

# Do Mutual Funds Respond to Mechanical Changes in ESG Ratings?

Finance Working Paper N° 981/2024

January 2026

Seungju Choi  
University of Hong Kong

Fabrizio Ferri  
University of Miami and ECGI

Daniele Macciocchi  
University of Miami

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## Abstract

Using a quasi-experimental setting, we study whether mutual fund investors respond to a purely mechanical change in ESG ratings—i.e., a change independent of concurrent changes in firms' actual ESG activities. We find that when a firm experiences a mechanical increase in ESG ratings, the probability of being selected by an ESG fund increases (extensive margin). In contrast, if the firm is already in the fund's portfolio, its holdings do not change (intensive margin), consistent with portfolio weighting being based on market capitalization. The selection effect is observable not only among funds that follow an ESG index but also among active ESG funds, which presumably should have the resources and ability to identify and filter out the mechanical increase in ESG ratings. Among active ESG funds, the selection effect is stronger for funds with less assets under management, larger portfolios of firms, and lower expense ratios, consistent with the notion that resource constraints may impede a fund's screening ability. Our findings imply that passive investing based on commercial ESG ratings—whether due to resource constraints or portfolio indexing—might result in portfolio allocations that do not reflect the actual ESG activities of firms.

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Keywords: ESG, Ratings, Information Intermediaries, Mutual Funds, Portfolio Selection

Seungju Choi

Assistant Professor of Accounting  
University of Hong Kong  
4/F, K.K. Leung Building  
Pok Fu Lam Rd, Pok Fu Lam, Hong Kong  
e-mail: seungju@hku.hk

Fabrizio Ferri

Professor  
University of Miami  
5251 University Drive  
Coral Gables FL 33146, USA  
phone: +1 (305) 284-5552  
e-mail: fxf221@miami.edu

Daniele Macciocchi\*

Associate Professor  
University of Miami  
5250 University Drive  
Coral Gables, Florida 33146, United States  
phone: +1 (312) 927-2624  
e-mail: dxm1442@miami.edu

\*Corresponding Author

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Seungju Choi

*University of Hong Kong*

[seungju@hku.hk](mailto:seungju@hku.hk)

Fabrizio Ferri

*University of Miami*

[fferri@miami.edu](mailto:fferri@miami.edu)

Daniele Macciocchi\*

*University of Miami*

[dmacciocchi@miami.edu](mailto:dmacciocchi@miami.edu)

## Abstract

Using a quasi-experimental setting, we study whether mutual fund investors respond to a purely mechanical change in ESG ratings—i.e., a change independent of concurrent changes in firms' actual ESG activities. We find that when a firm experiences a mechanical increase in ESG ratings, the probability of being selected by an ESG fund increases (extensive margin). In contrast, if the firm is already in the fund's portfolio, its holdings do not change (intensive margin), consistent with portfolio weighting being based on market capitalization. The selection effect is observable not only among funds that follow an ESG index but also among active ESG funds, which presumably should have the resources and ability to identify and filter out the mechanical increase in ESG ratings. Among active ESG funds, the selection effect is stronger for funds with less assets under management, larger portfolios of firms, and lower expense ratios, consistent with the notion that resource constraints may impede a fund's screening ability. Our findings imply that passive investing based on commercial ESG ratings—whether due to resource constraints or portfolio indexing—might result in portfolio allocations that do not reflect the actual ESG activities of firms.

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\*Corresponding author: Daniele Macciocchi, University of Miami Herbert Business School, 5250 University Dr, Coral Gables, FL 33146. We appreciate helpful comments from Sonakshi Agrawal (discussant), Khrystyna Bochkay, Thomas Bourveau, David Eisel (discussant), Davidson Heath, Anthony Joffre, Dan Li, Reeyarn Li (discussant), Mark Maffett, Jim Naughton, Zeyu Ou, Suhas Sridharan, and Philip Wang, along with workshop and conference participants at the 2023 Florida Accounting Symposium, 2024 AAA Annual Meeting, 2025 Financial Accounting and Reporting Section Midyear Meeting, and the University of Miami.

## 1. INTRODUCTION

Over the period from 2014 to 2020, sustainable investing experienced a dramatic rise, with over \$39 trillion in assets under management (AUM) held in 2020 by mutual funds claiming to integrate environmental, social, and governance (ESG) factors into their portfolio selection (Taylor and Collins, 2022). This trend increased the demand for information about firms' ESG activities, and, when coupled with the growing volume and heterogeneity of ESG data, led to the emergence of commercial ESG ratings as a cost-effective way for investors to synthesize complex, multi-dimensional ESG information. Indeed, survey evidence indicates that a significant majority of institutional investors use ESG ratings in their investment decisions.<sup>1</sup> While more recent developments—including net outflows from ESG funds in some markets—suggest a shift in sentiment, they further underscore the importance of critically assessing the tools and measures used in ESG investing. In this regard, concerns have grown regarding the ESG ratings' ability to reflect firms' actual ESG performance, with recent studies highlighting substantial divergence across providers, problematic methodologies, reliance on voluntary and subjective firms' disclosures, as well as potential biases and conflicts of interest (Berg, Fabisik, and Sautner, 2020; Berg, Koelbel, and Rigobon, 2022; Chatterji, Durand, Levine, and Touboul, 2016; Christensen, Serafeim, and Sikochi, 2022). These concerns raise the fundamental question of whether investors end up relying on such ratings even when they fail to capture firms' actual ESG performance, a concern echoed by regulators around the globe.<sup>2</sup>

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<sup>1</sup> A 2021 survey conducted by Deutsche Bank reports that approximately 70% of institutional investors rely on ESG ratings as either a major or minor factor in their investment decisions (see p.19 [here](#)), with another survey reporting that 88% (92%) of investment professionals use (expect to use) third-party ESG ratings as a part of their investment process (Larcker, Pomorski, Tayan, Watts, 2022).

<sup>2</sup> In August 2024, the UK government announced that it will introduce legislation aimed at regulating ESG ratings providers. In November 2024, the European Union adopted new rules to regulate ESG ratings providers, aimed at improving the transparency, reliability, and comparability of ESG ratings and boosting investor confidence in sustainable financial products. In the United States, the Securities and Exchange Commission (SEC) has expressed

To address this question, one needs to identify variation in ESG ratings that is orthogonal to the variation in the underlying ESG activities of a firm. This is a major empirical challenge since ESG ratings aim to capture (albeit imperfectly) such ESG activities. Consider, for example, a panel regression of investors' holdings on a firm's ESG ratings and observable proxies for ESG activities. A positive coefficient on ESG ratings would not allow us to infer that investors respond to changes in ESG ratings above and beyond the underlying changes in the ESG activities since the variation in both holdings and ESG ratings may reflect variation in ESG activities not observed, or imperfectly measured, by the researcher.<sup>3</sup>

To tackle this issue, we exploit a quasi-experimental setting that allows us to isolate a change in ESG ratings independent of concurrent changes in a firm's ESG activities. In 2015, Refinitiv (a major provider of commercial ESG ratings) began expanding its coverage of U.S. firms from Russell 1000 to Russell 3000. Under Refinitiv's methodology, firms receive an ESG rating based on their percentile rank within a group of peers (relative performance evaluation). By adding smaller firms from the Russell 2000, which typically invest less in ESG activities due to fewer resources (Thorne, Mahoney, and Manetti, 2014), the coverage expansion increased the number of peer firms with lower ESG performance, thus improving the relative position (ranking) of the firms already covered. Indeed, we observe that the Refinitiv ratings of Russell 1000 firms (which were fairly stable in the preceding years) exhibited a sharp increase around the 2015 coverage expansion, improving on average by 16.5 percentage points (from 0.537 to 0.703, on a scale from 0 to 1).

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concerns that mutual funds relying on ESG ratings provided by third-party agencies do not perform adequate due diligence to ensure these ratings conform with the funds' claims with respect to their ESG products ([link](#)).

<sup>3</sup> Even if all those activities were observable and perfectly measured, a time-series correlation between holdings and ESG ratings could arise if ESG funds and ratings agencies independently chose to change the weight assigned to those activities (e.g., because of perceived changes in their importance), and did so in similar manner.

Consistent with the notion that this increase was purely mechanical (i.e., independent of concurrent changes in a firm’s ESG activities), we document that Russell 1000 firms did not experience a corresponding increase in the ratings issued by other providers (Sustainalytics and KLD). Further, we replicate Refinitiv’s rating methodology and show that Russell 1000 firms would not have experienced a change in their Refinitiv ratings absent the 2015 coverage expansion. Finally, we document that the underlying ESG activities (e.g., carbon emissions, labor violations) of firms experiencing a mechanical increase in Refinitiv ratings did not change around the 2015 coverage expansion. Taken together, these tests suggest that we can use the 2015 Refinitiv coverage expansion as a plausibly exogenous increase in ESG ratings.

We exploit this setting to examine how ESG mutual funds respond to a mechanical increase in ESG ratings. A finding that, on average, ESG mutual funds increase their holdings of firms experiencing a mechanical increase in ESG ratings would suggest that funds follow ESG ratings to avoid costly, in-depth research on ESG activities—regardless of how well the ESG ratings capture such activities. In contrast, a finding that funds do not respond to a mechanical increase in firms’ ESG ratings would suggest that, while funds use ESG ratings as a cost-effective proxy for actual ESG activities, they recognize their limitations and are able to filter out purely mechanical changes unrelated to ESG activities.<sup>4</sup>

We focus on mutual funds (as opposed to other types of institutional investors) because the data allow us to better identify whether the fund has an ESG focus and its investment strategy (e.g., active vs. passive). In particular, we use a difference-in-differences design comparing ESG mutual funds’ holdings around the 2015 Refinitiv coverage expansion. The treatment group includes

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<sup>4</sup> A finding that funds do not respond to a mechanical increase in ESG ratings could be also consistent with the notion that funds do not use ESG ratings to start with. However, the survey evidence reported in footnote 1 suggests widespread use of ESG ratings by institutional investors.

already-covered firms that experience a mechanical increase in their 2015 ESG ratings, defined as an increase greater than the estimated increase absent the coverage expansion. The control group includes firms added to the coverage in 2015.<sup>5</sup> To enhance comparability between treatment and control groups and ensure that the results are not affected by control firms receiving their first-ever ESG rating (Darendeli, Fiechter, Hitz, and Lehmann, 2022), we require control firms to have ESG ratings from another provider prior to 2015 and include such ratings as covariates. Finally, the high dimensionality of our data—whereby we have funds that invest in treated and control firms at the same time and firms that are invested by multiple funds, allows us to sweep out funds’ time-varying traits (e.g., portfolio preferences) by including fund-by-quarter fixed effects while holding constant time-invariant firms’ characteristics by including firm fixed effects.

We find that ESG funds increase their holdings of treated firms by 15% relative to the pre-period sample mean. When we examine whether our results are driven by the intensive or extensive margins, we observe that the probability of being selected by an ESG fund is 1.5 percentage points higher for treatment firms relative to control firms (extensive margin). In contrast, we do not find that ESG funds increase their holdings of treated stocks already in their portfolio (the effect at the intensive margin is both statistically and economically insignificant). These findings suggest that the mechanical rating increase does help firms enter ESG funds’ portfolios but does not lead them to receive greater weights when they are already in the fund’s portfolio. In other words, ESG funds use ESG ratings mostly in the selection process rather than the portfolio weighting process, consistent with the notion that portfolio weighting is usually based on firms’ market capitalization.

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<sup>5</sup> The Refinitiv coverage expansion from Russell 1000 to Russell 3000 firms began in 2015 but occurred gradually between 2015 and 2017, with the largest additions taking place in 2015 and 2016. Since the expansion criteria resulted in larger firms being added first (see Section 3.1), we focus on the 2015 expansion, as firms added that year are more comparable in size to those already covered by Refinitiv (i.e., Russell 1000 firms, part of our treatment group). As a robustness test, we also use the 2016 and 2017 additions in a stacked cohort difference-in-differences design (Section 3.5).

Next, to investigate the mechanism underlying our selection result, we examine whether the effect of a mechanical increase in ESG ratings on the probability that a firm is selected into the fund's portfolio differs between ESG index funds and active ESG funds. ESG index funds have substantially no ability to select firms since they outsource their portfolio composition to third-party agencies like Refinitiv (Agrawal, Liu, Rajgopal, Sridharan, Yan, and Yohn, 2023). Hence, we conjecture that the mechanical rating increase likely pushed some treated firms into ESG indexes constructed by those same agencies, and thus into the portfolios of ESG index funds. In contrast, active ESG funds (i.e., funds that actively manage their portfolios) should have the economic resources and ability to conduct their due diligence and select the stocks to add to their portfolios. Thus, they should be able to filter out the mechanical increase in ESG ratings. Interestingly, and perhaps surprisingly, we find that both ESG index funds and active ESG funds are more likely to select a firm experiencing a mechanical increase in ESG ratings.

To better understand the result for active ESG funds, we next examine whether funds' economic resources to conduct their due diligence and selection of portfolio firms explain why some of these funds select firms experiencing a mechanical increase in ESG ratings. We conduct three tests that aim to capture different aspects of a fund's resources and ability to be active managers of their portfolios. Consistent with prior studies, we measure funds' resources using their AUM (Iliev and Lowry, 2015), their expense ratio (Bebchuk, Cohen, and Hirst, 2017), and the number of firms in their portfolios (Hu, Malenko, and Zytlick, 2024). Larger funds and funds with higher expense ratios have more resources to invest in portfolio selection and, in turn, should rely less on ESG ratings (or be better able to filter out a mechanical increase in ESG ratings if they rely on such ratings). Similarly, holding a fund's resources constant, a fund with investments in fewer

firms (smaller portfolio) is more likely to pay close attention to those firms' ESG activities, as it can allocate resources over a smaller number of firms.

Consistent with our predictions, we find that active ESG funds with fewer resources are significantly more likely to add to their portfolio firms with a mechanical increase in ESG ratings. For example, when we partition our sample of active ESG funds based on the median values of the three proxies discussed earlier, we find that the likelihood of selecting treated firms (relative to control firms) is 2.5 times higher among active ESG funds with less AUM, 6 times higher among active ESG funds with lower expense ratios, and 10 times higher among active ESG funds with a larger number of firms in their portfolio.

Taken together, our analyses show that passive ESG funds (those with an index-based investing strategy) and active ESG funds that are more “passive” in their selection strategy (due to resource constraints) are more likely to add to their portfolio firms that experience an increase in ESG ratings independent of concurrent changes in the firm's ESG activities. That is, “passive” investing (whether due to resource constraints or portfolio indexing) combined with reliance on commercial ESG ratings might lead to portfolio allocations that do not reflect firms' actual ESG activities, thus providing investors with a product that may not truly reflect the fund's stated objective—consistent with concerns expressed by the SEC (SEC, 2021). While our analyses are based on a 2015 event (Refinitiv coverage expansion), additional tests (detailed in Section 3.5) suggest that mutual funds' reliance on ESG ratings likely extends to more recent periods, making our findings even more salient.

It should also be noted that the magnitude of the effects we document may represent a lower bound of the potential distortion in portfolio allocations for two reasons. First, we are examining a change in ratings that should be easy to filter out as it is clearly unrelated to any

change in ESG activities (or their mapping into ESG ratings). More “subtle” changes in ESG ratings equally unrelated to ESG activities (e.g., due to rating agencies’ lack of sophistication, biases, or conflicts of interest) are likely to be harder for mutual funds to identify and filter out. Second, the change in ratings we examine only involves one rating agency. Thus, we are only capturing the effect on the subset of ESG funds using that rating. Any mechanical change in ESG ratings concurrently taking place at multiple rating agencies (especially if in the same direction) would result in a stronger effect.

Our paper provides three contributions to the literature. First, our findings speak to the recent literature that investigates investors’ use of ESG ratings (e.g., Hartzmark and Sussman, 2019; Gibson, Glossner, Krueger, Matos, and Steffen, 2022; Kim and Yoon, 2023; Raghunandan and Rajgopal, 2022; Heath, Macciocchi, Michaely, and Ringgenberg, 2023). As noted earlier, because of the intrinsic correlation between ESG ratings and ESG activities, those studies cannot disentangle whether funds use ESG ratings or actual ESG activities when selecting their portfolio firms. Because in our setting the variation in ESG ratings is independent of the underlying ESG activities of a firm, we can overcome this empirical challenge and shed new light on the funds’ selection process. In this respect, our evidence indicates that both ESG index funds and the most “passive” active ESG funds end up adding to their portfolios firms that experience an increase in ESG ratings unrelated to their ESG performance. In doing so, we complement Fabisik, Schäfer, and Steffen (2023), who examine the effect of a methodology-driven change in firms’ ESG ratings on the cost of debt of U.S. firms. We also extend related literature on the real effects of changes in ratings orthogonal to changes in firm fundamentals (e.g., Basu, Chen, and Naughton, 2022, examining the effect of corporate credit changes on firms’ voluntary disclosures).

Second, our findings add to a body of research raising concerns about the quality of commercial ESG ratings. These studies highlight large disagreements in ratings across providers and identify potential conflicts of interest (e.g., Agrawal et al., 2023; Berg et al., 2020; 2022; Chatterji et al., 2016; Li, Lou, and Zhang, 2024; Serafeim and Yoon, 2023; Tang, Yan, and Yao, 2022). We contribute to this research by showing that a particular methodology choice (relative performance evaluation) combined with coverage expansion can cause changes in ESG ratings unrelated to the firms' ESG activities, which in turn leads to ESG funds' portfolio allocations that do not reflect those activities.

