

Rzeźnik, Aleksandra; Hanley, Kathleen Weiss; Pelizzon, Loriana

**Working Paper**

## The salience of ESG ratings for stock pricing: Evidence from (potentially) confused investors

SAFE Working Paper, No. 310

**Provided in Cooperation with:**

Leibniz Institute for Financial Research SAFE

*Suggested Citation:* Rzeźnik, Aleksandra; Hanley, Kathleen Weiss; Pelizzon, Loriana (2021) : The salience of ESG ratings for stock pricing: Evidence from (potentially) confused investors, SAFE Working Paper, No. 310, Leibniz Institute for Financial Research SAFE, Frankfurt a. M., <https://doi.org/10.2139/ssrn.3801703>

This Version is available at:

<https://hdl.handle.net/10419/243279>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

Aleksandra Rzeźnik | Kathleen Weiss Hanley | Lorian Pelizzon

# The Saliency of ESG Ratings for Stock Pricing: Evidence From (Potentially) Confused Investors

SAFE Working Paper No. 310

**Leibniz Institute for Financial Research SAFE**  
Sustainable Architecture for Finance in Europe

[info@safe-frankfurt.de](mailto:info@safe-frankfurt.de) | [www.safe-frankfurt.de](http://www.safe-frankfurt.de)

# The Salience of ESG Ratings for Stock Pricing: Evidence From (Potentially) Confused Investors\*

Aleksandra Rzeźnik<sup>†</sup>, Kathleen Weiss Hanley<sup>‡</sup>, and Loriana Pelizzon<sup>§</sup>

September 23, 2021

## Abstract

We exploit a modification to Sustainalytics' environmental, social, and governance (ESG) rating methodology, which is subsequently adopted by Morningstar, to study whether ESG ratings are salient for stock pricing. We show that the inversion of the rating scale but not new information leads some investors to make incorrect assessments about the meaning of the change in ESG ratings. They buy (sell) stocks they misconceive as ESG upgraded (downgraded) even when the opposite is true. This trading behavior exerts transitory price pressure on affected stocks. Our paper highlights the importance of ESG ratings for investors and consequently for asset prices.

**Keywords:** Corporate social responsibility, ESG rating agencies, sustainable investments, socially responsible investing, ESG, portfolio choice

**JEL Classification:** G11, G12, G23, G59, M14, Q5

---

\*We thank Patrick Augustin, Robert Engle, Lutz Hahnenstein, Yigitcan Karabulut, Christian Koziol, Vikas Mehrota (discussant), Albert Menkveld, Lilian Ng, Roberto Rigobon, Matthew Ringgenberg, Ben Sand, Zacharias Sautner, as well as seminar participants at the Tinbergen Institute, University of Amsterdam, Frankfurt School of Finance and Management, European Central Bank, Bundesbank, Frankfurter Institut für Risikomanagement und Regulierung, IWFSAS 2021 Conference, Credit 2021 Conference, University Ca' Foscari of Venice and JRC Ispra. We thank Carmelo Latino and Yelyzaveta Barkova for excellent research support. Pelizzon thanks the Leibniz Institute for Financial Research SAFE and the European Investment Bank Institute for the EIBURS project "ESG-Credit.eu - ESG Factors and Climate Change for Credit Analysis and Rating" for financially sponsoring this research.

<sup>†</sup>York University, arz@yorku.ca.

<sup>‡</sup>Lehigh University, kwh315@lehigh.edu.

<sup>§</sup>Leibniz Institute for Financial Research SAFE, Goethe University Frankfurt, Ca' Foscari University of Venice and CEPR, pelizzon@safe-frankfurt.de.

# 1 Introduction

The environmental, social, and governance (ESG) activities of firms are of increasing importance to regulators and investors.<sup>1</sup> Numerous initiatives are underway to improve the disclosure and monitoring of ESG activities.<sup>2</sup> For example, the Principles for Responsible Investment association lists up to 700 policy interventions since 2020.<sup>3</sup> The demand for “green” assets, whether by regulation<sup>4</sup> or by choice, has increased reliance on rating agencies to distill information on firms’ ESG activities. A number of papers have noted a plethora of ESG ratings providers, each with vastly different criteria that often makes ESG ratings incomparable (Berg, Koelbel, and Rigobon, 2020; Billio, Costola, Hristova, Latino, and Pelizzon, 2021; Berg, Fabisik, and Sautner, 2020, among others). Such disparate criteria have led to calls for regulation, yet a significant gap persists in our understanding of how investors use ESG ratings as well as their potential impact on asset prices.

