable	N	Mean	Median	SD	Q1	Q3
CumRet	3,460	0.2788	0.2133	0.4437	0.0440	0.4327
Size	3,460	8.4924	8.3760	1.5397	7.4243	9.4343
MarketCap	3,460	0.0135	0.0039	0.0399	0.0020	0.0101
Sales Growth	3,460	0.4716	0.0605	13.3017	0.0038	0.1397
Capex	3,460	0.0395	0.0261	0.0486	0.0099	0.0520
Cash	3,460	0.1482	0.0839	0.1696	0.0307	0.2004
Lev	3,460	0.2664	0.2455	0.2111	0.0977	0.3841
EBIT	3,460	0.0807	0.0747	0.1149	0.0328	0.1231
PP&E	3,460	0.2241	0.1290	0.2382	0.0413	0.3366
R&D	3,460	0.0262	0.0000	0.0629	0.0000	0.0226
Toxic Release	963	3.2732	3.6875	3.3414	1.5194	5.8245
GHG Emission	590	5.1777	5.1577	2.3322	3.4208	6.8517
Violation (Env)	3,460	0.0893	0.0000	0.2852	0.0000	0.0000
Violation (Labor)	3,460	0.2133	0.0000	0.4097	0.0000	0.0000
Penalty (Env)	3,460	0.9831	0.0000	3.1954	0.0000	0.0000
Penalty (Labor)	3,460	2.1726	0.0000	4.2122	0.0000	0.0000
#Negative News (Env)	1,966	2.5493	0.0000	5.8316	0.0000	2.0000
#Negative News (Soc)	2,153	3.5286	1.0000	8.4247	0.0000	3.0000
#Negative News (Gov)	2,285	3.3759	1.0000	8.1571	0.0000	3.0000
Racial Diversity	2,437	0.0984	0.0909	0.0986	0.0000	0.1538
Gender Diversity	3,460	0.1658	0.1670	0.1034	0.1000	0.2220
Board Independence	3,460	0.7674	0.7778	0.1219	0.7143	0.8571
CEO Duality	3,460	0.4327	0.0000	0.4955	0.0000	1.0000

This table presents descriptive statistics. Panel A presents descriptives for main dependent and independent variables, and Panel B presents descriptive statistics partitioned by the treatment. All continuous variables are winsorized at the 1% and 99% levels. Tests of differences in means and medians are a two-sample t-test assuming unequal variances and the Mann-Whitney U test, respectively. ***, **, * (†††, ††, †) indicate significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are available in Table A.1.

TABLE 3
Fund Flow

Panel A: ESG VS. Non-ESG Funds			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
Post × *ESG Fund*	0.368	1.687	−0.027
	(1.32)	(1.52)	(−0.09)
Treat × *Post* × *ESG Fund*	1.020***	3.444**	0.669*
	(2.67)	(2.14)	(1.86)
Fund X Firm FE	Yes	Yes	Yes
Firm X YearQtr FE	Yes	Yes	Yes
Observations	50,580,080	4,501,408	29,317,748
Adj. R^2	0.785	0.855	0.742
Panel B: ESG Funds			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
Treat × *Post*	0.790**	3.132*	0.327
	(2.04)	(1.94)	(0.88)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	721,324	143,388	364,748
Adj. R^2	0.784	0.763	0.792
Panel C: Non-ESG Funds			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
Treat × *Post*	−0.091**	−0.244	−0.120**
	(−2.09)	(−0.73)	(−2.16)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	49,858,764	4,358,156	28,954,384
Adj. R^2	0.784	0.855	0.740

This table presents estimates of the relation between mechanical rating increases and fund flow. Specifically, in Panel A, we present the results of estimating Eq.2. We estimate Eq.2 separately for ESG funds and non-ESG funds, and present the results in Panels B and C, respectively. The constant are included in each regression, but are not reported. All variables are defined in Table A.1. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed tests. Reported z-statistics (in parentheses) are based on a clustering of standard errors at the firm level.