Finally, our paper provides a methodological contribution by developing a novel use of the 2015 Refinitiv coverage expansion. While Darendeli et al. (2022) exploit this setting to examine the consequences for *newly covered* firms receiving their first-time rating from Refinitiv, we use it to examine a plausibly exogenous (mechanical) change in ESG ratings for *already covered* firms. This approach can be used in future studies that require exogenous variation in ESG ratings.

## **2. BACKGROUND: THE 2015 REFINITIV COVERAGE EXPANSION**

### **2.1. Refinitiv ESG Rating Methodology**

Thomson Reuters Refinitiv is an ESG rating provider offering one of the most comprehensive ESG databases. Its data are used by major asset managers, and its ratings ("ESG scores") have been used in over 1,500 academic articles (Berg et al., 2020).

Refinitiv's rating methodology is an industry-based relative performance evaluation, aggregating specific ESG data points into a summary ESG score through five steps. First, from a pool of over 500 ESG data points, Refinitiv selects 186 data points considered the most comparable and material within each industry. Second, for each data point, the firm is assigned a percentile score within its industry based on the following formula:

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

In essence, the score indicates the firm's percentile rank within its industry.<sup>6</sup> Third, the 186 data points are grouped into 10 categories, and the sum of the firm's scores for all the data points within each category is computed. Then, the percentile scores formula above is applied again to derive the firm's percentile score in each category. Fourth, the 10 categories are grouped into three "pillars" – Environmental, Social, and Governance – and the score of each pillar is computed as the category-weighted average of the scores of the categories within each pillar. Finally, the overall ESG score is computed as the category-weighted average of the scores of the three pillars. In the last two steps, the category weights are determined by Refinitiv based on the relative importance (materiality) of each category in each industry. Fig. 1 details the methodology.

## 2.2. The 2015 Coverage Expansion

Refinitiv gradually expanded its global coverage over time (see Fig. 2). In the United States, initially it covered S&P 500 firms, then Russell 1000 firms, and starting in 2015 it began expanding to all Russell 3000 firms. The 2015 expansion represents Refinitiv's largest expansion to date, but it took place gradually between 2015 and 2017, with the largest additions occurring in 2015 and 2016 (see Fig. 3). The addition of the Russell 2000 index resulted in a massive influx of smaller companies into the coverage. As evident from Equation (1), depending on their ESG characteristics, newly added firms may affect the relative rank of already covered firms. In particular, since smaller firms tend to exhibit poorer ESG performance due to a lack of resources and/or lower public scrutiny (e.g., Cormier and Magnan 2003; and Thorne et al., 2014),<sup>7</sup> it is likely that their inclusion mechanically increased the percentile rankings (and thus the overall ESG score)

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<sup>6</sup> In Eq. (1) "# firms with the same value" includes the focal firm itself.

<sup>7</sup> In our sample, firms with above-median total assets have a mean ESG score of 0.602, versus a mean ESG score of 0.405 for firms with below-median total assets.

of already covered firms, above and beyond the effect of any actual concurrent improvement in their underlying ESG performance.

Table 1, Panel A, compares the mean ESG score before and after the expansion for firms already covered prior to 2015. Specifically, we report mean the ESG scores in 2012-2014 (before the expansion started) and in 2015-2017 (during the gradual expansion). Consistent with the above arguments, Panel A shows that the mean ESG score of firms already covered prior to 2015 increased by 16.5 percentage points (from 0.537 to 0.703) following the coverage expansion. The increase is generally monotonic in the firm's pre-expansion relative position (Panel B). Intuitively, the effect is smaller in firms with higher pre-expansion ESG scores, as these firms do not have much "room" to further increase their score, while it is higher for firms with lower pre-expansion ESG scores, which will benefit the most from the addition of firms with worse ESG performance. For example, ESG scores increased by only 1.0 percentage points for firms in the top decile of pre-expansion scores (decile 10) versus 18.4 percentage points for firms in the bottom decile (decile 1). Notably, the effect is strongest among firms in deciles 2 and 3 (at about 25 percentage points) rather than firms in decile 1. This is because the bottom decile is more likely to include firms with worse ESG performance than some of the newly added firms. Thus, their ESG score did not benefit from the coverage expansion. Finally, Table 1, Panel C, shows that the distribution of changes in ESG scores is fairly uniform across industries, except for Industrial Conglomerates, Food and Beverage, and Collective Investments, which exhibit no significant change.

### **2.3. Does the 2015 coverage expansion lead to a change in ESG scores orthogonal to the firm's underlying ESG activity?**

The large increase in ESG scores documented in Table 1 is suggestive of a "mechanical" effect of the coverage expansion, resulting from the relative performance evaluation used by

Refinitiv rather than any change in the firm’s underlying ESG activity. We provide three pieces of evidence directly supporting this interpretation.

First, for the firms covered by Refinitiv prior to 2015, we plot the ESG ratings assigned by three major ratings providers—Refinitiv, Sustainalytics, and KLD—before and after the expansion. Specifically, we examine three years prior to the expansion (2012–2014) and the three years during the gradual expansion (2015–2017). Consistent with Table 1, the solid line in Fig. 4 shows a sharp increase in the Refinitiv ratings starting in 2015 and continuing during the subsequent expansion years (2016 and 2017). In contrast, the ratings of Sustainalytics and KLD—whose coverage did not change during the same period—remain stable. To the extent that any improvements in the firm’s ESG activity are captured by the other two ratings providers (albeit imperfectly), the stark deviation of the Refinitiv ratings from those of the other two providers suggests that the post-expansion increase in Refinitiv ESG ratings is independent of concurrent changes in ESG activity.<sup>8</sup>

Second, we replicate Refinitiv’s methodology (which did not change around the coverage expansion) and estimate what their post-expansion ESG scores would have been absent the coverage expansion. Specifically, we remove all firms added to the coverage since 2015 and recalculate the percentile score in Eq. (1) using only the firms already covered prior to 2015 (see an example in Table A1 in Section I of the Online Appendix). Note that we apply Eq. (1) to Refinitiv’s summary ESG scores rather than the individual data points since we do not have access to the underlying values for all the data points. Thus, our estimation is subject to measurement error. However, Fig. 5 shows that in the pre-expansion period, the difference between actual ESG scores and the estimated ESG scores absent the effect of the coverage expansion is negligible, suggesting

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<sup>8</sup> We acknowledge that different rating agencies may have different objectives, leading to *cross-sectional* differences among their ESG ratings, which therefore are not directly comparable (Berg et al., 2022). However, our dynamic analysis in Fig. 4 only relies on the *time-series* changes in ESG ratings within each provider and suggests an abnormal spike around the 2015 coverage expansion only for Refinitiv’s ESG ratings.

that our replication of Refinitiv’s scoring process is reasonably accurate. Importantly, in the post-expansion period, we observe a dramatic deviation between actual and estimated ESG scores.<sup>9</sup> To the extent that our estimated scores capture changes in ESG activity (as measured by Refinitiv’s methodology), any difference between actual and estimated ESG scores should be due to the mechanical effect of the coverage expansion, above and beyond any changes in the firms’ underlying ESG activities.

Finally, we examine whether the post-expansion increase in Refinitiv’s ESG scores is explained by concurrent changes in observable measures of ESG activities. To do so, we select eight ESG outcomes used by Refinitiv as input into their scoring process, namely, two environmental metrics capturing pollution levels (toxic release and greenhouse gas emissions), two social metrics (occurrence of, and monetary penalty associated with labor-related violations), two governance metrics (board independence and CEO duality) and two measures capturing both governance and social metrics (board gender and racial diversity).<sup>10</sup>

Fig. 6 displays eight graphs showing a flat trend in the eight ESG outcomes listed above, which does not mirror the sudden increase in actual Refinitiv ratings observed in Fig. 4 and Fig. 5. Certain governance variables (e.g., board gender diversity) exhibit a very mild and constant improvement during the sample period, but there is no evidence of a spike in 2015 or in the subsequent years. This analysis further supports the notion that the large post-expansion increase in Refinitiv’s actual ratings is orthogonal to contemporaneous changes in a firm’s ESG activities.

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<sup>9</sup> Untabulated t-tests indicate that the difference between actual ESG scores and estimated ESG scores is indistinguishable from zero in the pre-event period (t-stat = 1.18) and significantly positive in the post-event period (t-stat = 18.06).

<sup>10</sup> Cai, Dey, Grennan, Pacelli, and Qiu (2022) show that board gender and racial diversity trickle down to employee diversity.

To sum up, whether we proxy for firms' ESG activities using the ratings offered by other providers (first test), the rating by Refinitiv itself absent the expansion (second test), or direct measures of ESG outcomes (third test), we consistently find that variation in ESG activities cannot explain the dramatic increase in Refinitiv ESG scores observed after the 2015 coverage expansion. Thus, our analyses validate the use of this setting to examine whether mutual funds' portfolio decisions are affected by changes in ESG ratings independent of concurrent changes in ESG activities, which we examine next.

### **3. MUTUAL FUNDS' RESPONSE TO MECHANICAL CHANGES IN ESG RATINGS**

#### **3.1. Data and Research Design**

Our research question is whether ESG mutual funds change their portfolio holdings in response to the mechanical increase in the Refinitiv ESG scores documented in Section 2. For this purpose, we combine data from various sources. We obtain mutual funds and exchange-traded funds (ETFs) portfolio holdings data from the Center for Research in Security Prices (CRSP) US Mutual Fund Holdings Database. Within the CRSP universe of funds, we identify ESG funds using data from Morningstar's annual Sustainable Funds U.S. Landscape Report. We also obtain firm-level ESG ratings from three major providers, namely Refinitiv, KLD, and Sustainalytics.<sup>11</sup> The Appendix provides definitions and data sources for all variables used in the study.

Using these data, we construct a panel dataset of 755,166 fund-firm-quarter observations and conduct a difference-in-differences (DiD) analysis centered around the issuance of the 2015 Refinitiv scores (descriptive statistics for our panel are presented in Table 2). Specifically, we estimate the following ordinary least squares (OLS) regression:

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<sup>11</sup> We use a recent vintage of Refinitiv data. Berg et al. (2020) document that Refinitiv ESG scores differ between different vintages of data because Refinitiv retroactively adjusted their historical ratings after a methodology change in 2020. In Section II of the OA, we discuss this problem and provide evidence suggesting that it is not a concern for our setting (see Table A2 and A3).

$$Y_{i,j,t} = \beta_0 + \beta_1 Treatment_i + \beta_2 Post_t + \beta_3 Treatment_i \times Post_t + \beta_4 X_{i,t} + \delta_{j,t} + \theta_i + \epsilon_{i,j,t} \quad (2)$$

The dependent variable  $Y_{i,j,t}$  measures, alternatively, the percentage holdings of firm  $i$ , by fund  $j$ , in quarter  $t$ , or the probability that fund  $j$  holds firm  $i$  in quarter  $t$ . *Treatment* is an indicator equal to 1 for Russell 1000 firms experiencing a mechanical increase in their Refinitiv ESG scores in 2015, defined as an increase in their 2015 Refinitiv score relative to both (i) their 2014 score and (ii) their estimated score absent the effect of the coverage expansion (see Section 2.3 for details on the estimated score). That is, treated firms are those whose ratings increased more than one would have expected based on changes in their ESG activities (or, more precisely, in how Refinitiv translates changes in ESG activities into ratings).<sup>12</sup> This results in a sample of 653 treated firms. The control group includes firms added to the Refinitiv coverage in 2015 and with ESG ratings from KLD in 2014 (prior to the expansion). Requiring that control firms have ESG ratings from providers other than Refinitiv prior to the coverage expansion ensures that the funds' holdings of control firms are not confounded by any effect associated with receiving an ESG rating for the first time when added to Refinitiv in 2015 (Darendeli et al., 2022).<sup>13, 14</sup>

*Post* is an indicator equal to 1 for the 2016 calendar quarters and equal to 0 for the 2015 calendar quarters. We identify the post-period this way because the 2015 Refinitiv scores—which incorporate the mechanical change that defines our treatment—were made available to investors in 2016. Further, as noted earlier, the 2015 Refinitiv expansion took place gradually over three years. According to our conversations with Refinitiv, firms included in other Refinitiv indexes

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<sup>12</sup> Conceptually, our prediction applies to both firms experiencing a mechanical increase and firms experiencing a mechanical decrease. However, we focus on firms experiencing a mechanical increase because only 31 firms experience a mechanical rating decrease. Further, on average, these firms' ratings declined only by 2.3 points on a 100-point scale, a small change relative to the change in ratings for firms experiencing an increase (see Table 1). Thus, the magnitude of the “shock” to (the few) firms experiencing a mechanical decrease in ratings is quite small.

<sup>13</sup> Darendeli et al. (2022) find that suppliers receiving their first ESG rating—and receiving a low rating—experience reductions in their number of contracts and corporate customers.

<sup>14</sup> In untabulated analyses, we confirm that our results are robust to using control firms without KLD ratings in 2014.

were added first, resulting in larger firms being added earlier. Consistent with this, the mean (median) market capitalization of firms added in 2015, 2016, and 2017 was, respectively, \$1,943 (\$1,771), \$811 (\$636), and \$506 (\$428) million (untabulated analysis). In our main analyses, we focus on the 2015 expansion to enhance size comparability between the treatment (Russell 1000 firms) and control groups. Moreover, to ensure that control firms' scores are not affected by the inclusion of other firms in the Refinitiv coverage in 2016 and 2017 (see Fig. 3), we limit our post-period to four quarters. More precisely, by focusing only on the four quarters following the first round of expansion (i.e., the one in 2015) we avoid the problem that control firms (those added in 2015) may become 'treated' (i.e., experience a mechanical rating increase) when new firms are added in 2016 and 2017 (next two rounds of expansion). In Section 3.5, we assess the robustness of our results to a different specification that uses the entire 2015-2017 expansion (i.e., we run a stacked-cohort DiD). Finally,  $X_{i,t}$  is the firm's KLD rating, which controls for changes in ESG activity.<sup>15</sup>

A challenge in identifying the effect of the mechanical increase in ESG ratings on portfolio holdings is that portfolio strategy is a function of fund preferences (which are unobservable and may vary over time) as well as firm characteristics. To address this challenge, we take advantage of the granularity of our data and use a DiD with high dimensional fixed effects. Because our panel contains observations at the fund-firm-quarter level, we include fund-by-quarter fixed effects in our regressions ( $\delta_{j,t}$ ), which absorb time-varying fund-level characteristics, including variation in fund preferences and investment strategy. We also include firm fixed effects ( $\theta_i$ ), which allows us to absorb time-invariant firm-level characteristics like index status (Russell 1000 vs. Russell 2000)

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<sup>15</sup> In untabulated analysis, we verify that interacting  $X_{i,t}$  with  $Post_t$  does not alter our results.

at the time of the coverage expansion, which could determine funds' portfolio selection.<sup>16</sup> Further, in Section 2.3 we show that a firm's ESG activities (e.g., emissions) do not vary over the sample period (see Fig. 6), which suggests that our treatment effect is unlikely to capture any time-series variation in a firm's ESG conduct.

In brief, our research design enables us to compare the change in an ESG fund's holdings of a treatment firm to the change in the same fund's holdings of a control firm. This difference-in-differences is captured by  $\beta_3$  in Eq. 2 (note that  $\beta_1$  and  $\beta_2$  are subsumed by the fixed effects).

### 3.2. ESG Fund Holdings Following a Mechanical Increase in ESG Ratings

Table 3, Column (1), presents the results for our main analysis (Eq. 2), where we estimate the average treatment effect of the mechanical increase in ESG ratings on a fund's portfolio holdings. The positive and significant coefficient  $\beta_3$  indicates that ESG funds increase their holdings of firms that experience a mechanical increase in ESG ratings. The magnitude of the coefficient (0.003) implies an increase in holdings of approximately 15% compared to the pre-expansion mean of 0.020 for treated firms (untabulated).

The key identifying assumption in DiD is parallel trends, meaning that the change in the control group mirrors what the change in the treatment group would have been in the absence of treatment. While the parallel trends assumption is not directly testable, we provide indirect evidence of its validity by examining whether there are differential pre-trends in fund holdings of treatment and control firms. In Fig. 7, we report the results of Table 3 Column (1) in event time. The figure indicates the absence of statistically significant differential pre-trends, which provides reassurance about the validity of our DiD. Fig. 7 also shows that the treatment effect fully "kicks

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<sup>16</sup> Our treatment assignment is not a function of firms switching Russell indexes, which in our research design are held constant to the pre-expansion period. Our treatment assignment is strictly a function of whether a firm was in the Refinitiv coverage right before the expansion.

in” in the third quarter of 2016. The reason for this apparent ‘delay’ is that Refinitiv ratings for a given year (e.g., 2015) are not released immediately at the end of that year. Rather, they are released gradually during the subsequent year (e.g., 2016) as firms release sustainability reports, 10-Ks, and other public disclosures, which provide the inputs for Refinitiv’s ratings.