Determining whether investors rely on ESG ratings and the extent to which their investment decisions based on those ratings subsequently affect stock prices is challenging. Causal identification remains elusive, as a change in ESG ratings often reflects news about a firm’s sustainability activities, which may affect both its discount rate as well as its future cash flow.

To disentangle the effect of ESG ratings shifts from the changes in a firm’s ESG fundamentals on stock returns, we exploit a quasi-natural shock that inverted the rating scale and thus the interpretation of the rating. This shock was caused by the adoption of a new rating methodology (provided by Sustainalytics since September 2018) by Yahoo! Finance and Morningstar in September 2019. As a consequence of the methodology change, the numerical ESG rating

---

<sup>1</sup>In the U.S., sustainable investments reached \$17.1 trillion at the beginning of 2020, which translates into a 42% increase since 2018 – [https://www.ussif.org/blog\\_home.asp?Display=155](https://www.ussif.org/blog_home.asp?Display=155). Globally, the amount could be as high as \$100 trillion – <https://www.unpri.org/news-and-press/principles-for-responsible-investment-releases-new-framework-for-signatories-to-take-action-on-the-sustainable-development-goals/5924.article>.

<sup>2</sup>The U.S. Securities and Exchange Commission is considering ways to create an effective ESG disclosure system (<https://www.sec.gov/news/public-statement/coates-esg-disclosure-keeping-pace-031121>). The European Union recently adopted regulations that require financial market participants, such as mutual funds, insurance companies, venture capitalists, and others, to publish a statement on their website describing the policies in place “where they consider principal adverse impacts of investment decisions on sustainability factors, a statement on due diligence policies with respect to those impacts, or where they do not consider adverse impacts of investment decisions on sustainability factors, clear reasons for why they do not do so” (Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019).

<sup>3</sup>For further details, see <https://www.unpri.org/policy/regulation-database>.

<sup>4</sup>See <https://www.esma.europa.eu/press-news/esma-news/esma-calls-legislative-action-esg-ratings-and-assessment-tools> and <https://www.sec.gov/oiea/investor-alerts-and-bulletins/environmental-social-and-governance-esg-funds-investor-bulletin>.

declined for over 2,000 U.S. stocks that rated by Sustainalytics. We provide evidence that these rating declines are initially misinterpreted as “downgrades” or bad news by investors, resulting in significant negative abnormal returns even in cases where the ratings changes are unlikely to be associated with a change in ESG fundamentals. Moreover, we show that retail investors and non-ESG oriented mutual funds, those types of investors that we posit are less familiar with socially responsible investing (SRI), are more likely to be confused by the new ESG ratings.

Specifically, the change in the Sustainalytics’ methodology has two main outcomes. The first is to reassess the unique components of a firm’s ESG risk exposure in order to facilitate comparisons across companies that may operate in different sectors. The second is to make the interpretation of the ESG Risk rating more logical by inverting the scale. Both the new and the old ratings share the same scale from 0 to 100, but under the old method, *higher* ratings indicate lower ESG risk while under the new method *lower* ratings indicate lower ESG risk. For example, a firm that is considered to be the best in terms of ESG risk would have previously been rated closer to 100; under the new methodology, it is rated closer to 0.

The inversion of the rating scale results in a decline in the level of the ESG rating for the majority of firms in our sample. This, in turn, leads to an unintended consequence during the transition period: a decline in the ESG rating is perceived to be a “downgrade” and this causes investors to rebalance their portfolio in such a way as to impact prices. We show that a one standard deviation decline in the ESG rating translates into a 1.08% decrease in the monthly four-factor abnormal return.