TABLE 4
Fund Flow: Extensive vs. Intensive Margin

Panel A: Extensive Margin			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
Treat × *Post*	0.539***	1.259**	0.705***
	(3.99)	(2.41)	(3.60)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	673,644	119,872	340,584
Adj. R^2	0.283	0.305	0.273

Panel B: Intensive Margin			
Dependent Variable	Perc. Holding		
	(1) All	(2) Passive	(3) Active
Treat × *Post*	0.002	−0.002	−0.015
	(0.08)	(−0.13)	(−0.52)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	47,680	23,516	24,164
Adj. R^2	0.811	0.910	0.750

This table presents estimates of the relation between mechanical rating increases and fund flow using sample of ESG funds. Specifically, in Panels A and B, we present the results of intensive and extensive margin tests, respectively. The constant are included in each regression, but are not reported. All variables are defined in Table A.1. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed tests. Reported z-statistics (in parentheses) are based on a clustering of standard errors at the firm level.

TABLE 5
Real Effects on Firms

Panel A: Environmental activities

	(1) Toxic Release	(2) GHG Emission	(3) Prob. Violation	(4) $ Violation	(5) # Neg News
Treat × *Post*	−0.059	−0.060	−0.008	−0.158	0.017
	(−0.28)	(−0.42)	(−0.51)	(−0.86)	(0.09)
MDES	±0.601	±0.405	±0.046	±0.517	±0.512
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Reg Model	OLS	OLS	OLS	OLS	Poisson
Observations	937	569	3,379	3,379	1,408
Adj./Pseudo R^2	0.923	0.964	0.416	0.427	0.677

Panel B: Social activities

	(1) Racial Diversity	(2) Gender Diversity	(3) Prob. Violation	(4) $ Violation	(5) # Neg News
Treat × *Post*	0.006	0.002	−0.026	−0.250	−0.087
	(1.26)	(0.41)	(−1.12)	(−1.08)	(−0.58)
MDES	±0.014	±0.014	±0.065	±0.651	±0.423
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Reg Model	OLS	OLS	OLS	OLS	Poisson
Observations	2,364	3,379	3,379	3,379	1,872
Adj./Pseudo R^2	0.848	0.793	0.450	0.479	0.729

Table 5, continued

Panel C: Governance-related activities					
	(1) Board Independence	(2) CEO Duality	(3) Poison Pill	(4) E Index	(5) # Neg News
Treat × *Post*	0.002	−0.040	−0.012	−0.073	0.003
	(0.31)	(−1.33)	(−0.82)	(−1.53)	(0.02)
MDES	±0.015	±0.086	±0.043	±0.134	±0.521
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Reg Model	OLS	OLS	OLS	OLS	Poisson
Observations	3,379	3,379	2,374	2,374	1,962
Adj./Pseudo R^2	0.832	0.674	0.876	0.806	0.718

This table presents estimates of the relation between mechanical rating increases and firms' real ESG activities. In all models, the independent variable, *Treat* × *Post*, is an indicator for firms experienced mechanical rating increases. In Panel A, the dependent variable is the amount of toxic release (column 1), GHG emissions (column 2), the incidence and monetary penalty of environmental violations (column 3-4), and the number of negative environmental incidents (column 5), respectively. Similarly, in Panel B, the dependent variable is board-level racial and gender diversity (column 1-2), the incidence and monetary penalty of social violations (column 3-4), and the number of negative social incidents (column 5), respectively. Finally, in Panel C, the dependent variable is board independence (column 1), the presence of dual CEO (column 2), the presence of Poison Pill provision (column 3), the Entrenchment index (column 4), and the number of negative governance-related incidents (column 5), respectively. Firm fixed effects, year fixed effects, and the constant are included in each regression, but are not reported. All variables are defined in Table A.1. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed tests. Reported z-statistics (in parentheses) are based on a clustering of standard errors at the firm level.

TABLE 6
Voting on Shareholder Proposals

	(1) # ES Items	(2) # E Items	(3) # S Items	(4) # ES Items by ESG Funds	(5) # ES Items Passed	(6) % ES Items Passed	(7) # ES Items Withdrawn	(8) % ES Items Withdrawn
Treat × *Post*	0.021	0.013	0.006	−0.008	0.006	0.000	−0.052**	0.002
	(0.91)	(0.62)	(0.44)	(−0.31)	(1.42)	(1.17)	(−2.10)	(0.04)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,253	3,253	3,253	2,062	3,253	3,244	2,062	689
Adj. R^2	0.418	0.358	0.325	0.258	0.081	0.067	0.154	0.244