Next, we unpack this effect by examining the intensive and extensive margins. Specifically, we partition both treatment and control samples into firms that were already in the portfolios of ESG funds in the pre-period and those that were not. Then, we examine (i) whether ESG funds increase their exposure to existing firms in their portfolios when these firms experience a mechanical increase in ratings (intensive margin, Column 2), and (ii) whether ESG funds select new firms (i.e., firms they did not hold in the pre-period) when those firms experience a mechanical increase in ratings (extensive margin, Column 3). For this second analysis, we examine the probability that fund  $j$  holds firm  $i$  in quarter  $t$  (an indicator variable labelled *Prob. Holdings*).

In Column (2), we observe that ESG funds do not increase their holdings of pre-existing firms in their portfolios when those firms experience a mechanical increase in ESG ratings. Results are both statistically and economically insignificant. In contrast, ESG funds are 1.5 percentage points more likely to add to their portfolio a firm that experiences a mechanical increase in ESG ratings (Column 3), relative to control firms.

Note that in Table 3, *Treatment* is defined as an indicator variable. An alternative approach would be to define it as a continuous variable based on the magnitude of the mechanical increase in ESG rating. However, such magnitude is only relevant to the extent that it enables firms to surpass certain thresholds of “acceptable” ESG performance above which a fund will invest (such thresholds are unobservable and likely to vary across funds). For example, a firm that experiences, say, a mechanical rating increase of 0.30, from 0.10 to 0.40, is still less likely to be selected than

one that experiences, say, a (smaller) 0.10 increase, from 0.60 to 0.70. Thus, focusing on a continuous variable is likely to bias against detecting the predicted effect, as it would impose a linear relationship on a fundamentally non-linear phenomenon. Hence, we choose to impose less structure and focus on an indicator variable to capture firms likely to experience an increase in the probability of passing the threshold, even though this approach may include firms whose rating increases are insufficient to surpass the threshold, thereby understating the documented effect.<sup>17</sup>

Taken together, the analyses in Table 3 suggest that ESG funds respond to a purely mechanical increase in ESG ratings, independent of concurrent changes in a firm's ESG activity, mostly through their selection process rather than their portfolio weighting process. The intensive margin result is consistent with portfolio weighting usually being based on firms' market capitalization, rather than ESG ratings.<sup>18,19</sup> For the extensive margin, the result is consistent with portfolio selection reflecting the level of ESG ratings: If a rating increases above a certain threshold (or decreases below a certain threshold) a firm will be included or excluded from an ESG fund portfolio. To support this interpretation, we reviewed all the prospectuses of the ESG funds in our sample. We find that 99% of these funds use either a positive screening or inclusion strategy—selecting high-ESG-performing firms—or an exclusion strategy that eliminates firms in “brown” industries or with low ESG performance. That is, portfolio selection is based on the level of ESG ratings, consistent with our explanation of the extensive margin result.

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<sup>17</sup> In untabulated tests we replicate all our analyses using a continuous variable equal to the amount of mechanical increase in ESG ratings for treatment firms, and zero for control firms (these firms did not experience a mechanical increase in ESG ratings due to having no pre-period ratings). Our main results continue to hold, while our cross-sectional analyses are weaker but generally consistent with the results in the paper.

<sup>18</sup> In untabulated analyses, we verify that the market capitalization of treatment firms does not vary from the pre-period to the post-period. Thus, changes in market capitalization do not drive our results.

<sup>19</sup> While our results do not show strong evidence of intensive margin effects overall, such effects might still exist within specific subsets of funds—particularly among funds that do not rebalance portfolios based on market capitalization but instead pursue growth strategies in the ESG space (i.e., where portfolio weights reflect ESG performance). We leave the exploration of this possibility to future research.

### 3.3. Active vs. Passive ESG funds

Next, we start to unpack the selection effect documented in Table 3, Column 3. First, we examine whether the selection of firms with a mechanical increase in ESG ratings differs between ESG funds that passively follow an index (passive funds) and ESG funds that actively manage their portfolios (active funds). In principle, to the extent that the mechanical rating increase pushes some treated firms into the ESG indexes constructed by third-party agencies (like Refinitiv), then those firms are more likely to be automatically added to the portfolios of passive ESG funds that track such indexes. In contrast, active ESG funds should have the resources and the ability to conduct their due diligence and pick the stocks in their portfolios. In other words, they should be able to filter out the mechanical increase in ESG ratings. Hence, we expect the selection effect documented in Table 3 to be confined to passive funds only.<sup>20</sup>

To shed light on this question, in Table 4, we repeat the selection analysis separately for passive ESG funds (Column 1) and active ESG funds (Column 2). Interestingly, we find that both passive and active ESG funds are about 1.5-1.6 percentage points more likely to add to their portfolios a firm exhibiting a mechanical increase in ESG ratings (relative to a control firm), with no differential effect among passive and active funds.

While the result for passive funds is expected, the result for active ESG funds is somewhat surprising. Those funds are supposed to conduct a careful examination of firms' ESG activities

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<sup>20</sup> Another reason why one may expect a differential effect between passive funds and active funds is that the latter may include “activist” funds with a portfolio strategy of selecting “bad” ESG firms with the intent of improving their ESG conduct. If so, these “activist” funds’ holdings should not vary in response to a mechanical increase in ESG ratings. However, as noted above, 99% of the funds in our sample employ either a positive screening (or inclusion) strategy—selecting high-ESG-performing firms—or an exclusion strategy that eliminates firms in “brown” industries or with low ESG performance. Even ESG funds that assert they engage with portfolio firms—whether to “*encourage sustainable business policies and practices*” or “*raise environmental, social, and governance issues with the management of select portfolio companies through various channels*”—also indicate that they begin by selecting high-ESG-performing firms, consistent with Heath et al. (2023). In sum, it does not appear that ESG funds with a portfolio strategy of investing in low-ESG performing firms can explain any differential effect between passive funds and active funds.

and select stocks that align with the fund’s stated ESG objective (Heath et al., 2023). Therefore, they should not be misled by a merely mechanical rise in ESG ratings. We delve further into this finding with our next analyses.

### **3.4. Cross-sectional Variation in Active ESG Funds’ Resources**

In this section, we examine whether active ESG funds’ propensity to select firms with a mechanical increase in ESG ratings (documented in Table 4, Column 2) systematically varies with the funds’ resources available to conduct their in-house selection of portfolio firms. Put simply, we investigate whether active funds’ resource constraints can explain our results. To identify funds with resource constraints, following prior research, we use three proxies. First, consistent with Iliev and Lowry (2015), we proxy for resource constraints by looking at the fund size (AUM), since larger funds have more resources to invest in carefully selecting their portfolio firms. Second, consistent with Bebchuk et al. (2017), we use the fund expense ratio since funds with higher expense ratios can invest more resources in stewardship. Third, we use the fund portfolio size (i.e., the number of firms in the portfolio), as Hu et al. (2024) predict that a fund’s incentive to pay close attention to each individual firm in its portfolio is a function of the number of firms in a fund portfolio. We predict that smaller funds, funds with lower expense ratios, and funds with more firms in their portfolio are more likely to rely on ESG ratings, as their resource constraints limit their ability to filter out mechanical increases in ratings orthogonal to the firms’ underlying ESG activities. We examine these predictions with three distinct tests that expand the selection analysis reported in Table 4 Column (2).

We begin in Table 5, where we partition our sample of active ESG funds based on whether the fund’s AUM is above the median (Column 1) or below the median (Column 2). We observe that while the coefficient of *Treatment* remains statistically significant in both partitions, its

magnitude is 2.5 times larger for smaller funds—i.e., funds that invest fewer resources in stewardship. Next, in Table 6, we partition our sample of active ESG funds based on whether the funds’ expense ratio is above the median (Column 1) or below the median (Column 2). While the coefficient of *Treatment* remains statistically significant in both partitions, its magnitude is 6 times larger for funds with a low expense ratio—i.e., funds that invest fewer resources in stewardship. Finally, in Table 7, we partition the sample of active ESG funds based on whether the number of firms in a fund portfolio is below (Column 1) or above (Column 2) the median. Again, we observe that funds that spread their resources across more firms are significantly more likely (about 10 times more) to respond to a mechanical increase in ESG ratings relative to active ESG funds that invest in a smaller number of firms.

Across the three tests, the evidence is consistent with our prediction that active ESG funds with fewer resources to conduct their in-house selection of portfolio firms (i.e., the more “passive” among active funds) are significantly more likely to respond to a mechanical increase in ESG ratings, relative to active ESG funds with more resources. Taken together, our results suggest that “passive” investing (either due to resource constraints or portfolio indexing) combined with reliance on commercial ESG ratings might lead to portfolio allocations that do not reflect firms’ actual ESG activities, consistent with concerns expressed by the SEC (SEC 2021). Put differently, passively managed ESG funds seem to provide their investors with a product that is not always consistent with the fund’s stated objective.

### **3.5. Are our findings generalizable to recent years?**

As noted in the Introduction (footnote 1), survey evidence suggests that mutual funds continue to use ESG ratings to date.<sup>21</sup> However, our findings that they respond to mechanical increases in

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<sup>21</sup> We also hand-collected and reviewed the current prospectuses for all ESG funds in our sample to determine whether they publicly disclose the use of ESG ratings in their portfolio allocation. While funds are not required to provide this

ESG ratings are based on an event (Refinitiv’s coverage) that took place in 2015. It is not immediately obvious whether such a finding is generalizable to a more recent period. On the one hand, advances in technology and greater access to ESG raw data, combined with increased investors’ sophistication in processing these data, may have reduced reliance on ESG ratings provided by information intermediaries. On the other hand, increased data availability, coupled with increased corporate sustainability disclosures (e.g., ESG reports, CDP reports, SASB standards, TCFD disclosures, SEC filings, conference calls), has likely raised the information-processing costs for investors (Blankespoor, deHaan, and Marinovic, 2020). In turn, this may have increased investors’ reliance on ESG ratings as a cost-efficient way to synthesize information available from multiple sources in a variety of formats.

To shed light on this question, we exploit the fact that the Refinitiv coverage expansion occurred over three separate years, 2015, 2016, and 2017, which allows us to employ a stacked-cohort DiD design. In our main tests, we only focus on the first year (2015) and the following four quarters to ensure that control firms (i.e., newly covered firms in 2015) do not later become ‘treated’ (i.e., experience a mechanical rating increase) due to new firms being added in 2016 and 2017. Focusing on the first year also makes the treatment and control samples more comparable in size, as noted in Section 3.1, since the firms added to coverage in 2015 include the largest Russell 2000 firms. However, to fully use the three years of expansion, we perform a stacked-cohort DiD test, treating each expansion year as an independent cohort of treated and control firms, each with a clean pre- and post-period of four quarters. This approach allows us to extend the timeline to include up to Q4 2018. It also ensures that our main results are not driven by the type of firms

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information in their prospectus (hence the figure is a lower bound of the actual usage), we find that 41% of the ESG funds in our sample publicly disclose the use of third-party ESG scores in selecting firms, further supporting the survey evidence.

added in 2015. The regression model is consistent with Equation (2) except that we augment the fixed effects by including firm-by-cohort fixed effects and fund-by-quarter-by-cohort fixed effects.

Results are reported in Table 8. We find that our main results (Table 8, Panel A), as well as our four cross-sectional analyses (from Panel B to E), are confirmed in the stacked-cohort DiD analysis. This suggests that our inferences can be extended at least until the end of 2018, and that the takeaways from our cleanly identified effect using the 2015 Refinitiv coverage expansion are likely to generalize to more recent years.<sup>22</sup>

### **3.6. Alternative explanations: new information**

Our interpretation of the study's findings is that some mutual funds rely on ESG ratings even when these ratings change for reasons unrelated to actual changes in a firm's ESG activities and performance. A potential alternative explanation is that the Refinitiv coverage expansion revealed new information about firms' ESG activities (even if such activities did not change). Our research design excludes the possibility of new information about treatment firms' ESG activities since these firms were already covered by Refinitiv's ratings. However, one can argue that the expansion may have brought new information about the ESG performance of our control sample, i.e., previously non-covered firms.

To alleviate this concern, as noted in Section 3.1, we limit our control sample to firms already rated by another ESG rating provider before Refinitiv's coverage expansion. The idea is that investors already have significant information about the ESG activities of these firms. However, ESG is a multi-dimensional construct, and it is well known that ESG ratings providers

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<sup>22</sup> In Section III of the Online Appendix, we also analyze the association between ESG fund holdings and ESG ratings in a more recent sample of years (2018-2022). Results reported in Table A4 confirms a positive association between ESG holding and ESG ratings, after controlling for ESG performance, which is suggestive of a mechanical effect of ESG ratings. While this test is not suitable to draw causal inferences, it is consistent with the notion that some funds continue to rely mechanically on ESG ratings even in recent years.

differ in terms of the ESG dimension they focus on (Chatterji et al., 2016). Thus, it remains possible that the Refinitiv rating revealed new information about some of the control firm's ESG activities, leading investors to revise their beliefs about these firms' ESG performance.

If, based on this new information, investors concluded that the ESG performance of control firms was worse than expected, the effect documented in Table 3 may reflect new information about the ESG performance of treated firms relative to control firms, rather than a mechanical response (our current interpretation). In contrast, if the new Refinitiv ratings of control firms led investors to revise "upwards" their assessment of these firms' ESG performance, then the effect documented in Table 3 would understate the magnitude of the mechanical response (i.e., ESG funds increased the probability of selecting treatment firms relative to control firms even if the coverage expansion revealed positive ESG information about control firms).

In sum, under this story, even though there was no new information about the *absolute* ESG performance of treated firms (because they were already covered by Refinitiv), the new ESG ratings of control firms conveyed new information about the *relative* ESG performance of treatment firms, which would potentially affect our inferences.

To assess this alternative story, we perform two tests. First, we compare the Refinitiv's (new) ratings of control firms with their KLD ratings. In untabulated analyses, we find that 76% of the control firms that are in the bottom tercile based on the 2015 Refinitiv scores (their first rating by Refinitiv) are also in the bottom tercile based on their KLD ESG ratings in 2014 (before the Refinitiv coverage expansion). The percentages are even higher when we focus on the E, S, and G, separately (respectively, 91%, 89%, and 90%). In other words, control firms known to be poor ESG performers relative to treated firms before being added to Refinitiv's coverage remained poor performers (overall and across the three dimensions of ESG) even under Refinitiv's rating.

Thus, it seems unlikely that the Refinitiv coverage expansion brought a significant amount of new information about the relative ESG performance of treated vs. control firms.

Second, as a robustness test, we repeat all our analyses after excluding from the control group the top quartile of firms in terms of the difference between their 2014 KLD ESG rating and their 2015 Refinitiv rating (after standardizing both ratings on a scale from 0 to 100). Specifically, we exclude firms with the largest “negative” surprise—those whose percentile rank in the new Refinitiv rating was significantly worse than under the pre-expansion KLD rating. As noted earlier, if investors concluded that based on the new Refinitiv rating the ESG performance of control firms was worse than expected, the effect documented in Table 3 for treated firms might be driven by new “negative” information about the control firms rather than the mechanical rating increase for treated firms (our interpretation). By excluding control firms with the largest new “negative” information about their ESG performance, we aim to alleviate concerns regarding this alternative interpretation. We replicate all our analyses using this alternative control group and report the results in Table 9 (Panels A-E). We observe that our inferences remain unchanged.

Finally, one may argue that even if Refinitiv’s ratings of newly added firms (the control firms) did not change investors’ perception of the relative ranking of treated vs. control firms, investors may have simply responded to news that Refinitiv (using a different methodology and criteria than other ratings providers) “confirmed” the relative ESG ranking of treated vs. control firms. Under this argument, the greater likelihood of selecting firms experiencing a mechanical increase in ESG ratings after the 2015 coverage expansion would be just a response to this confirmatory evidence. However, we note that this argument would imply a similar response across all active funds, regardless of their resource constraints. Instead, we find that the documented selection effect is driven by active funds with greater resource constraints.

All of that said, it is important to note that even if mutual funds responded to some other information contained in the ratings change induced by Refinitiv’s 2015 coverage expansion, our key inference remains valid: mutual funds responded to a change in ESG ratings that was not driven by actual changes in a firm’s ESG activities and performance. This behavior, however, should not be interpreted as irrational. It may make sense for resource-constrained funds to minimize costs by mechanically following ESG ratings. Nonetheless, our findings highlight that this behavior results in portfolio allocations that do not reflect the funds’ stated ESG objectives.

#### **4. CONCLUSIONS**

In this paper, we study whether mutual funds change their portfolio holdings in response to mechanical changes in ESG ratings—i.e., changes independent of concurrent changes in a firm’s actual ESG activities. To do so, we exploit a change in Refinitiv’s ESG ratings mechanically driven by the expansion of its coverage in 2015. We first document that the coverage expansion automatically and substantially improved the relative position—and thus the ESG rating—of the firms already covered by Refinitiv. Next, we show that these firms did not exhibit any improvement in their ESG performance (as measured using actual ESG outcomes, ESG ratings by other providers, as well as our estimated Refinitiv’s ESG rating absent the coverage expansion). That is, we confirm that the increase in ESG rating was independent of concurrent changes in a firm’s ESG activities, which validates the use of the 2015 Refinitiv coverage expansion as a plausibly exogenous increase in ESG ratings.

Moving to our research question, we then examine how ESG mutual funds respond to a mechanical increase in ESG ratings. We use a difference-in-differences design comparing ESG mutual funds’ holdings around the 2015 Refinitiv coverage expansion, where the treatment group

includes already-covered firms experiencing a mechanical increase in their 2015 ESG rating, and the control group includes firms added to the coverage in 2015.