To ensure that it is the inversion of the scale and not the reevaluation of ESG risk that is driving our results, we employ two different methods to control for the potential information content of the new ratings methodology that may cause investors to rationally reassess the firm’s ESG exposure. In the first, we incorporate two variables that capture the relative change in ESG risk of the firm due to the new methodology. The first variable measures how much a firm’s ESG risk ranking changes relative to its peers before and after adoption. The second variable reflects whether the firm’s change in rating is accompanied by a reclassification of its ESG risk within Morningstar’s ESG Rating Assessment. For example, firms in high ESG risk sectors such as oil and gas may have been ranked highly in their industry under the old methodology but now have an inferior ranking when compared to all other firms. The inclusion of either of these

measures of new information does not affect our findings.<sup>5</sup>

In our second method, we restrict our sample to firms whose downgrade is not accompanied by a negative change in their actual ESG exposure: that is, firms whose ratings decline but whose ESG ranking is the same or better than their peers after adoption. These firms are unambiguously good (or at least no worse) in terms of the new ESG Risk rating, and we would expect either an increase or no change in abnormal returns. However, our results for this sample of firms remain quantitatively and qualitatively unchanged; investors perceive negative changes in ratings as a “downgrade” even when they are not. The combination of an exogenous shock to ESG ratings and investor confusion makes the interpretation of our findings clear: investor preferences for sustainable assets and their reliance on ESG ratings when making investment decisions can have significant pricing implications.

In our setting, investor preferences are made manifest through confusion; therefore, we expect that prices will eventually converge to rational values when misinformed investors correct their erroneous beliefs. Our empirical findings support this conjecture; the effect on abnormal returns is short-lived. We show that returns adjust to their pre-adoption level within five months (by February 2020).

We next examine which type of investor is most likely to be confused by the new methodology and thus drive the post-adoption abnormal returns. We investigate the trading behavior of four different types of investors: retail, institutional, short sellers, and mutual funds. We further split the mutual funds into three groups: ESG funds, GGL funds (as in Gantchev, Giannetti, and Li (2021)), and all other funds.

Retail investors are generally perceived as less sophisticated, less informed investors, or as noise traders (e.g., Calvet, Campbell, and Sodini, 2007; Barber, Odean, and Zhu, 2006). Using Robinhood data, we find that retail participation is reduced when firms experience a large decline in their ESG ratings upon adoption, even when these firms either have no change or experience an upgrade in their relative risk ranking. Conversely, they purchase stocks in firms that experience a positive change in their rating. Our findings that retail investors value sustainability are in contrast to those of Moss, Naughton, and Wang (2020), who find that retail investors do not respond to ESG press releases and conclude that “ESG disclosure is irrelevant to retail investors’ portfolio reallocation decisions” (p. 20).

---

<sup>5</sup>We do a number of robustness tests to rule out alternative explanations or potentially correlated variables.

We show that the new methodology is not accompanied by changes in the holdings of more sophisticated investors such as 13F institutions, ESG or funds that are classified by Gantchev et al. (2021) as having an incentive to improve or maintain their globe ratings. These investors do not react either because they subscribe to Sustainalytics directly and thus have been using the new ESG Risk ratings for a year prior to adoption or because they are savvy enough to understand the specific implications of the change in methodology. We do show, however, that the “Other Fund” category appears to react in a similar way to retail investors. Here, the greater the decrease (increase) in the ESG rating, the more these funds are likely to sell (buy) the security. Thus, investor confusion is not simply limited to less informed retail traders.

The finding that no portfolio rebalancing takes place for 13F institutions is not definitive because the reported transactions on Form 13F are only for long positions. Even if institutions believe that the Sustainalytics rating change itself is uninformative, they may still take advantage of confused investors by shorting the stock. Indeed, since the adoption of the new methodology could have been known in advance, we investigate whether short sellers would take advantage of unsophisticated investors’ misinterpretation of the ratings change.<sup>6</sup> We document that the size of the change in short interest is positively related to the change in ESG ratings. In other words, when confused investors are buying, short sellers increase their positions in the expectation that returns will undergo a subsequent reversal once investors realize their error. On the other hand, when confused investors are selling, short sellers reduce their positions to take advantage of the price pressure on the stock. We do not find, however, that short seller trading completely reverses the impact of confused investors.

We show that the effect of investor confusion about ESG ratings on stock prices is reduced when firms have high institutional holdings and/or their sustainability ratings are provided by other rating agencies, such as MSCI, and are publicly available. Since firms with high institutional holdings and MSCI ESG ratings tend to be larger firms, investors have alternate sources of information to determine whether the change in the Sustainalytics rating is revelatory, thus reducing the potential for confusion.