This table presents estimates of the relation between mechanical rating increases and voting on shareholder proposals. In all models, the independent variable, *Treat* × *Post*, is an indicator for firms experienced mechanical rating increases. In columns 1 to 3, the dependent variable is the number of shareholder proposals related to environmental and social issues (ES), environmental issues (E), and social issues (S), respectively. In column 4, the dependent variable is the number of ES items proposed by SRI funds. In columns 5 and 6, the dependent variable is the number and fraction of ES proposals that pass, respectively. In columns 7 and 8, the dependent variable is the number and fraction of ES proposals withdrawn, respectively. Firm fixed effects, year fixed effects, and the constant are included in each regression, but are not reported. All variables are defined in Table A.1. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed tests. Reported z-statistics (in parentheses) are based on a clustering of standard errors at the firm level.

APPENDIX

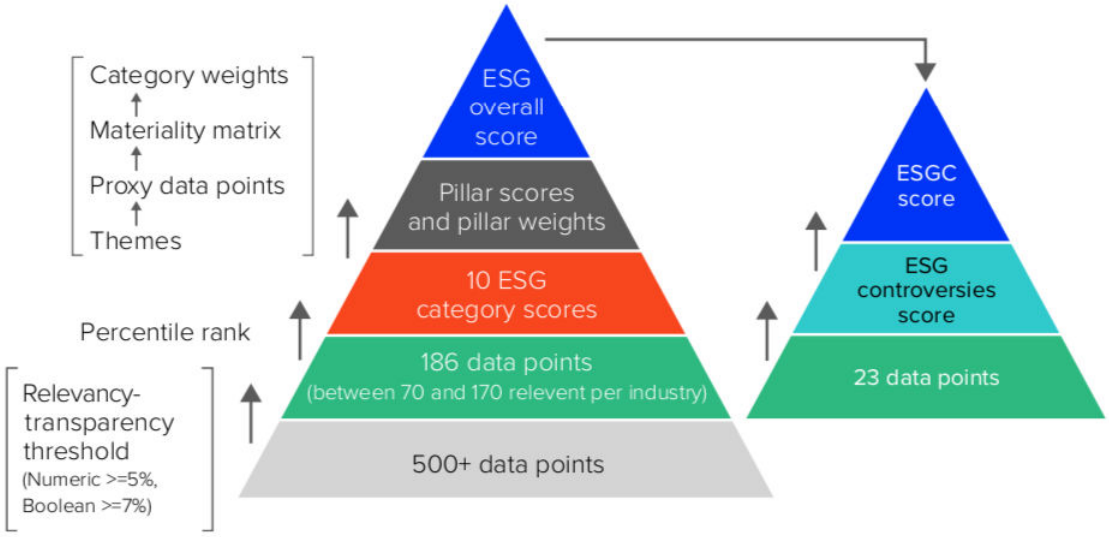
TABLE A.1
Variable Definitions and Data Sources

Variable	Definition	Source
Dependent variables		
Prob. Holding	The probability of mutual funds' shareholdings of security *i* in year-quarter *t*.	CRSP
Perc. Holding	Mutual funds' percentage holdings of security *i* in year-quarter *t*.	CRSP
Toxic Release	Natural logarithm of sum of total on-site and off-site releases for firm *i* in year *t*, scaled by cost of goods sold.	U.S. EPA
GHG Emission	Natural logarithm of total GHG emissions for firm *i* in year *t*, scaled by cost of goods sold.	U.S. EPA
Racial Diversity	The ratio of the number of non-caucasian directors on the board for firm *i* in year *t*.	ISS
Gender Diversity	The ratio of women directors on the board for firm *i* in year *t*.	BoardEx
Board Independence	The ratio of independent directors on the board for firm *i* in year *t*.	BoardEx
CEO Duality	Indicator variable equals one if the firm's CEO is the chairman of the board of directors in year *t*, and zero otherwise.	BoardEx
Poison Pill	Indicator variable equals one if the firm *i* has a poison pill provision in place in year *t*, and zero otherwise.	ISS
E Index	The entrenchment index of Bebchuk et al. (2009).	ISS
Prob. Violation	Indicator variable equals one if the firm *i* has any environmental or labor-related federal violation in year *t*.	Violation Tracker
$ Violation	Natural logarithm of one plus environmental or labor-related penalty amount for firm *i* in year *t*, where the penalty amount equals to zero if there were no violation.	Violation Tracker
# Neg News	Number of negative ESG-related news for the recent 12 months as of the fiscal year-end for firm *i* in year *t*.	RepRisk
# ES Items	The number of shareholder proposals related to environmental and social issues.	ISS
# E Items	The number of shareholder proposals related to environmental issues.	ISS
# S Items	The number of shareholder proposals related to social issues.	ISS
# ES Items by ESG Funds	The number of E&S items proposed by SRI funds.	ISS
# (%) ES Items Passed	The number (fraction) of E&S proposals that pass the shareholders vote.	ISS
# (%) ES Items Withdrawn	The number (fraction) of E&S proposals that are withdrawn before the shareholders vote.	ISS