We find that ESG funds increase their holdings of treated firms. In particular, the probability of being selected by an ESG fund is higher for treatment firms relative to control firms, whereas we do not find that ESG funds increase their holdings of treated stocks already in their portfolio. These findings suggest that ESG funds use ESG ratings mostly in the selection process rather than the portfolio weighting process. The documented selection effect holds both among ESG index funds and active ESG funds. With regard to the latter group, the effect is driven by the subset of active ESG funds with fewer resources available to conduct their due diligence and selection of portfolio firms (i.e., active ESG funds with smaller AUM, more firms in their portfolios, and lower expense ratios).

Taken together, our analyses show that passive ESG funds (those with an index-based investing strategy) and active ESG funds that are more “passive” in their selection strategy (due to resource constraints) are more likely to add to their portfolios firms that experience an increase in ESG ratings independent of concurrent changes in the firm’s ESG activities. Consistent with concerns expressed by the SEC, we document that passive investing based on commercial ESG ratings—whether due to resource constraints or portfolio indexing—might result in portfolio allocations that do not reflect the actual ESG activities of firms, providing investors with products that do not truly reflect the fund’s stated ESG objective. These concerns are even more relevant given the global trends toward passive investing and ESG investing.

An important caveat is that our findings may not necessarily generalize to other classes of investors. Some of the economic forces driving our results (investors’ search cost constraints, degree of sophistication, access to ESG data) are likely to be relevant for all types of investors,

though in different degrees. For example, processing costs of large volumes of ESG data should be more pronounced for retail investors, potentially leading them to rely more heavily on ESG ratings to minimize these costs. However, retail investors may not be able to afford the commercial ESG ratings subscription fee, which may prevent them from using such ratings and thus from being affected by any mechanical increases. In contrast, more activist investors, such as hedge funds, typically have smaller portfolios and invest significant resources in a limited number of firms. This focus might make them better suited to discern any mechanical changes in ESG ratings, consistent with our findings for more active ESG mutual funds. Furthermore, due diligence on ESG metrics could be particularly relevant for retail funds, given their fiduciary responsibilities. We leave it to future research to examine reliance on ESG ratings for other classes of investors.

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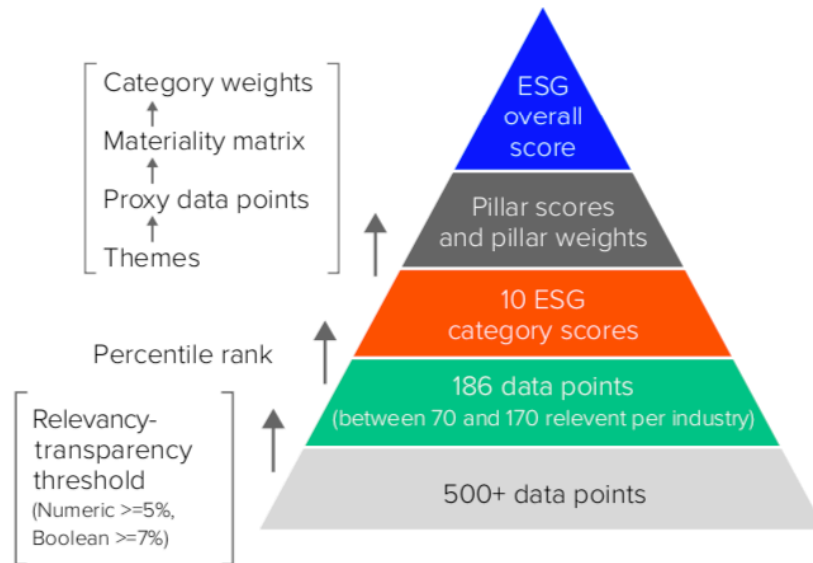
## APPENDIX: Variable Definitions and Data Sources

| Variable               | Definition                                                                                                                                                                                                                                                                                                                                                                           | Source            |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Prob. Holdings         | An indicator equal to one if fund $j$ holds firm $i$ in quarter $t$ , and zero otherwise.                                                                                                                                                                                                                                                                                            | CRSP              |
| Perc. Holdings         | The percentage holdings of firm $i$ by fund $j$ in quarter $t$ .                                                                                                                                                                                                                                                                                                                     | CRSP              |
| Treatment              | Indicator variable equal to one for Russell 1000 firms experiencing a mechanical increase in their Refinitiv ESG scores in 2015, and zero otherwise. A firm is classified as having a mechanical increase if its Refinitiv score in 2015 is higher than its Refinitiv score 2014 and higher than its estimated 2015 Refinitiv score absent the coverage expansion (see Section 2.3). | Refinitiv         |
| Post                   | Indicator variable equal to one for the 2016 calendar quarters, and equal to 0 for the 2015 calendar quarters.                                                                                                                                                                                                                                                                       | CRSP              |
| KLD Rating             | ESG ratings issued by KLD for firm $i$ in year $t$ , measured as the number of ‘strengths’ minus the number of ‘concerns’.                                                                                                                                                                                                                                                           |                   |
| Size (AUM)             | The total net assets, in millions of dollars, as of the last trading day of each calendar quarter $t$ for fund $j$ .                                                                                                                                                                                                                                                                 | CRSP              |
| Expense Ratio          | The fund’s total operating expenses as a percentage of the fund’s $j$ total net assets in quarter $t$ .                                                                                                                                                                                                                                                                              | CRSP              |
| Toxic Releases         | Natural logarithm of sum of total on-site and off-site releases for firm $i$ in year $t$ , scaled by cost of goods sold.                                                                                                                                                                                                                                                             | US EPA            |
| GHG Emissions          | Natural logarithm of total greenhouse gas (GHG) emissions for firm $i$ in year $t$ , scaled by cost of goods sold.                                                                                                                                                                                                                                                                   | US EPA            |
| Prob. Labor Violation  | Indicator variable equal to one if firm $i$ has any labor-related federal violation in year $t$ , and zero otherwise.                                                                                                                                                                                                                                                                | Violation Tracker |
| Log \$ Labor Violation | Natural logarithm of one plus the penalty amount for labor-related federal violations for firm $i$ in year $t$ , where the penalty amount equals to zero if no violation occurred.                                                                                                                                                                                                   | Violation Tracker |
| 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 equal to one if the firm $i$ 's CEO is the chairman of the board of directors in year $t$ , and zero otherwise. | BoardEx |
|-------------|------------------------------------------------------------------------------------------------------------------------------------|---------|

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**FIGURE 1**  
**Refinitiv's ESG Score Methodology**

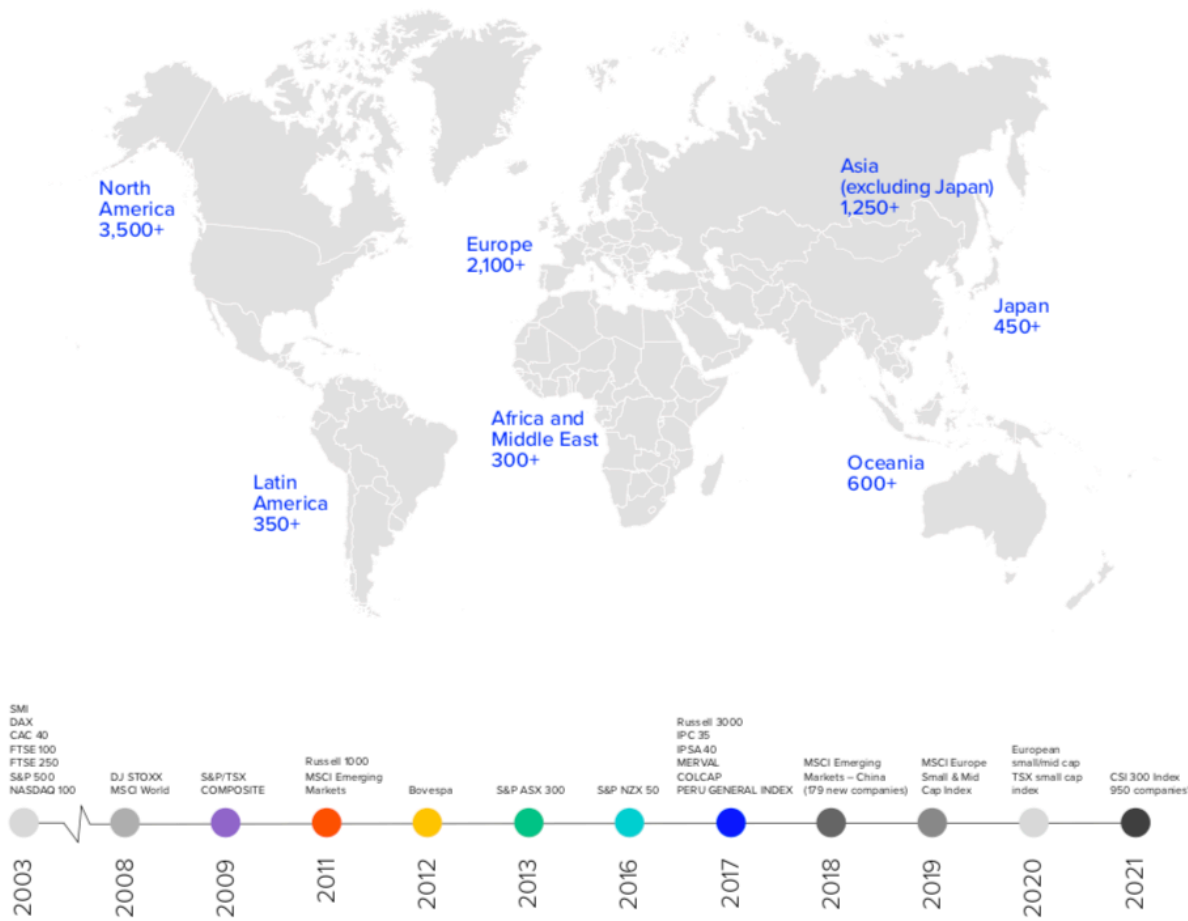


This figure shows the five-step process underlying Refinitiv's ESG scoring methodology. The figure is sourced from Refinitiv's [Methodology document](#). The five steps are the following:

1. From a pool of over 500 data points, Refinitiv selects 186 data points that are considered the most comparable and material within each respective industry. Industries are identified using Refinitiv's proprietary industry classification system known as TRBC (Thomson Reuters Business Classification).
2. Within each industry, each firm is assigned a percentile score for each of the 186 ESG data points based on its percentile rank. Refinitiv interprets scores below 0.25 as an indication of "poor" performance, scores from 0.25 to 0.50 as "satisfactory," scores from 0.50 to 0.75 as "good," and scores above 0.75 as "excellent" performance.
3. The 186 data points are grouped into 10 categories, and the sum of the firm's scores for all the data points within each category is computed. Then, within each category, each firm is assigned a percentile score based on its percentile rank (ESG category score).
4. The 10 categories are grouped into 3 "pillars": Environmental (three categories: Resource Use, Emissions, and Innovation), Social (four categories: Workforce, Human Rights, Community, and Product Responsibility), and Governance (three categories: Management, Shareholders, and CSR strategy.) Each pillar's score is computed as the category-weighted average of the scores of the categories within the pillar.
5. Finally, the overall ESG score is the category-weighted average of the three pillars' scores.

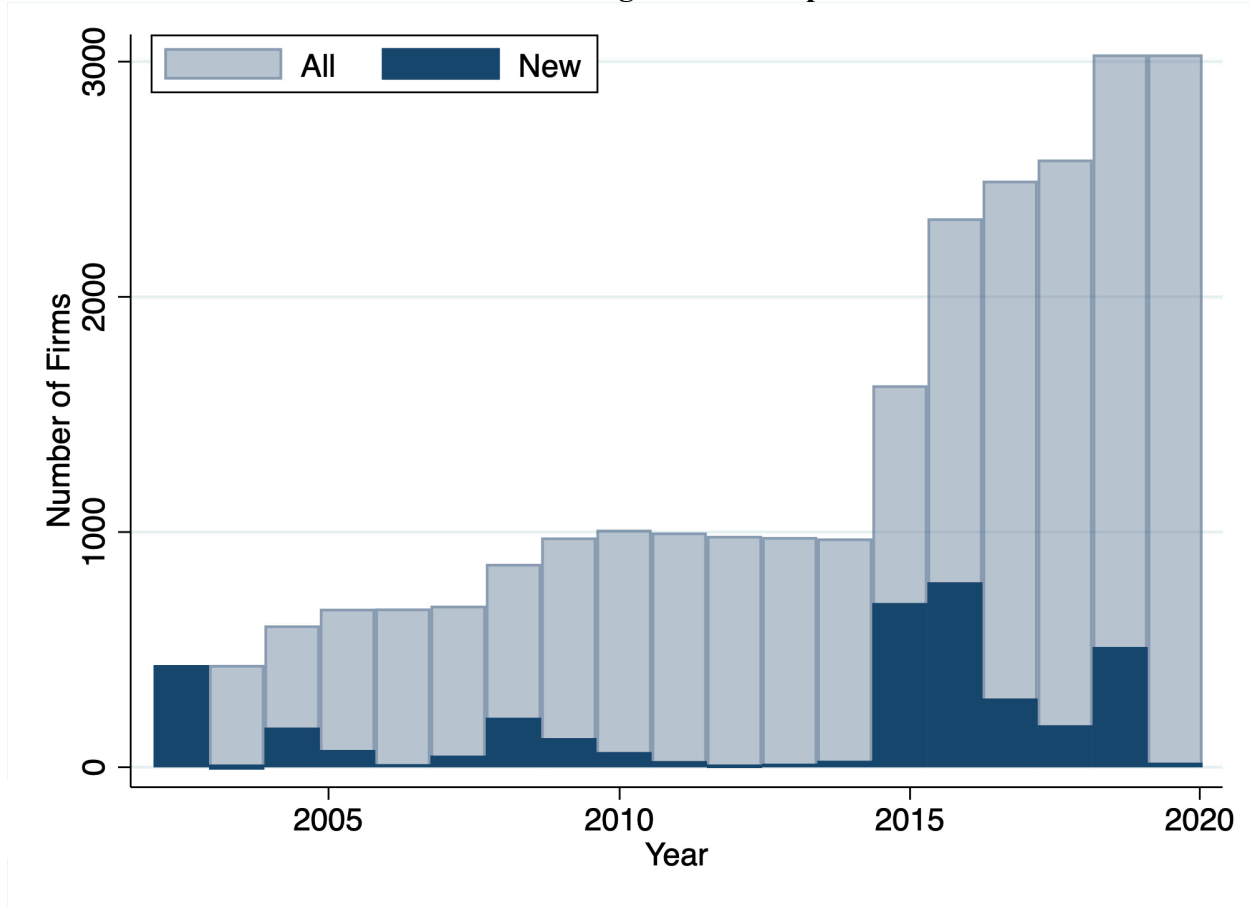
For Steps 4 and 5, the category weights are determined through an objective and data-driven approach, assessing the relative importance (materiality) of each thematic area within individual industry groups. Category weights vary by industry within the environmental and social categories, while they remain consistent across all industries for the governance categories. The category weights matrix is presented in Appendix B-E of Refinitiv's [Methodology document](#).

**FIGURE 2**  
**Refinitiv Coverage Expansion over time**



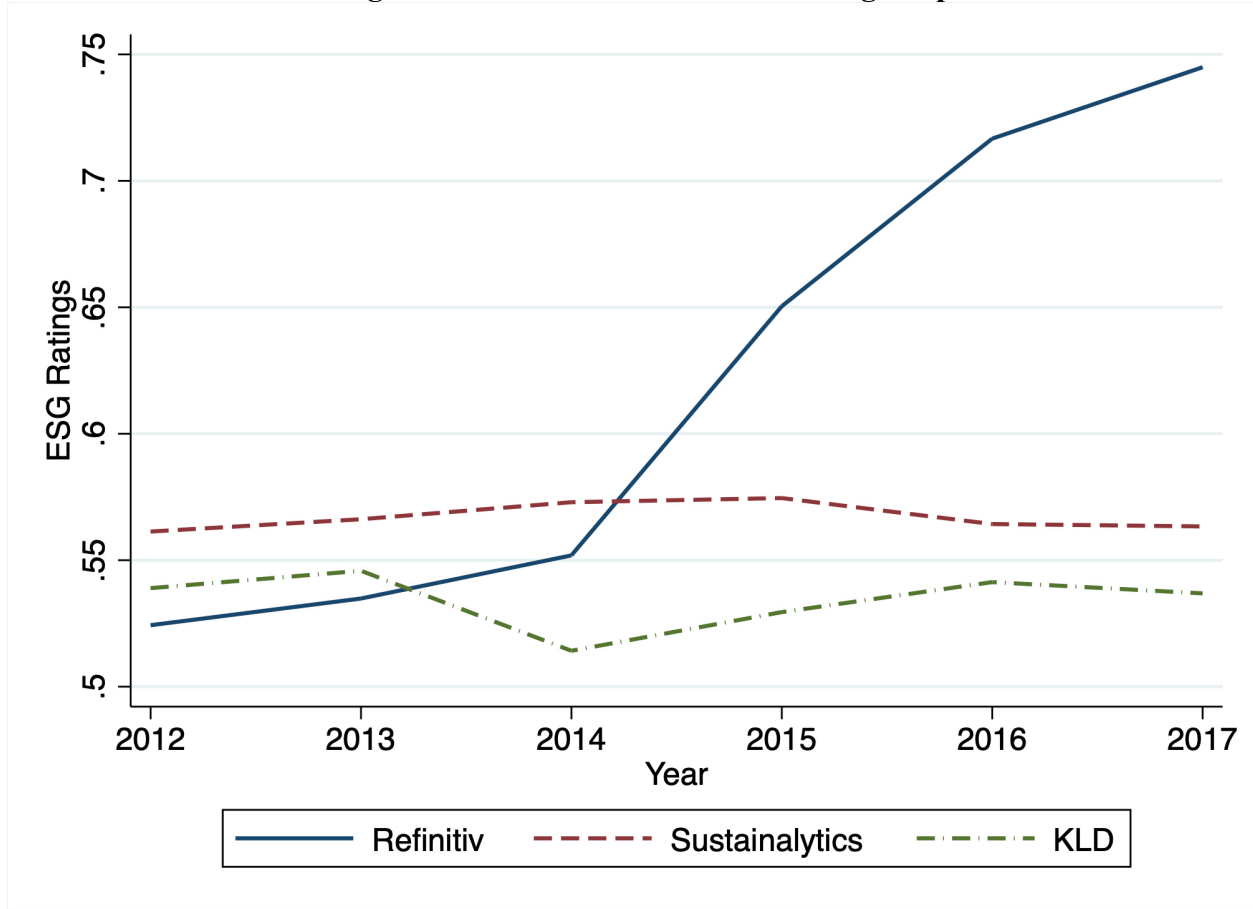
This figure shows the history of Refinitiv’s coverage expansion (source: Refinitiv’s [Methodology document](#)).