Our work builds on that of Hartzmark and Sussman (2019), who examine the introduction of Morningstar’s sustainability globes for mutual funds in March 2016. They show that

---

<sup>6</sup>Short-sellers are traditionally considered well-informed or at least able to process information. See Boehmer, Jones, and Zhang (2008); Engelberg, Reed, and Ringgenberg (2012); Cohen, Diether, and Malloy (2007); Diether, Lee, and Werner (2009); Boehmer, Huszar, and Jordan (2010).

highly-rated sustainable funds, those with five “globes,” experience significant inflows after the introduction of mutual fund sustainability rankings, whereas low-ranked funds, those with one “globe,” suffer investors’ withdrawals but find no relationship between fund flows based on ESG ratings and future fund performance. The authors motivate their study with the question “Put simply, do investors collectively view sustainability as a positive, negative, or neutral attribute of a company?” However, the link between mutual fund flows and company performance is not direct (Wardlaw, 2020); thus, the answer to the question they posit remains ambiguous. Our contribution is to directly examine this question by analyzing whether investors (both retail and institutional) incorporate sustainability information from ratings into their investment choices of *individual stocks* and whether these choices impact returns.

Our paper is also complementary to a broader literature investigating the impact of ESG-related risk on asset prices. Both theoretical and empirical papers have examined whether sustainability should be included in a modified CAPM (Pedersen, Fitzgibbons, and Pomorski (2020), and Pástor, Stambaugh, and Taylor (2021)), specific ESG-related risk factors (Hong and Kacperczyk (2009), Hong, Li, and Xu (2019), Bolton and Kacperczyk (2021) and Hsu, Li, and Tsou (2020)), and drivers of investors’ preferences for sustainable investments (Białkowski and Starks (2016), Barber, Morse, and Yasuda (2021), Riedl and Smeets (2017), Krueger, Sautner, and Starks (2020), Ilhan, Sautner, and Vilkov (2021), and Engel, Giglio, Kelly, Lee, and Stroebl (2020)).<sup>7</sup> Our finding that investors’ assessment of the level of ESG risk in a firm affects stock returns adds to this debate.

The trading behavior we document for the different types of investors also provides support for the assumption that clienteles exist that value a firm’s ESG activities independent of its effect on cash flows (e.g., Pedersen et al.’s (2020) “Type-M” investors and Goldstein, Kopytov, Shen, and Xiang’s (2021) non-monetary cash flow component). We thus conclude that some investors view sustainability as a positive attribute of a company and these views are incorporated into the firm’s share prices.

Finally, our paper adds to the literature that finds that investor confusion may have an impact on asset prices. In our paper, we take this result as given and use investor confusion to shed light on the salience of ESG ratings on stock returns. Rashes (2001) notes that investors

---

<sup>7</sup>Giglio, Kelly, and Stroebl (2021) provide a broad literature review on the interaction between climate change, socially responsible investing, and asset prices.



may confuse one ticker symbol for another, causing comovement among similar firms. Using an experimental setting, Kirchler, Huber, and Stöckl (2012) find that investor confusion about firms’ fundamental values can create bubbles. Rather than focusing on investor confusion per se, we exploit their misinterpretation of the new ratings to understand how investors use ESG ratings in their investment decisions. Thus, our results highlight the importance of the type of information these ratings convey independent of the firm’s ESG fundamental information. Our findings suggest that concerns around the reliability and quality of ESG ratings are not misplaced.