Table A.1, continued

Variable	Definition	Source
Control variables		
Stock Return	Firm *i*'s annual buy-and-hold return over an year as of the end of year *t*.	CRSP
Size	Natural logarithm of the total assets for firm *i* as of the end of year *t*.	Compustat
Sales Growth	Firm *i*'s total sales at the end of year *t* divided by total sales at the end of the previous year, minus one.	Compustat
Capex	Firm *i*'s capital expenditure in year *t* divided by total assets.	Compustat
Cash	Firm *i*'s cash plus short-term investments in year *t* divided by total assets.	Compustat
Debt	Firm *i*'s total debt in current liabilities plus total long-term debt in year *t* divided by total assets.	Compustat
EBIT	Firm *i*'s earnings before interest and taxes in year *t* divided by total assets.	Compustat
PP&E	Firm *i*'s property, plant and equipment in year *t* divided by total assets.	Compustat
R&D	Firm *i*'s research and development expenditures in year *t* divided by total assets, where missing values of R&D expenditure are replaced with zero.	Compustat

FIGURE A.1
Refinitiv's Scores Structure



This figure shows the scores calculation methodology of Refinitiv, which can be summarised and illustrated by means of a five-step process flow. The figure is from https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf.

TABLE A.2
Fund Flow

Panel A: ESG VS. Non-ESG Funds			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
Post × *ESG Fund*	0.525*	2.091*	0.102
	(1.66)	(1.66)	(0.30)
High Abn Rating × *Post* × *ESG Fund*	0.482**	1.802**	0.280
	(2.33)	(2.03)	(1.50)
Fund X Firm FE	Yes	Yes	Yes
Firm X YearQtr FE	Yes	Yes	Yes
Observations	50,580,080	4,501,408	29,317,748
Adj. R^2	0.785	0.855	0.742
Panel B: ESG Funds			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
High Abn Rating × *Post*	0.371*	1.544*	0.121
	(1.75)	(1.71)	(0.62)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	721,324	143,388	364,748
Adj. R^2	0.784	0.763	0.792
Panel C: Non-ESG Funds			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
High Abn Rating × *Post*	−0.054**	−0.204	−0.062**
	(−2.35)	(−1.16)	(−2.11)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	49,858,764	4,358,156	28,954,384
Adj. R^2	0.784	0.855	0.740

This table presents estimates of the relation between . Firm-Year fixed effects, Fund-Year fixed effects, and the constant are included in each regression, but are not reported. All variables are defined in Table A.1. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed tests. Reported z-statistics (in parentheses) are based on a clustering of standard errors at the firm level.

TABLE A.3
Fund Flow: Extensive vs. Intensive Margin

Panel A: Extensive Margin			
Dependent Variable	Prob. Holding		
	(1) All	(2) Passive	(3) Active
High Abn Rating × *Post*	0.301***	0.691**	0.396***
	(4.22)	(2.51)	(3.92)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	673,644	119,872	340,584
Adj. R^2	0.283	0.305	0.273

Panel B: Intensive Margin			
Dependent Variable	Perc. Holding		
	(1) All	(2) Passive	(3) Active
High Abn Rating × *Post*	−0.004	0.001	−0.019
	(−0.40)	(0.13)	(−1.22)
Fund X Firm FE	Yes	Yes	Yes
YearQtr FE	Yes	Yes	Yes
Observations	47,680	23,516	24,164
Adj. R^2	0.811	0.910	0.750

This table presents estimates of the relation between . Firm-Year fixed effects, Fund-Year fixed effects, and the constant are included in each regression, but are not reported. All variables are defined in Table A.1. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed tests. Reported z-statistics (in parentheses) are based on a clustering of standard errors at the firm level.