**FIGURE 3**  
**Refinitiv's Coverage of US Companies**



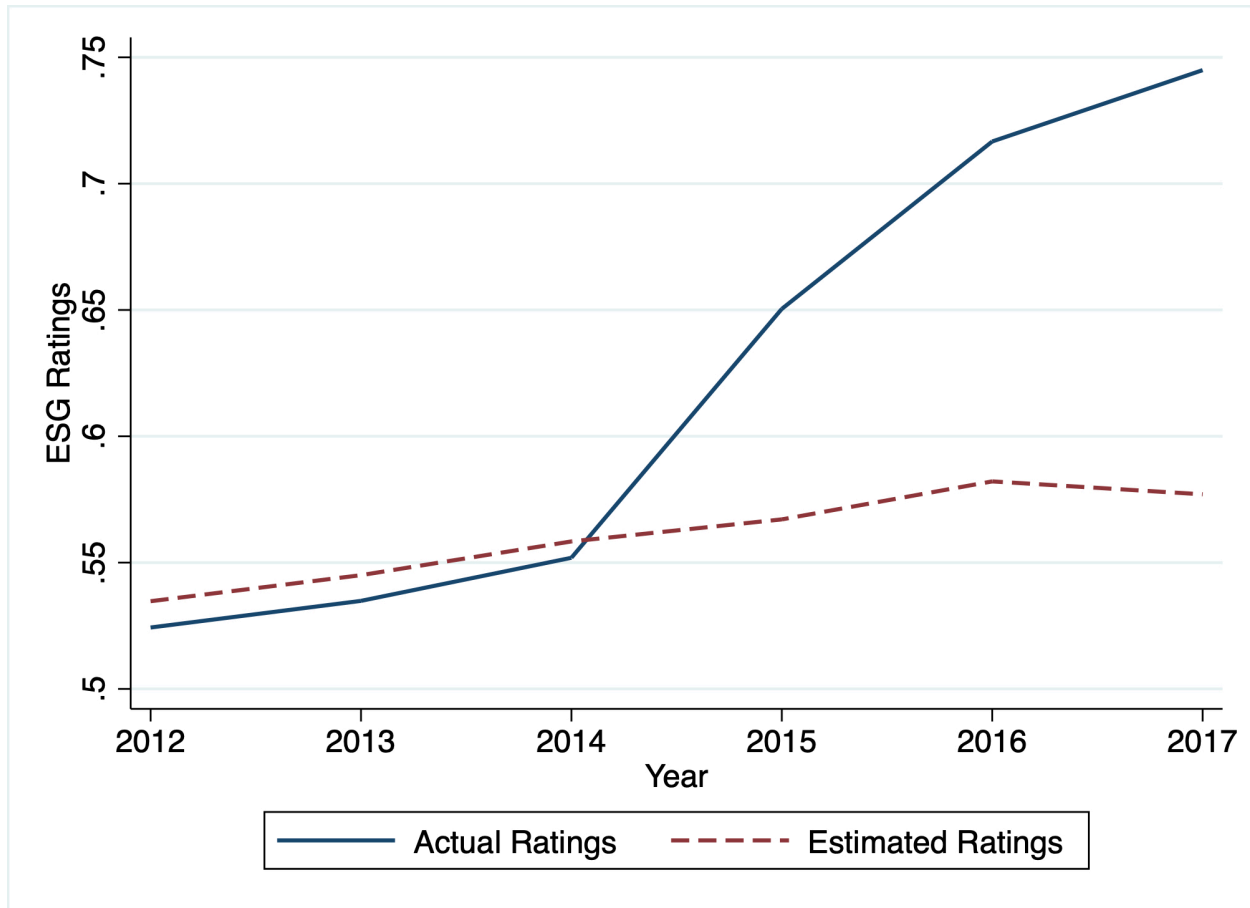
This figure shows Refinitiv's coverage of US companies over time. The light-shaded bars represent the total number of companies for which Refinitiv provides ESG scores in a specific year. The dark-shaded bars represent the number of newly added companies that make their first appearance in Refinitiv's coverage during the respective years.

**FIGURE 4**  
**ESG Ratings around the 2015 Refinitiv Coverage Expansion**



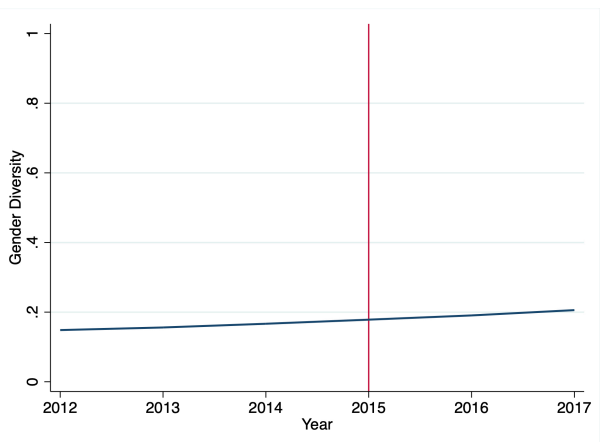
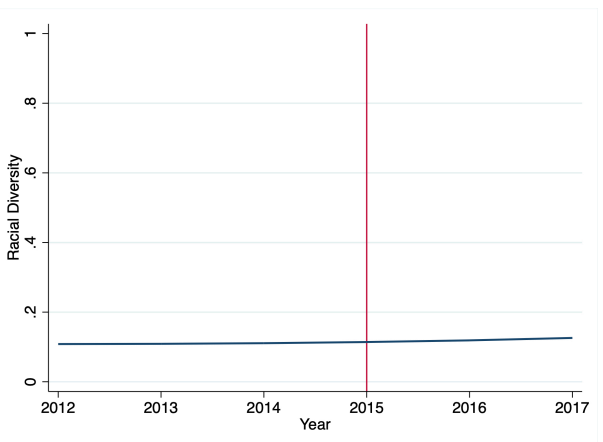
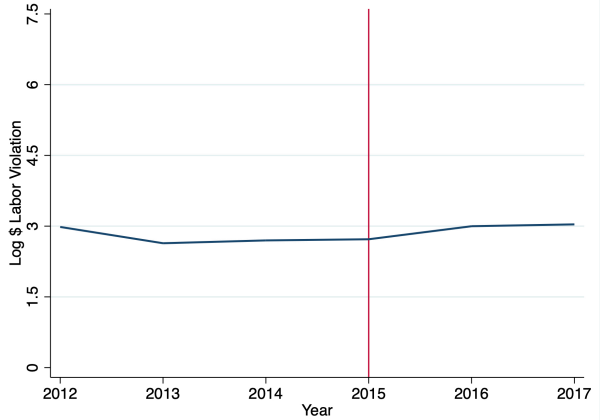
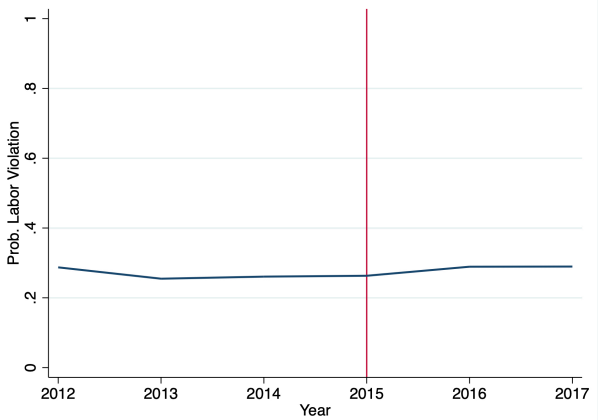
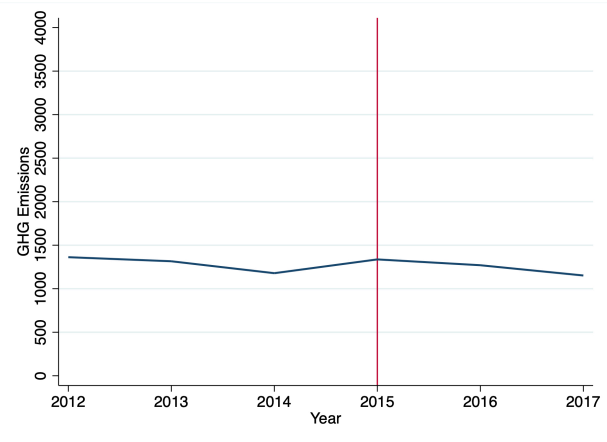
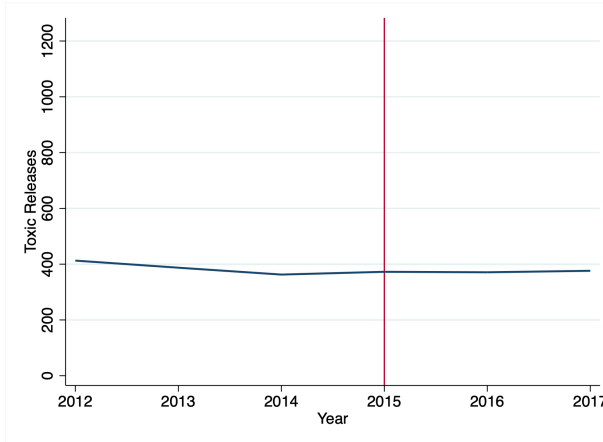
This figure plots the ESG ratings by three major providers (Refinitiv, Sustainalytics, and KLD) around the 2015 Refinitiv coverage expansion. The blue solid line shows the Refinitiv ratings for the sample of 899 Russell 1000 firms used in Table 1. The red dashed line and green dashed-dotted line show the ESG ratings provided for the subset of firms also rated by Sustainalytics and KLD, respectively. In Section I of the Online Appendix, Fig. A1 presents the same analysis for the subset of 614 Russell 1000 firms rated in 2014 and 2015 by all three providers, thereby imposing a common sample to enhance comparability.

**FIGURE 5**  
**Actual vs. Estimated Refinitiv's Ratings**  
**around the Refinitiv 2015 Coverage Expansion**

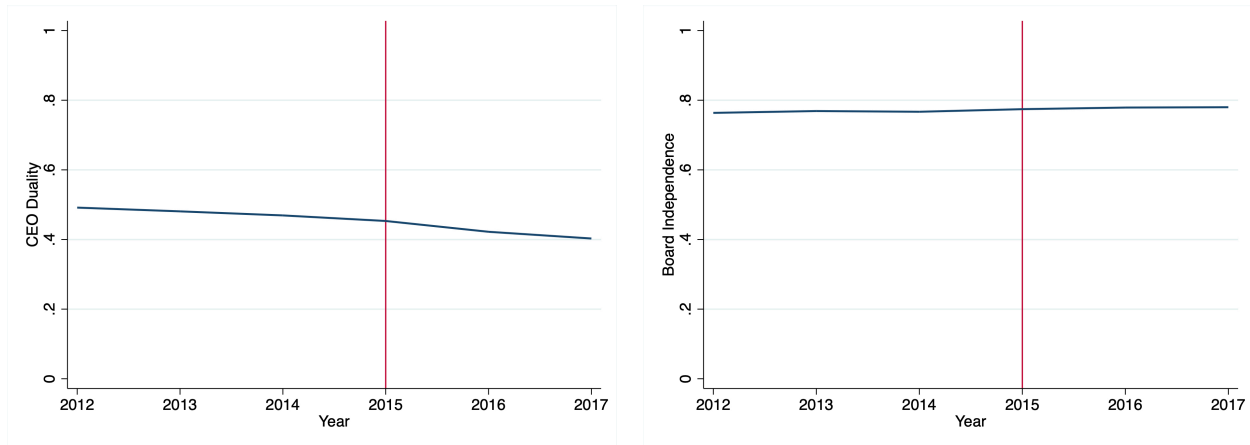


This figure compares the actual Refinitiv ratings (blue solid line) and our estimated Refinitiv ratings (red dashed line) for the sample of 899 Russell 1000 firms used in Table 1. The estimated ratings capture the ratings that firms already covered by Refinitiv prior to 2015 would have received absent the 2015 coverage expansion. As explained in Section 2.3, the estimated ratings are calculated as percentile ranks based on Refinitiv's scoring methodology (see Equation (1)) but using only firms already covered prior to 2015, thereby removing the effect of the 2015 coverage expansion (see example in Table A1 in Section I of the Online Appendix).

**FIGURE 6**  
**Trend in ESG Outcomes around the Refinitiv 2015 Coverage Expansion**

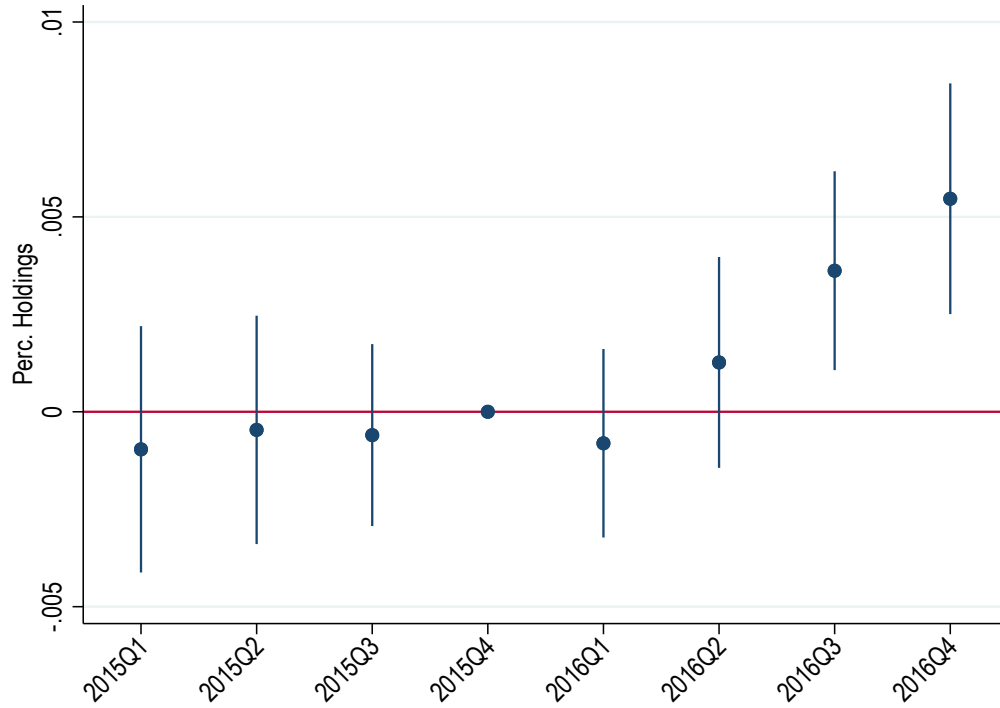


**FIGURE 6 (cont'd)**  
**Trend in ESG Outcomes around the Refinitiv 2015 Coverage Expansion**



This figure plots the trend in eight real ESG outcomes for the sample of 899 Russell 1000 firms used in Table 1. *Toxic Releases* are a firm's annual amount of toxic releases, reported in pounds. *GHG Emissions* is a firm's annual amount of greenhouse gas emissions, expressed in metric tons of CO<sub>2</sub> equivalent. *Prob Labor Violation* and *Log \$ Labor Violation* are, respectively, the annual occurrence of, and dollar penalty for, labor-related violations. *Racial Diversity* and *Gender Diversity* are, respectively, the ratio of racial and gender diversity on the board of directors each year. *CEO Duality* is an indicator denoting whether the CEO is also Chairman of the board. *Board Independence* is the annual ratio of independent directors on the board. The Appendix provides variables definitions and data sources.