## 2 ESG Rating Methodology Change

Through a third-party vendor (Sustainalytics), Morningstar has provided sustainability (ESG) ratings for over 40,000 mutual funds and 75,000 companies worldwide since 2016 and 2018, respectively.<sup>8</sup> In September 2018, Sustainalytics launched its new enhanced ESG Risk rating.<sup>9</sup> Morningstar’s adoption of the new Sustainalytics ESG Risk rating was delayed until October 2019, when it first disclosed the September 2019 ESG Risk ratings. Sustainalytics ESG ratings are also publicly available on Yahoo! Finance’s website and an examination of the time series of ESG ratings on Morningstar and Yahoo! Finance indicates that both platforms adopted the new methodology at the same time.<sup>10</sup> Figure 1 shows the time series of Sustainalytics ESG ratings methodologies and their subsequent adoption by Morningstar and Yahoo! Finance.<sup>11</sup>

Under the old ESG rating, a company was evaluated with respect to “its general preparedness to address its ESG risks and opportunities on an industry-relative basis.”<sup>12</sup> The old ESG rating was on a scale from 0 to 100 and a firm with a high ESG rating was considered a leader in managing ESG risks within an industry. According to Morningstar, “To a large degree, it [the old ESG rating] was focused only on what is called “managed risk” without regard to how much

---

<sup>8</sup>Morningstar acquired a 40% stake in Sustainalytics in 2017 and purchased the remaining 60% in April 2020.

<sup>9</sup>Sustainalytics still produces the old ESG rating for legacy clients and continued to provide it to clients during the transition period for adopters (<https://www.sustainalytics.com/sustainable-finance/2019/04/26/webinar-understanding-esg-risk-ratings-2/>).

<sup>10</sup>Yahoo! Finance has been providing sustainability ratings from Sustainalytics for more than 2,000 companies since February 1, 2018 (<https://www.sustainalytics.com/esg-investing-news/yahoo-finance-adds-sustainability-scores/>).

<sup>11</sup>Note the name changed on Morningstar and Yahoo! Finance from “ESG” ratings to “ESG Risk” ratings in October 2019.

<sup>12</sup><https://www.morningstar.com/articles/954595/enhancement-to-sustainability-rating-emphasizes-material-esg-risk>.

ESG risk exposure a company faced in the first place.”<sup>13</sup> One drawback of the old ESG rating was the inability of investors to compare companies’ ESG scores across industries.

To address the problem of comparability and to update the score to better reflect ESG risk exposure, Sustainalytics introduced a new rating, “ESG Risk,” which first identifies the material ESG risks in each industry. For example, “in the integrated oil and gas industry, greenhouse-gas emissions, other emissions, effluents and waste from operations, management of human capital, community relations, and bribery and corruption issues have been identified by Sustainalytics as the key material ESG risks. By contrast, in the enterprise and infrastructure software industry, the most important material ESG risks include data privacy and security issues, management of human capital, and corporate governance.”<sup>14</sup> Thus, companies in different industries may have a distinct set of material ESG risks, and each of these risks have a unique weighting depending on their importance. In addition, the ESG Risk rating then incorporates any risk mitigation activities by the firm and determines the ESG Risk rating based on the unmanaged ESG risk exposure.<sup>15</sup> Finally, all ESG risks are standardized so they are on the same scale across all economic sectors.<sup>16</sup>

Sustainalytics implemented one additional change to the ratings, to make their interpretation easier, and this change is independent of any information regarding the firm’s ESG risk exposure. Although the new ESG Risk rating is still between 0 and 100, the scale is inverted. After the methodology change, a firm with a low exposure to ESG risk is given a *low* ESG Risk rating, rather than a high ESG rating as under the previous rating regime. Morningstar provides an example of how the methodology changes the interpretation of the ESG risk exposure:<sup>17</sup>

For example, in the older company ratings, Royal Dutch Shell and Microsoft both scored 75 out of 100 within their industry groups, ranking in the best quartile among their peers. (Higher scores were better in this version.) These were good scores, indicating the two companies were among the best-in-class ESG performers in their

---

<sup>13</sup> *Ibid.*

<sup>14</sup> *Ibid.*

<sup>15</sup> Note that the new ESG Risk rating eliminates the complicated calculation that included a deduction for a company’s involvement in ESG-related controversies under the old rating – <https://www.morningstar.com/articles/954595/enhancement-to-sustainability-rating-emphasizes-material-esg-risk>.

<sup>16</sup> This discussion only briefly describes a more complicated methodology as we do not focus on the specific information content of the new ratings. For more information on how the ESG Risk ratings are calculated, see [https://globalaccess-tutorials.s3.amazonaws.com/ESG%20Risk%20Rating\\_Methodology%20document.pdf](https://globalaccess-tutorials.s3.amazonaws.com/ESG%20Risk%20Rating_Methodology%20document.pdf).