**FIGURE 7**  
**ESG Funds Portfolio Holdings around the Refinitiv 2015 Coverage Expansion**



This figure plots the coefficient estimates and the 95% confidence intervals of the difference in ESG funds' percentage holdings between treatment and control firms in event time based on Equation (2). We use 2015Q4 as a benchmark because it is the latest year-quarter before the release of the Refinitiv ratings post-coverage expansion. The 2015 Refinitiv scores—which incorporate the mechanical change that defines our treatment—were not available to investors until the end of 2015.

**TABLE 1**  
**Changes in Refinitiv ESG Scores Following the 2015 Coverage Expansion**

| <b>Panel A. Difference in means Refinitiv ESG scores</b> |       |       |          |
|----------------------------------------------------------|-------|-------|----------|
|                                                          | Pre   | Post  | Diff     |
| Full sample                                              | 0.537 | 0.703 | 0.165*** |
| Observations                                             | 2,626 | 2,578 | 5,204    |

| <b>Panel B. Differences in means Refinitiv ESG scores by decile rank</b> |       |       |          |
|--------------------------------------------------------------------------|-------|-------|----------|
|                                                                          | Pre   | Post  | Diff     |
| 1                                                                        | 0.180 | 0.364 | 0.184*** |
| 2                                                                        | 0.256 | 0.504 | 0.248*** |
| 3                                                                        | 0.344 | 0.594 | 0.250*** |
| 4                                                                        | 0.403 | 0.637 | 0.235*** |
| 5                                                                        | 0.488 | 0.712 | 0.224*** |
| 6                                                                        | 0.572 | 0.759 | 0.186*** |
| 7                                                                        | 0.672 | 0.834 | 0.162*** |
| 8                                                                        | 0.773 | 0.877 | 0.105*** |
| 9                                                                        | 0.863 | 0.913 | 0.049*** |
| 10                                                                       | 0.931 | 0.941 | 0.010*** |
| Observations                                                             | 2,626 | 2,578 | 5,204    |

| <b>Panel C. Differences in means Refinitiv ESG scores by Industry</b> |       |       |          |
|-----------------------------------------------------------------------|-------|-------|----------|
|                                                                       | Pre   | Post  | Diff     |
| Energy - Fossil Fuels                                                 | 0.494 | 0.657 | 0.163*** |
| Renewable Energy                                                      | 0.717 | 0.888 | 0.171**  |
| Chemicals                                                             | 0.721 | 0.816 | 0.095**  |
| Mineral Resources                                                     | 0.571 | 0.730 | 0.159*** |
| Applied Resources                                                     | 0.659 | 0.813 | 0.154*** |
| Industrial Goods                                                      | 0.625 | 0.797 | 0.172*** |
| Industrial & Commercial Services                                      | 0.532 | 0.705 | 0.173*** |
| Industrial Conglomerates                                              | 0.735 | 0.786 | 0.052    |
| Transportation                                                        | 0.686 | 0.827 | 0.141*** |
| Automobiles & Auto Parts                                              | 0.646 | 0.810 | 0.164*** |
| Cyclical Consumer Products                                            | 0.578 | 0.734 | 0.155*** |
| Cyclical Consumer Services                                            | 0.412 | 0.581 | 0.169*** |
| Retailers                                                             | 0.489 | 0.705 | 0.216*** |
| Food & Beverages                                                      | 0.827 | 0.870 | 0.044    |
| Personal & Household Products & Services                              | 0.565 | 0.696 | 0.131**  |
| Food & Drug Retailing                                                 | 0.651 | 0.801 | 0.150*** |
| Banking & Investment Services                                         | 0.436 | 0.612 | 0.176*** |
| Insurance                                                             | 0.431 | 0.608 | 0.176*** |
| Real Estate                                                           | 0.346 | 0.608 | 0.262*** |
| Collective Investments                                                | 0.263 | 0.331 | 0.068    |
| Investment Holding Companies                                          | 0.270 | 0.406 | 0.136    |
| Healthcare Services & Equipment                                       | 0.519 | 0.708 | 0.189*** |
| Pharmaceuticals & Medical Research                                    | 0.519 | 0.637 | 0.118**  |
| Technology Equipment                                                  | 0.648 | 0.798 | 0.151*** |
| Software & IT Services                                                | 0.478 | 0.658 | 0.180*** |
| Telecommunications Services                                           | 0.490 | 0.672 | 0.182*** |
| Utilities                                                             | 0.696 | 0.836 | 0.140*** |
| Observations                                                          | 2,626 | 2,578 | 5,204    |

This table reports the changes in Refinitiv ESG scores following the 2015 coverage expansion. The sample includes all Russell 1000 firms with a Refinitiv rating in both 2014 and 2015 (899 firms). The pre-period spans from 2012 to 2014, while the post-period spans from 2015 to 2017. In Panel A, we report the difference in means for the ESG scores between the pre- and the post-period. In Panel B, we sort firms into deciles of mean ESG scores in the pre-period, and for each decile, we report the difference in mean ESG scores between the pre- and the post-period. In Panel C, we sort firms into industries and report the difference in mean ESG scores between the pre- and the post-period. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

**TABLE 2**  
**Descriptive Statistics**

| Statistics            | Mean    | Std Dev  | p25    | p50     | p75     | Obs.    |
|-----------------------|---------|----------|--------|---------|---------|---------|
|                       | (1)     | (2)      | (3)    | (4)     | (5)     | (6)     |
| <i>Perc. Holdings</i> | 0.015   | 0.097    | 0.000  | 0.000   | 0.000   | 755,166 |
| <i>Prob. Holdings</i> | 0.053   | 0.224    | 0.000  | 0.000   | 0.000   | 755,166 |
| <i>Size (AUM)</i>     | 508.262 | 1635.958 | 23.900 | 110.400 | 363.600 | 493,189 |
| <i>Expense Ratio</i>  | 0.011   | 0.004    | 0.010  | 0.011   | 0.014   | 479,511 |
| <i>Portfolio Size</i> | 72.136  | 142.141  | 19.000 | 42.000  | 71.000  | 446,106 |

This table reports the descriptive statistics for our main variables of interest at the firm-fund-quarter level. *Perc. Holdings* is the outcome variable used in our main analysis (Table 3 Column (1) and Fig. 7) and measures the percentage holdings of firm  $i$ , by fund  $j$ , in quarter  $t$ . *Prob. Holdings* measures the probability that fund  $j$  holds firm  $i$  in quarter  $t$ . *Size (AUM)* measures an active ESG fund's assets under management (in millions); we use this variable in Table 5 to partition our sample of active ESG funds based on whether their size is above or below the sample median. *Expense Ratio* measures the total operating expenses of an active ESG fund as a percentage of the fund's total net assets; we use this variable in Table 6 to partition our sample of active ESG funds based on whether their expense ratio is above or below the sample median. *Portfolio Size* measures the number of firms in an active ESG fund's portfolio; we use this variable in Table 7 to partition our sample of active ESG funds based on whether their portfolio size is above or below the sample median. Continuous variables are winsorized at the 1% and 99% levels. For each variable, we report the mean, the standard deviation, the first quartile, the median, the third quartile, and the number of observations. The Appendix provides variables definitions and data sources.

**TABLE 3**  
**ESG Funds Portfolio Holdings**  
**following a Mechanical Increase in ESG Ratings**

| Dependent Variable:     | <i>Perc. Holdings</i> | <i>Perc. Holdings</i> | <i>Prob. Holdings</i> |
|-------------------------|-----------------------|-----------------------|-----------------------|
| Sample:                 | All                   | Intensive             | Extensive             |
|                         | (1)                   | (2)                   | (3)                   |
| <i>Treatment X Post</i> | 0.003**<br>(2.602)    | 0.001<br>(0.159)      | 0.015***<br>(3.222)   |
| <i>KLD Rating</i>       | 0.018**<br>(2.098)    | 0.122<br>(1.470)      | 0.043**<br>(2.366)    |
| Observations            | 755,166               | 43,908                | 711,192               |
| Adj. R-squared          | 0.086                 | 0.675                 | 0.108                 |
| Fund-YrQtr FE           | Yes                   | Yes                   | Yes                   |
| Firm FE                 | Yes                   | Yes                   | Yes                   |

This table presents the results of the effect of a mechanical increase in ESG ratings on ESG funds' portfolio holdings (Equation (2)). In Column (1), we examine a panel of all combinations of ESG funds and firms spanning over the eight calendar quarters of 2015 and 2016. In Column (2), we restrict our sample to firms that were already in the portfolio of ESG funds in the pre-period (intensive margins). In Column (3), we restrict our sample to firms that were not in the portfolio of ESG funds in the pre-period (extensive margins). *Perc. Holdings* measures the percentage holdings of firm  $i$  by fund  $j$  in quarter  $t$ . *Prob. Holdings* measures the probability that fund  $j$  holds firm  $i$  in quarter  $t$ . *KLD Rating* is the ESG ratings issued by KLD for firm  $i$  in year  $t$ , measured as the number of 'strengths' minus the number of 'concerns'. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. The Appendix provides variables definitions and data sources.

**TABLE 4**  
**Active vs. Passive ESG Funds**

| Dependent Variable: <i>Prob. Holdings</i> |                     |                    |
|-------------------------------------------|---------------------|--------------------|
| Sample:                                   | Passive ESG Funds   | Active ESG Funds   |
|                                           | (1)                 | (2)                |
| <i>Treatment X Post</i>                   | 0.016***<br>(2.830) | 0.015**<br>(2.366) |
| <i>KLD Rating</i>                         | 0.068**<br>(2.665)  | 0.033<br>(1.383)   |
| Observations                              | 213,046             | 498,146            |
| Adj. R-squared                            | 0.092               | 0.120              |
| Fund-YrQtr FE                             | Yes                 | Yes                |
| Firm FE                                   | Yes                 | Yes                |

This table presents the results of the effect of a mechanical increase in ESG ratings on ESG funds' portfolio holdings (Eq. 2). Consistent with Table 3 Column (3), we restrict our sample to firms that were not in the portfolio of ESG funds in the pre-period (extensive margins). Furthermore, in Column (1), we restrict our sample to passive ESG funds, while in Column (2), we restrict our sample to active ESG funds. Consistent with Heath et al. (2022), we define an ESG fund as passive if it is a fund labeled with the "D" fund flag in the CRSP Mutual Fund Database. All other mutual funds are categorized as active funds. *Prob. Holdings* measures the probability that fund  $j$  holds firm  $i$  in quarter  $t$ . *KLD Rating* is the ESG ratings issued by KLD for firm  $i$  in year  $t$ , measured as the number of 'strengths' minus the number of 'concerns'. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. An F-test for the equality of coefficients across columns is conducted. The Appendix provides variables definitions and data sources.

**TABLE 5**  
**Cross-sectional Variation in Active ESG Funds Resources:**  
**Large vs. Small Fund Size (AUM)**

| Dependent Variable: <i>Prob. Holdings</i> |                                  |                                  |
|-------------------------------------------|----------------------------------|----------------------------------|
| Sample:                                   | Large Active<br>ESG Funds<br>(1) | Small Active<br>ESG Funds<br>(2) |
| <i>Treatment X Post</i>                   | 0.008***<br>(2.727)              | 0.020*<br>(1.820)                |
|                                           | F=2.13                           |                                  |
| <i>KLD Rating</i>                         | 0.003<br>(0.170)                 | 0.057<br>(1.408)                 |
| Observations                              | 243,550                          | 249,639                          |
| Adj. R-squared                            | 0.06                             | 0.152                            |
| Fund-YrQtr FE                             | Yes                              | Yes                              |
| Firm FE                                   | Yes                              | Yes                              |

This table presents the results of the effect of a mechanical increase in ESG ratings on ESG funds' portfolio holdings (Equation (2)). Consistent with Table 4 Column (2), we restrict our sample to firms that were not in the portfolio of active ESG funds in the pre-period (extensive margins). Further, we partition our sample between active ESG funds with above-the-median size (AUM), in Column (1), and active ESG funds with below-the-median size (AUM), in Column (2). *Prob. Holdings* measures the probability that fund  $j$  holds firm  $i$  in quarter  $t$ . *KLD Rating* is the ESG ratings issued by KLD for firm  $i$  in year  $t$ , measured as the number of 'strengths' minus the number of 'concerns'. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. An F-test for the equality of coefficients across columns is conducted. The Appendix provides variables definitions and data sources.

**TABLE 6**  
**Cross-sectional Variation in Active ESG Funds Resources:**  
**High vs. Low Expense Ratio**

| Dependent Variable: <i>Prob. Holdings</i> |                     |                   |
|-------------------------------------------|---------------------|-------------------|
| Sample:                                   | High Expense        | Low Expense       |
|                                           | Active ESG Funds    | Active ESG Funds  |
|                                           | (1)                 | (2)               |
| <i>Treatment X Post</i>                   | 0.004***<br>(2.807) | 0.024*<br>(1.948) |
|                                           | F=3.28*             |                   |
| <i>KLD Rating</i>                         | 0.004<br>(0.397)    | 0.058<br>(1.265)  |
| Observations                              | 244,072             | 235,439           |
| Adj. R-squared                            | 0.026               | 0.154             |
| Fund-YrQtr FE                             | Yes                 | Yes               |
| Firm FE                                   | Yes                 | Yes               |

This table presents the results of the effect of a mechanical increase in ESG ratings on ESG funds' portfolio holdings (Equation (2)). Consistent with Table 4 Column (2), we restrict our sample to firms that were not in the portfolio of active ESG funds in the pre-period (extensive margins). Further, we partition our sample between active ESG funds with above-the-median expense ratio, in Column (1), and active ESG funds with below-the-median expense ratio, in Column (2). *Prob. Holdings* measures the probability that fund  $j$  holds firm  $i$  in quarter  $t$ . *KLD Rating* is the ESG ratings issued by KLD for firm  $i$  in year  $t$ , measured as the number of 'strengths' minus the number of 'concerns'. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. An F-test for the equality of coefficients across columns is conducted. The Appendix provides variables definitions and data sources.

**TABLE 7**  
**Cross-sectional Variation in Active ESG Funds Resources:**  
**Large vs. Small Portfolio Size**

| Dependent Variable: <i>Prob. Holdings</i> |                     |                    |
|-------------------------------------------|---------------------|--------------------|
| Sample:                                   | Small Portfolio     | Large Portfolio    |
|                                           | Active ESG Funds    | Active ESG Funds   |
|                                           | (1)                 | (2)                |
| <i>Treatment X Post</i>                   | 0.003***<br>(3.602) | 0.031**<br>(2.197) |
|                                           | F=3.32*             |                    |
| <i>KLD Rating</i>                         | 0.014<br>(1.386)    | 0.060<br>(1.110)   |
| Observations                              | 236,063             | 210,043            |
| Adj. R-squared                            | 0.021               | 0.140              |
| Fund-YrQtr FE                             | Yes                 | Yes                |
| Firm FE                                   | Yes                 | Yes                |

This table presents the results of the effect of a mechanical increase in ESG ratings on ESG funds' portfolio holdings (Eq. 2). Consistent with Table 4 Column (2), we restrict our sample to firms that were not in the portfolio of active ESG funds in the pre-period (extensive margins). Further, we partition our sample between active ESG funds with below-the-median portfolio size, in Column (1), and active ESG funds with above-the-median portfolio size, in Column (2). Portfolio size is measured by the number of firms in a fund portfolio. *Prob. Holdings* measures the probability that fund  $j$  holds firm  $i$  in quarter  $t$ . *KLD Rating* is the ESG ratings issued by KLD for firm  $i$  in year  $t$ , measured as the number of 'strengths' minus the number of 'concerns'. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. An F-test for the equality of coefficients across columns is conducted. The Appendix provides variables definitions and data sources.

**TABLE 8**  
**Stacked-cohort Difference-in-Differences**

| <b>Panel A. Replication of Table 3</b> |                       |                       |                       |
|----------------------------------------|-----------------------|-----------------------|-----------------------|
| Dependent Variable:                    | <i>Perc. Holdings</i> | <i>Perc. Holdings</i> | <i>Prob. Holdings</i> |
| Sample:                                | All                   | Intensive             | Extensive             |
|                                        | (1)                   | (2)                   | (3)                   |
| Treatment X Post                       | 0.001**<br>(2.514)    | -0.000<br>(-0.082)    | 0.009***<br>(4.004)   |
| Observations                           | 2,100,675             | 82,923                | 2,017,476             |
| Adj. R-squared                         | 0.103                 | 0.702                 | 0.129                 |
| Control                                | Yes                   | Yes                   | Yes                   |
| Fund-YrQtr-Cohort FE                   | Yes                   | Yes                   | Yes                   |
| Firm-Cohort FE                         | Yes                   | Yes                   | Yes                   |

| <b>Panel B. Replication of Table 4</b>    |                     |                    |
|-------------------------------------------|---------------------|--------------------|
| Dependent Variable: <i>Prob. Holdings</i> |                     |                    |
| Sample:                                   | Passive ESG Funds   | Active ESG Funds   |
|                                           | (1)                 | (2)                |
| Treatment X Post                          | 0.012***<br>(3.897) | 0.007**<br>(2.548) |
|                                           | F=0.04              |                    |
| Observations                              | 592,134             | 1,425,342          |
| Adj. R-squared                            | 0.0938              | 0.152              |
| Control                                   | Yes                 | Yes                |
| Fund-YrQtr-Cohort FE                      | Yes                 | Yes                |
| Firm-Cohort FE                            | Yes                 | Yes                |

---

**Panel C. Replication of Table 5**

---

Dependent Variable: *Prob. Holdings*

| Sample:              | Large Active        | Small Active      |
|----------------------|---------------------|-------------------|
|                      | ESG Funds<br>(1)    | ESG Funds<br>(2)  |
| Treatment X Post     | 0.004***<br>(3.398) | 0.009*<br>(1.838) |
|                      | F=1.72              |                   |
| Observations         | 701,176             | 718,027           |
| Adj. R-squared       | 0.0577              | 0.197             |
| Control              | Yes                 | Yes               |
| Fund-YrQtr-Cohort FE | Yes                 | Yes               |
| Firm-Cohort FE       | Yes                 | Yes               |

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**Panel D. Replication of Table 6**

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Dependent Variable: *Prob. Holdings*

| Sample:              | High Expense            | Low Expense             |
|----------------------|-------------------------|-------------------------|
|                      | Active ESG Funds<br>(1) | Active ESG Funds<br>(2) |
| Treatment X Post     | 0.003***<br>(3.307)     | 0.010*<br>(1.973)       |
|                      | F=2.94*                 |                         |
| Observations         | 697,948                 | 696,916                 |
| Adj. R-squared       | 0.0308                  | 0.186                   |
| Control              | Yes                     | Yes                     |
| Fund-YrQtr-Cohort FE | Yes                     | Yes                     |
| Firm-Cohort FE       | Yes                     | Yes                     |

---

| <b>Panel E. Replication of Table 7</b>    |                     |                    |
|-------------------------------------------|---------------------|--------------------|
| Dependent Variable: <i>Prob. Holdings</i> |                     |                    |
| Sample:                                   | Small Portfolio     | Large Portfolio    |
|                                           | Active ESG Funds    | Active ESG Funds   |
|                                           | (1)                 | (2)                |
| <i>Treatment X Post</i>                   | 0.003***<br>(3.659) | 0.030**<br>(2.165) |
|                                           | F=3.07*             |                    |
| Observations                              | 388,061             | 350,370            |
| Adj. R-squared                            | 0.0234              | 0.157              |
| Control                                   | Yes                 | Yes                |
| Fund-YrQtr-Cohort FE                      | Yes                 | Yes                |
| Firm-Cohort FE                            | Yes                 | Yes                |

This table replicates the results from Tables 3–7 using the stacked cohort difference-in-differences design. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. An F-test for the equality of coefficients across columns is conducted. The Appendix provides variables definitions and data sources.

**TABLE 9**  
**Excluding the Subset of Control Firms with the Largest Negative Surprise**

| <b>Panel A. Replication of Table 3</b> |                       |                       |                       |
|----------------------------------------|-----------------------|-----------------------|-----------------------|
| Dependent Variable:                    | <i>Perc. Holdings</i> | <i>Perc. Holdings</i> | <i>Prob. Holdings</i> |
| Sample:                                | All                   | Intensive             | Extensive             |
|                                        | (1)                   | (2)                   | (3)                   |
| <i>Treatment X Post</i>                | 0.003***<br>(2.752)   | 0.002<br>(0.308)      | 0.015***<br>(3.261)   |
| Observations                           | 717,561               | 42,552                | 674,932               |
| Adj. R-squared                         | 0.0872                | 0.669                 | 0.108                 |
| Control                                | Yes                   | Yes                   | Yes                   |
| Fund-YrQtr FE                          | Yes                   | Yes                   | Yes                   |
| Firm FE                                | Yes                   | Yes                   | Yes                   |

| <b>Panel B. Replication of Table 4</b>    |                     |                    |
|-------------------------------------------|---------------------|--------------------|
| Dependent Variable: <i>Prob. Holdings</i> |                     |                    |
| Sample:                                   | Passive ESG Funds   | Active ESG Funds   |
|                                           | (1)                 | (2)                |
| <i>Treatment X Post</i>                   | 0.016***<br>(2.867) | 0.015**<br>(2.390) |
|                                           | F=0.92              |                    |
| Observations                              | 201,665             | 473,267            |
| Adj. R-squared                            | 0.0935              | 0.120              |
| Control                                   | Yes                 | Yes                |
| Fund-YrQtr FE                             | Yes                 | Yes                |
| Firm FE                                   | Yes                 | Yes                |

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**Panel C. Replication of Table 5**


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Dependent Variable: *Prob. Holdings*

| Sample:                 | Large Active<br>ESG Funds<br>(1) | Small Active<br>ESG Funds<br>(2) |
|-------------------------|----------------------------------|----------------------------------|
| <i>Treatment X Post</i> | 0.009***<br>(2.887)              | 0.020*<br>(1.816)                |
|                         | F=2.14                           |                                  |
| Observations            | 230,161                          | 238,585                          |
| Adj. R-squared          | 0.0605                           | 0.152                            |
| Control                 | Yes                              | Yes                              |
| Fund-YrQtr FE           | Yes                              | Yes                              |
| Firm FE                 | Yes                              | Yes                              |

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**Panel D. Replication of Table 6**


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Dependent Variable: *Prob. Holdings*

| Sample:                 | High Expense<br>Active ESG Funds<br>(1) | Low Expense<br>Active ESG<br>Funds<br>(2) |
|-------------------------|-----------------------------------------|-------------------------------------------|
| <i>Treatment X Post</i> | 0.004***<br>(3.030)                     | 0.024*<br>(1.951)                         |
|                         | F=3.28*                                 |                                           |
| Observations            | 231,241                                 | 224,261                                   |
| Adj. R-squared          | 0.0264                                  | 0.153                                     |
| Control                 | Yes                                     | Yes                                       |
| Fund-YrQtr FE           | Yes                                     | Yes                                       |
| Firm FE                 | Yes                                     | Yes                                       |

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| <b>Panel E. Replication of Table 7</b>    |                     |                    |
|-------------------------------------------|---------------------|--------------------|
| Dependent Variable: <i>Prob. Holdings</i> |                     |                    |
| Sample:                                   | Small Portfolio     | Large Portfolio    |
|                                           | Active ESG Funds    | Active ESG Funds   |
|                                           | (1)                 | (2)                |
| <i>Treatment X Post</i>                   | 0.003***<br>(3.664) | 0.031**<br>(2.221) |
|                                           | F=3.27*             |                    |
| Observations                              | 225,325             | 199,588            |
| Adj. R-squared                            | 0.0206              | 0.139              |
| Control                                   | Yes                 | Yes                |
| Fund-YrQtr FE                             | Yes                 | Yes                |
| Firm FE                                   | Yes                 | Yes                |

This table presents the results of replicating Table 3-7, excluding the subset of control firms that had a relatively larger negative surprise in their ratings. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. An F-test for the equality of coefficients across columns is conducted. The Appendix provides variables definitions and data sources.

## ONLINE APPENDIX

### “Do Mutual Funds Respond to Mechanical Changes in ESG Ratings?”

*By* SEUNGJU CHOI, FABRIZIO FERRI, AND DANIELE MACCIOCCHI

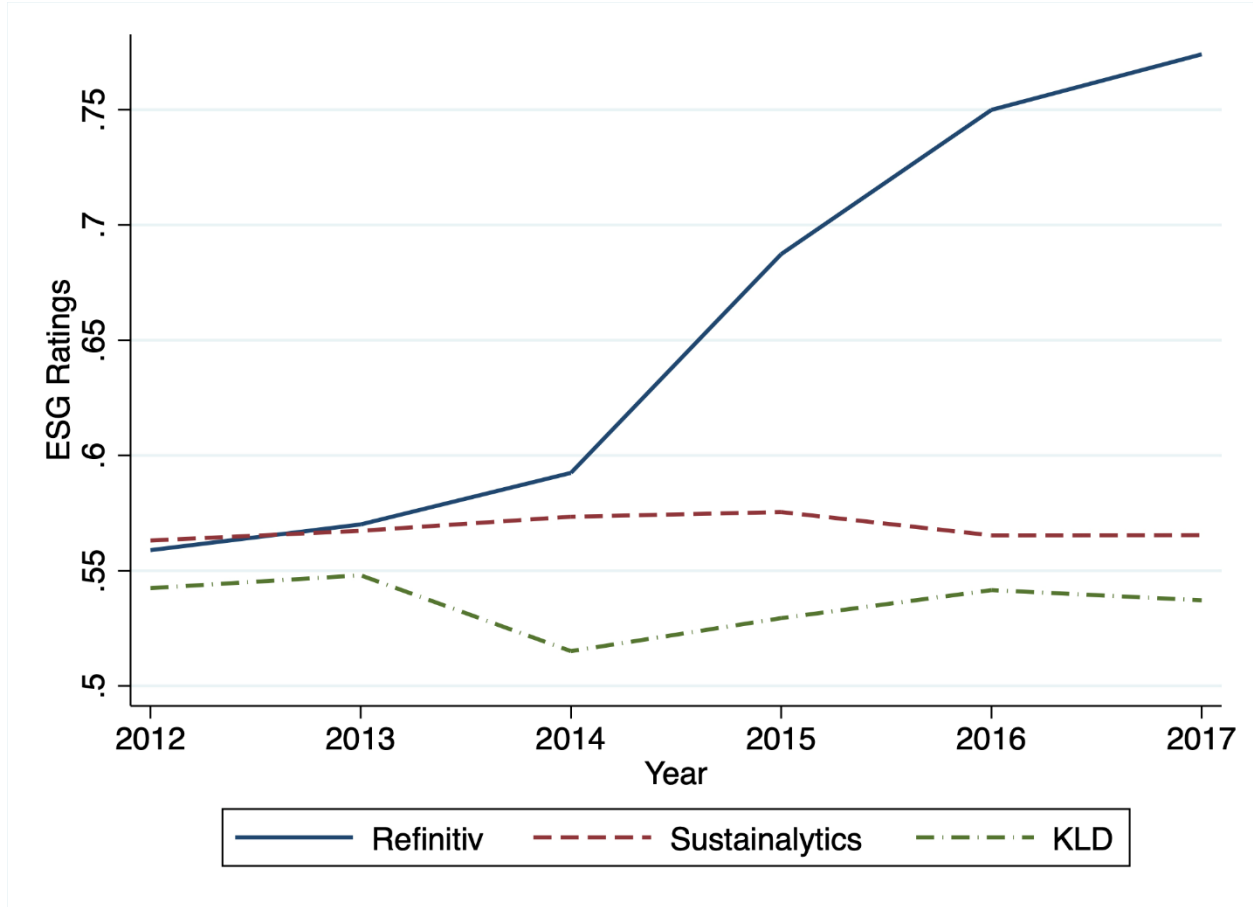
#### **Table of Contents:**

This appendix provides additional information to supplement the analyses presented in the paper:

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  - Figure A1: Replication of Figure 4 using a common sample between the three different rating providers (KLD, Sustainalytics, and Refinitiv).
  - Table A1: Example of the estimation of Refinitiv ESG Scores in the absence of the 2015 coverage expansion.
- **Section II: Reconciliation between Current and Historical Refinitiv Data**
  - Figure A2: ESG Ratings around the 2015 Refinitiv Coverage Expansion using post-2020 and pre-2020 vintages of Refinitiv data.
  - Table A2: Replication of Table 1 using pre-2020 vintage of Refinitiv data.
  - Table A3: Replication of Tables 3-7 using pre-2020 vintage of Refinitiv data.
- **Section III: Generalizability of our findings to recent years**
  - Table A4: Generalizability of our findings to recent years

## SECTION I. Supplementary Evidence and Analyses

**FIGURE A1**  
**ESG Ratings around the 2015 Refinitiv Coverage Expansion using a Common Sample**



Similar to Figure 4 in the paper, this figure plots the ESG ratings by three major providers (Refinitiv, Sustainalytics, and KLD) around the 2015 Refinitiv coverage expansion. The solid blue line shows the Refinitiv ratings, the red dashed line shows the Sustainalytics ratings, and the green dashed-dotted line shows the KLD ratings. In contrast to Figure 4, this figure presents the data for the subset of 614 Russell 1000 firms rated in 2014 and 2015 by all three providers, thereby imposing a common sample to enhance comparability.

**TABLE A1**  
**Example of the Estimation of Refinitiv ESG Score absent the 2015 Coverage Expansion**

| Company    | Year        | EIKON Codes           | Value          | Calculation<br>Actual Score   | Actual Score | Calculation<br>Estimated<br>Score | Estimated<br>Score | Δ Score<br>(Mechanical<br>Increase) |
|------------|-------------|-----------------------|----------------|-------------------------------|--------------|-----------------------------------|--------------------|-------------------------------------|
| (1)        | (2)         | (3)                   | (4)            | (5)                           | (6)          | (7)                               | (8)                | (9)                                 |
| JKL        | 2015        | TR.AnalyticCO2        | 5.081          | $(5+0.5)/6$                   | 0.917        | $(3+0.5)/4$                       | 0.875              | 0.042                               |
| ABC        | 2015        | TR.AnalyticCO2        | 123.163        | $(4+0.5)/6$                   | 0.750        | $(2+0.5)/4$                       | 0.625              | 0.125                               |
| LMN        | 2015        | TR.AnalyticCO2        | 181.884        | $(3+0.5)/6$                   | 0.583        | $(1+0.5)/4$                       | 0.375              | 0.208                               |
| PQR        | 2015        | TR.AnalyticCO2        | 188.565        | $(2+0.5)/6$                   | 0.417        | $(0+0.5)/4$                       | 0.125              | 0.292                               |
| <i>ENR</i> | <i>2015</i> | <i>TR.AnalyticCO2</i> | <i>190.102</i> | <i><math>(1+0.5)/6</math></i> | <i>0.250</i> | -                                 |                    |                                     |
| <i>MSE</i> | <i>2015</i> | <i>TR.AnalyticCO2</i> | <i>210.503</i> | <i><math>(0+0.5)/6</math></i> | <i>0.083</i> | -                                 |                    |                                     |

In this table, we provide an example of our estimation of the Refinitiv ESG scores for firms covered prior to 2015 (i.e., Russell 1000 firms) absent the 2015 coverage expansion to Russell 2000 firms. “EIKON Codes” is a code indicating a datapoint and “Value” is the value of the datapoint for each company-year. In this example, the datapoint “TR.AnalyticCO2” is a measure of CO2 emissions in the Thomson Reuters database, computed as total CO2 and CO2 equivalent emissions in metric tons scaled by revenues in USD millions (higher values indicate more pollution). Companies in italics (ENR and MSE) are newly added firms in Refinitiv’s coverage in 2015. “Actual Score” represents the score reported by Refinitiv based on all firms covered that year, *including* newly added firms. “Estimated Score” represents our estimated score using Refinitiv methodology but *excluding* newly added firms. “Δ Score” shows the difference between the “Actual Score” and the “Estimated Score,” which is what we define as a mechanical increase in ESG ratings.

## SECTION II. Reconciliation between Current and Historical Refinitiv Data

On April 6, 2020, Refinitiv implemented a change in its methodology, introducing a new proprietary model aimed at better capturing the different importance of ESG metrics to different industries.<sup>1</sup> Berg et al. (2020) document differences in Refinitiv ESG scores for the same firm-years between vintages of Refinitiv data released prior to April 2020 and those released afterward. Berg et al. (2020) suggest that Refinitiv may have retroactively adjusted its historical (i.e., pre-2020) ESG scores based on the 2020 methodology change and recommend that researchers using post-2020 vintages of Refinitiv data carefully consider whether this issue affects their analyses.

We have access to a pre-2020 vintage of data for US firms. However, in this study, we use a recent (post-2020) vintage of Refinitiv data with global coverage (i.e., US and non-US firms) because we need the “global” dataset to compute the “estimated” ratings in the absence of the 2015 coverage expansion (as discussed in Section 2.3 of the paper, with an example presented in Table A1 in this Online Appendix). Such estimated ratings are key to our definition of treatment firms and form the basis for the trends reported in Figure 5.

However, since we use a post-2020 vintage of data, the evidence in Berg et al. (2020) raises two potential concerns. The first is that the documented spike in Refinitiv ratings around the 2015 coverage expansion (Figures 4 and 5) is somehow an artifact of the post-2020 retroactive modifications made by Refinitiv. The second is that such modifications introduce noise to our classification of treatment and control firms. We examine both issues below and conclude they are not affecting our study.

---

<sup>1</sup> Refinitiv also changed the treatment of unreported data items covering qualitative measures, that is, items that can be answered with “yes” or “no” (coded as 1 or 0 or vice versa). Previously, a score of 0.5 was allocated to firms which did not report information on a metric, essentially giving them the “benefit of the doubt.” To encourage disclosure and transparency, the new methodology assigns to such firms a score of zero.

1. *Is the documented spike in Refinitiv ratings around the coverage expansion an artifact of the post-2020 retroactive modifications made by Refinitiv?*

Berg et al. (2020) document that the difference in Refinitiv ESG scores between the pre-2020 and the post-2020 vintage of data is similar across all years (see Table 2 in Berg et al., 2020), suggesting that these differences across data vintages are unlikely to explain the spike in 2015 Refinitiv ESG scores documented in Figures 4 and 5. To support this conclusion more directly, we examine a pre-2020 vintage of data for the sample of US firms. Using these data, in Table A2, we replicate Table 1 and find that the distribution of the increase in Refinitiv scores from the pre-2015 period to the post-2015 period (i.e., around the coverage expansion) is very similar to that reported in Table 1 (where we use the post-2020 vintage). Along the same lines, in Figure A2 (which replicates Figure 4 by adding the Refinitiv ESG score from the pre-2020 vintage), we continue to observe a spike in 2015 Refinitiv scores when using the pre-2020 vintage. In brief, the spike in the Refinitiv ESG scores around the 2015 coverage expansion is not driven by adjustments made by Refinitiv to the historical data after 2020.