<sup>17</sup> <https://www.morningstar.com/articles/954595/enhancement-to-sustainability-rating-emphasizes-material-esg-risk>.

respective peer groups. At the portfolio level, assuming their position size was the same, they would have had the same impact on the Portfolio Sustainability Score.

In the new company ESG Risk rating, by contrast, Royal Dutch Shell's score is 34, an indicator of High ESG Risk, while Microsoft's score is 13.8, an indicator of Low ESG Risk. While both companies do reasonably well managing the material ESG risks they face relative to their peers—one reason why their old scores were similar—Royal Dutch Shell operates in an industry that carries far more ESG risk exposure. As a result, its ESG Risk rating has a much more negative impact on the Portfolio Sustainability Score compared with Microsoft's rating.

That said, the new rating remains sensitive to best-in-class comparisons. For example, a portfolio that holds an oil company would be better off with exposure to Royal Dutch Shell, with its ESG Risk rating of 34, than with exposure to ExxonMobil, which has an ESG Risk rating of 40.5.

The new methodology and the subsequent change in the ESG rating may create some confusion for unsophisticated investors, at least in the short-term. If some investors incorporate the ESG rating in their portfolio but do not understand that the scoring scale has been inverted, then they may make incorrect investment decisions. Thus, we predict that less sophisticated investors, those who are most likely to rely on information from readily available sources such as Morningstar and Yahoo! Finance, are expected to simply respond to the change in rating without understanding the specific details of the new rating methodology. In other words, these less informed investors may not understand the rating change and interpret a reduction in the ESG rating as a “downgrade” or worse score, and an increase as an “upgrade” or better score, even when this may not be the case. If investors value ESG ratings, then this confusion should result in purchases of firms with an increase in their ESG rating and sales of firms with a decrease in their ESG rating. Moreover, these actions are expected to affect asset prices and their effect is not due to any new ESG fundamental information regarding the company but simply the salience of ESG ratings.

Informed investors, such as institutional investors and ESG-focused mutual funds, are expected to respond to the new methodology as intended (e.g., purchasing firms with better ratings) or not at all because they have had access to the new Sustainalytics Risk ratings prior to October 2019 (so the adoption by Morningstar and Yahoo! Finance has already been incorporated into their portfolio decisions) and/or they are able to better understand the construction and information content of the new ESG Risk rating.

Finally, since the announcement of the ratings change was made by Morningstar in July

2019, we predict that short sellers may have taken advantage of the possibility of unsophisticated investor misinterpretation. If so, we would then expect an increase (a decrease) in short selling for firms that experience an increase (decline) in their ESG ratings.

As we note above, the change in the ESG rating under the new methodology could contain new information on the ESG risk exposure of the firm that may be relevant to investors. It is important, therefore, to isolate this new information in order to test whether some investors misinterpret the nature of the rating change rather than rationally respond to a change in ESG risk. Ideally, we would like to control for the counterfactual – i.e., the October 2019 ESG Rating had the new methodology and the change in rating scale had not been introduced. However, such a measure is not available to us so, we address this problem in several ways. First, we control for any change in the relative ranking of the firm in terms of ESG scores. As noted in the example above, Microsoft’s ranking among all firms is unlikely to change after the adoption of the new methodology. In contrast, Royal Dutch Shell’s ranking is likely to worsen because it was previously highly ranked in its industry but is now considered to have more ESG risk exposure relative to other firms. Thus, we assume that if there is (is not) a change in the relative ranking of the firm, then there is (is not) new information on the sector-specific exposure of the firm to material ESG risk.

Second, we use an alternative measure of a given firm’s relative sustainability ranking provided by Morningstar. Specifically, we control for whether the firm experienced a change in its Morningstar ESG Rating Assessment, which is similar to the globe rating used in the Morningstar Sustainability Rating for funds (Hartzmark and Sussman (2019); hereafter referred to as “Morningstar Classification”). Finally, during the quarter preceding the rating change, a firm may undergo an ESG event that could affect its rating. For example, an oil and gas company might experience an oil spill in September 2019 that could change its ESG Risk rating, but the effect of this event on ESG exposure on ratings would be difficult to determine as it coincides with the adoption of the new ESG Risk rating by Morningstar and Yahoo! Finance. Since we have the firm’s Sustainalytics ESG Risk rating during the pre-adoption period, we can control for any actual changes in the ESG Risk rating around this time that may reflect a change in a firm’s ESG risk exposure or related activities.