2. *Do the post-2020 retroactive modifications made by Refinitiv introduce noise to our classification of treatment and control firms?*

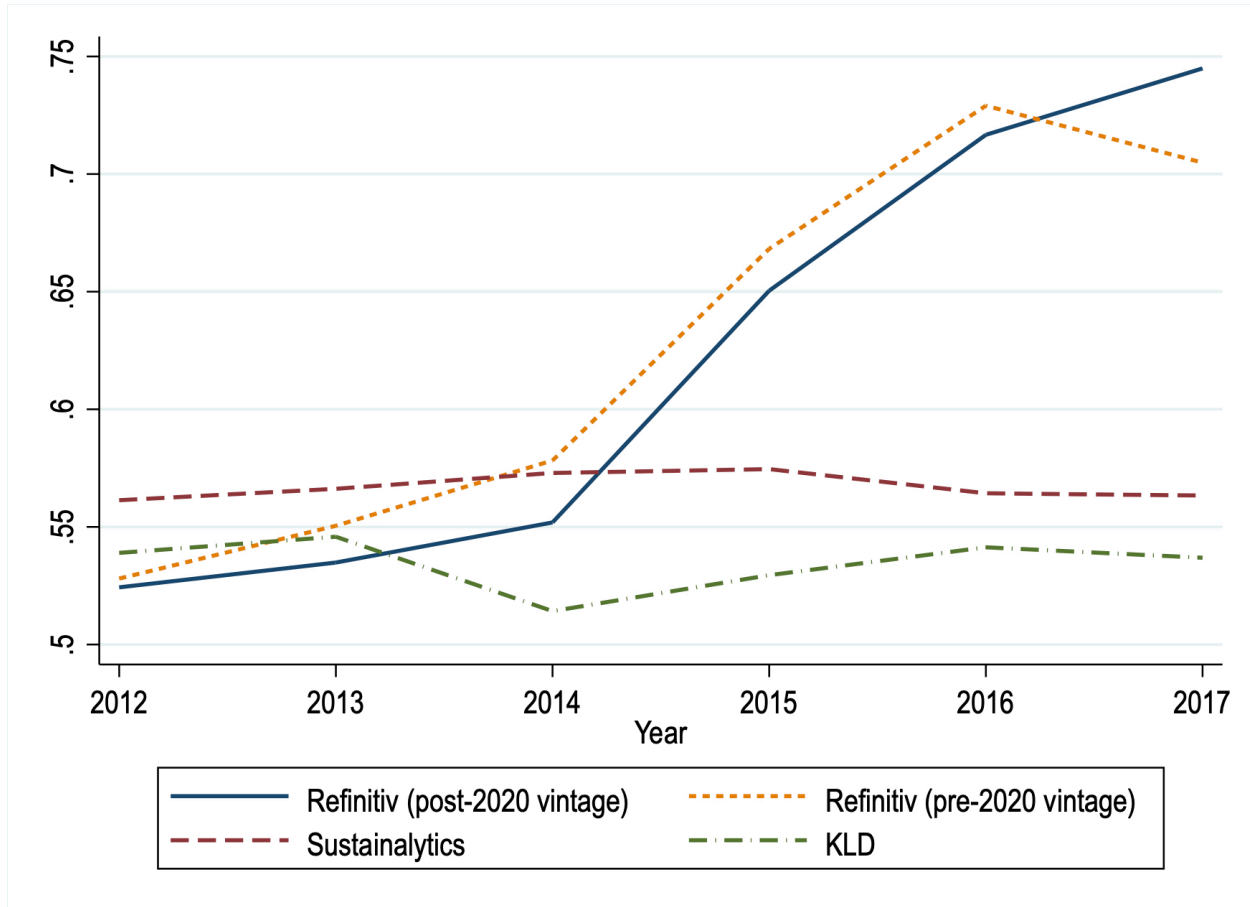
Our classification of control firms—i.e., firms added to the Refinitiv coverage in 2015—does not depend on Refinitiv ratings. Thus, by definition, our control sample is unaffected by this issue. As for the treatment sample, recall that it includes firms that experience an increase in their 2015 Refinitiv scores relative to both (i) their 2014 scores and (ii) their estimated scores absent the effect of the 2015 coverage expansion. We find that 95% of our treatment firms had an increase in their Refinitiv scores between 2014 and 2015 even when using the pre-2020 vintage of data—i.e., they met condition (i) above. Further, and importantly, when we replicate Tables 3-7 using this

subset of the treatment firms, the results are virtually identical to the ones reported in the manuscript in terms of both economic and statistical significance (see Table A3 below).<sup>2</sup> Hence, we conclude that the issue raised by Berg et al. (2020) does not affect our study.

---

<sup>2</sup> While we cannot determine that all these firms would have met condition (ii) (recall that we need the global vintage of data to compute the estimated ratings), in our post-2020 vintage of data 83% of firms meeting condition (i) also meet condition (ii), which is not surprising given the patterns in Table 1 and Figure 5.

**FIGURE A2**  
**ESG Ratings around the 2015 Refinitiv Coverage Expansion**  
**using post-2020 and pre-2020 vintages of Refinitiv data**



This figure plots the ESG ratings by three major providers (Refinitiv, Sustainalytics, and KLD) around the 2015 Refinitiv coverage expansion. Consistent with Figure 4 in the manuscript, the solid blue solid line shows the Refinitiv ratings based on a post-2020 vintage of Refinitiv data, while the red dashed line and the green dashed-dotted lines show, respectively, the Sustainalytics ratings and the KLD ratings. In this figure, we add the orange dotted line, which shows the Refinitiv ratings based on a pre-2020 vintage of data.

**TABLE A2**  
**Replication of Table 1 (using the pre-2020 vintage of Refinitiv data)**

| <b>Panel A. Difference in means Refinitiv ESG scores</b> |       |       |          |
|----------------------------------------------------------|-------|-------|----------|
|                                                          | Pre   | Post  | Diff     |
| Full sample                                              | 0.553 | 0.700 | 0.147*** |
| Observations                                             | 2,474 | 2,289 | 4,763    |

| <b>Panel B. Differences in means Refinitiv ESG scores by decile rank</b> |       |       |          |
|--------------------------------------------------------------------------|-------|-------|----------|
|                                                                          | Pre   | Post  | Diff     |
| 1                                                                        | 0.195 | 0.375 | 0.180*** |
| 2                                                                        | 0.277 | 0.517 | 0.240*** |
| 3                                                                        | 0.359 | 0.593 | 0.234*** |
| 4                                                                        | 0.434 | 0.656 | 0.222*** |
| 5                                                                        | 0.510 | 0.697 | 0.187*** |
| 6                                                                        | 0.599 | 0.767 | 0.168*** |
| 7                                                                        | 0.680 | 0.825 | 0.145*** |
| 8                                                                        | 0.783 | 0.877 | 0.094*** |
| 9                                                                        | 0.868 | 0.908 | 0.040*** |
| 10                                                                       | 0.931 | 0.939 | 0.008*** |
| Observations                                                             | 2,474 | 2,289 | 4,763    |

This table reports the changes in Refinitiv ESG scores following the 2015 coverage expansion using a pre-2020 vintage of Refinitiv data (available only for US firms). The pre-period spans from 2012 to 2014, while the post-period spans from 2015 to 2017. In Panel A, we report the difference in means for the ESG scores between the pre- and the post-period. In Panel B, we sort firms into deciles of mean ESG scores in the pre-period, and for each decile, we report the difference in means between the pre- and the post-period. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

**TABLE A3 Using the pre-2020 vintage of Refinitiv data**

| <b>Panel A. Replication of Table 3</b> |                       |                       |                       |
|----------------------------------------|-----------------------|-----------------------|-----------------------|
| Dependent Variable:                    | <i>Perc. Holdings</i> | <i>Perc. Holdings</i> | <i>Prob. Holdings</i> |
| Sample:                                | All                   | Intensive             | Extensive             |
|                                        | (1)                   | (2)                   | (3)                   |
| <i>Treatment X Post</i>                | 0.003***<br>(2.689)   | 0.001<br>(0.185)      | 0.015***<br>(3.287)   |
| Observations                           | 730,213               | 41,898                | 688,249               |
| Adj. R-squared                         | 0.085                 | 0.679                 | 0.104                 |
| Control                                | Yes                   | Yes                   | Yes                   |
| Fund-YrQtr FE                          | Yes                   | Yes                   | Yes                   |
| Firm FE                                | Yes                   | Yes                   | Yes                   |

| <b>Panel B. Replication of Table 4</b>    |                     |                    |
|-------------------------------------------|---------------------|--------------------|
| Dependent Variable: <i>Prob. Holdings</i> |                     |                    |
| Sample:                                   | Passive ESG Funds   | Active ESG Funds   |
|                                           | (1)                 | (2)                |
| <i>Treatment X Post</i>                   | 0.015***<br>(2.877) | 0.015**<br>(2.427) |
|                                           | F=1.00              |                    |
| Observations                              | 206,434             | 481,815            |
| Adj. R-squared                            | 0.091               | 0.115              |
| Control                                   | Yes                 | Yes                |
| Fund-YrQtr FE                             | Yes                 | Yes                |
| Firm FE                                   | Yes                 | Yes                |

---

**Panel C. Replication of Table 5**

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Dependent Variable: *Prob. Holdings*

| Sample:                 | Large Active<br>ESG Funds<br>(1) | Small Active<br>ESG Funds<br>(2) |
|-------------------------|----------------------------------|----------------------------------|
| <i>Treatment X Post</i> | 0.008***<br>(2.806)              | 0.020*<br>(1.847)                |
|                         | F=2.15                           |                                  |
| Observations            | 235,609                          | 241,413                          |
| Adj. R-squared          | 0.0597                           | 0.146                            |
| Control                 | Yes                              | Yes                              |
| Fund-YrQtr FE           | Yes                              | Yes                              |
| Firm FE                 | Yes                              | Yes                              |

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**Panel D. Replication of Table 6**

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Dependent Variable: *Prob. Holdings*

| Sample:                 | High Expense<br>Active ESG Funds<br>(1) | Low Expense<br>Active ESG<br>Funds<br>(2) |
|-------------------------|-----------------------------------------|-------------------------------------------|
| <i>Treatment X Post</i> | 0.004***<br>(2.919)                     | 0.024*<br>(1.992)                         |
|                         | F=3.40*                                 |                                           |
| Observations            | 236,016                                 | 227,780                                   |
| Adj. R-squared          | 0.0258                                  | 0.148                                     |
| Control                 | Yes                                     | Yes                                       |
| Fund-YrQtr FE           | Yes                                     | Yes                                       |
| Firm FE                 | Yes                                     | Yes                                       |

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**Panel E. Replication of Table 7**


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Dependent Variable: *Prob. Holdings*

| Sample:                 | Small Portfolio     | Large Portfolio    |
|-------------------------|---------------------|--------------------|
|                         | Active ESG Funds    | Active ESG Funds   |
|                         | (1)                 | (2)                |
| <i>Treatment X Post</i> | 0.003***<br>(3.655) | 0.031**<br>(2.247) |
|                         | F=3.41*             |                    |
| Observations            | 228,261             | 203,236            |
| Adj. R-squared          | 0.0207              | 0.135              |
| Control                 | Yes                 | Yes                |
| Fund-YrQtr FE           | Yes                 | Yes                |
| Firm FE                 | Yes                 | Yes                |

---

This table presents the results of replicating Table 3-7, using the subset of treatment firms that had an increase in their Refinitiv scores between 2014 and 2015 even when using the pre-2020 vintage of Refinitiv data (available only for US firms). \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively. Reported t-statistics (in parentheses) are based on a clustering of standard errors at the fund level. An F-test for the equality of coefficients across columns is conducted. The Appendix provides variables definitions and data sources.

### SECTION III: Generalizability of our findings to recent years

In this section, we examine the association between ESG fund holdings and ESG ratings in a more recent sample of years (2018-2022), using the following two-step approach. In the first step, we regress Refinitiv ESG ratings on observable ESG performance metrics known to be inputs in the Refinitiv methodology (see Figure 6) using a firm-year panel.<sup>3</sup> The results are reported in Table A4, Column 1. The residuals from this model represent the portion of ESG ratings not explained by observed ESG performance. In the second step, we use a fund-firm-quarter panel (consistent with our main analyses) to regress ESG fund holdings on the residuals from the first regression. As shown in Table A4, Column 2, the coefficient of the residual is positive and significant. If the first-step analysis fully captured the effect of all ESG metrics on ESG ratings, such positive association would be enough to conclude that ESG ratings affect ESG fund holdings above and beyond the effect of ESG performance. In other words, it would support the notion that a mechanical effect of ESG ratings on ESG fund holdings persists in a more recent period.

However, the residuals from the first step jointly capture two components: the variation in ESG ratings explained by unobserved ESG performance metrics (hereinafter the unobserved component) and the variation that is truly 'unexplained,' i.e., not explained by observed or unobserved ESG performance (hereinafter the unexplained component). This unexplained component is akin to the mechanical increase in ratings detected with our main research design. The key issue is how to infer whether an association between ESG holdings and residuals reflects the unobserved component, the unexplained component, or both.

To shed light on this issue, we add the ESG performance metrics from the first-step regression one at a time into the second regression. In doing so, our premise is that these observable metrics

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<sup>3</sup> We include the ESG metrics reported in Fig 6 of the manuscript, except the indicator for labor-related violations (*Prob. Labor Violation*), to avoid multicollinearity issues.

are likely correlated with other unobserved ESG metrics. For example, firms with higher dollar penalties for labor violations are likely to have more workplace incidents, lower employee satisfaction, etc. A finding that the residual's coefficient remains stable and significant after adding each control variable would indicate that the unexplained component matters and that the association between holdings and residuals is not merely capturing the effect of unobserved ESG performance.

As shown in Table A4, Columns 3-7, indeed the residuals are consistently positively associated with the probability of ESG fund holdings. The coefficient on the residual is stable, ranging from 0.022 in Column 2 (without controls) to 0.018 in Column 7 (with all controls), and remains statistically significant across all specifications. While admittedly only suggestive, this association test is consistent with the results from our main specification and implies that some funds continue to rely mechanically on ESG ratings even in a more recent period.

Taken together, both tests suggest the takeaways from our cleanly identified effect using the 2015 Refinitiv coverage expansion are likely to generalize to more recent years.

**TABLE A4**  
**Generalizability of our Findings to Recent Years**

| Dependent Variable:    | (1)<br><i>Refinitiv<br/>Ratings</i> | (2)<br><i>Prob.<br/>Holdings</i> | (3)<br><i>Prob.<br/>Holdings</i> | (4)<br><i>Prob.<br/>Holdings</i> | (5)<br><i>Prob.<br/>Holdings</i> | (6)<br><i>Prob.<br/>Holdings</i> | (7)<br><i>Prob.<br/>Holdings</i> |
|------------------------|-------------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Residuals              | —                                   | 0.022***<br>(2.776)              | 0.022***<br>(2.780)              | 0.022***<br>(2.772)              | 0.021***<br>(2.738)              | 0.023***<br>(2.843)              | 0.018**<br>(2.033)               |
| Toxic Releases         | -0.010*<br>(-1.662)                 |                                  | -0.000<br>(-0.141)               | 0.000<br>(0.055)                 | 0.000<br>(0.018)                 | 0.000<br>(0.038)                 | -0.000<br>(-0.009)               |
| GHG Emissions          | -0.007<br>(-0.843)                  |                                  |                                  | -0.002<br>(-1.576)               | -0.002<br>(-1.512)               | -0.002<br>(-1.570)               | -0.002<br>(-1.575)               |
| Log \$ Labor Violation | 0.000<br>(0.282)                    |                                  |                                  |                                  | -0.000<br>(-1.345)               | -0.000<br>(-1.377)               | -0.000<br>(-1.488)               |
| Gender Diversity       | 0.419***<br>(4.243)                 |                                  |                                  |                                  |                                  | 0.015<br>(1.076)                 | 0.013<br>(0.901)                 |
| Racial Diversity       | 0.402***<br>(3.506)                 |                                  |                                  |                                  |                                  |                                  | -0.022*<br>(-1.843)              |
| Observations           | 748                                 | 329,120                          | 329,120                          | 329,120                          | 329,120                          | 329,120                          | 329,120                          |
| Adj. R-squared         | 0.353                               | 0.272                            | 0.272                            | 0.272                            | 0.272                            | 0.272                            | 0.272                            |
| Industry FE            | Yes                                 | No                               | No                               | No                               | No                               | No                               | No                               |
| Year FE                | Yes                                 | No                               | No                               | No                               | No                               | No                               | No                               |
| Fund-YrQtr FE          | No                                  | Yes                              | Yes                              | Yes                              | Yes                              | Yes                              | Yes                              |
| Firm FE                | No                                  | Yes                              | Yes                              | Yes                              | Yes                              | Yes                              | Yes                              |

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