### 3 Data and Variable Construction

We collect ESG ratings from two sources for all companies trading on the NYSE, NASDAQ, and Amex exchanges between June 2019 and January 2020. First, we obtain both the old ESG ratings and the new ESG Risk ratings from Morningstar Direct and confirm that the same ratings are reported on Yahoo! Finance. Second, we collect the new ESG Risk ratings during the transition period (June 2019 to September 2019) from Sustainalytics.

Given that Morningstar reports Sustainalytics monthly ESG ratings at the beginning of the following month, the first time the new September ESG Risk rating is available is at the beginning of October 2019. Thus, we define an indicator variable,  $POST_t$ , equal to one if the month is equal to or later than October 2019 to capture the post-adoption period of the new ESG Risk rating.

We define four measures that capture the change in a firm's ESG rating as reported by Morningstar and Yahoo! Finance. First,  $\Delta ESG_i$  is defined as the difference in stock  $i$ 's ESG rating between October 2019 (the first month when the new ESG Risk rating is available at Morningstar and Yahoo! Finance) and September 2019 (the last month before the adoption of the new methodology). Second,  $\overline{\Delta ESG}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.

Figure 2 shows the distribution of the average old ESG rating in the three months (July-September 2019) before the adoption in Panel A and the average new ESG Risk rating in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance in Panel B. The inversion in the ratings is evident from the two graphs. In Panel A, most firms have an old average ESG rating between 40 and 80; in Panel B, most firms have a new average ESG Risk rating between 10 and 60. In Table 1, Panel A, the average ESG rating is 50.51 before adoption and 30.38 after, translating into an overall average change of -20.17 (Panel B). Further evidence of the impact of the new methodology on numerical ratings is presented in Figure 3, which plots the difference between the two ratings,  $\overline{\Delta ESG}_i$ ; evidently, most firms experience a decline in rating.

The final measures of the change in a firm's ESG ratings are two indicator variables that

isolate the direction of the change in rating. The first is ESG PSEUDO- DOWNGRADE<sub>*i*</sub>, which is equal to one if stock *i*'s change in its average ESG rating is in the lowest quartile of the  $\Delta\overline{\text{ESG}}_i$  distribution. Firms that have a value of one for ESG PSEUDO- DOWNGRADE<sub>*i*</sub> have the largest negative change in their ESG rating. For example, Microsoft has a value of one for this variable because it experienced a sizable change in its ESG rating from 75 to 13.8. In other words, firms that have a ESG PSEUDO-DOWNGRADE<sub>*i*</sub> equal to one generally have very low ESG risk both before and after the adoption, because the new methodology only changes their rating but provides no additional information on the firm's ESG risk. This means that the decline in ESG rating for firms that we classify as ESG PSEUDO-DOWNGRADED is not an indication of worsened ESG exposure. Indeed, we find that most firms in this category, 86%, have the same or better Morningstar Classification after the change.

The second indicator variable is similar to the first but captures whether the firm has been "upgraded." Specifically, we define ESG PSEUDO-UPGRADE<sub>*i*</sub> as an indicator variable equal to one if stock *i*'s pre-adoption ESG rating is lower than its post-adoption ESG Risk rating. Unlike the previous downgrade indicator variable, we do not restrict an observation to any particular quartile since only 6% of the firms in our sample experienced an increase in their ESG ratings.

The change in ESG rating reflects not only the inversion of the scale, but also potential new information on the relative ESG risk of the firm. This new information may cause some investors to rationally reassess the ESG risk of the firm and trade accordingly. To control for change in a firm's ESG risk exposure due to a change in the firm's underlying fundamentals, we include three additional variables to confirm the robustness of our results. The first variable is the change in the relative ranking of the firm before and after adoption. To construct this variable, we rank each firm from 1 to 2,310 (the total number of firms in our sample), where one is the firm with the *best* ESG rating, that is, the firm with the lowest ESG risk. In the pre-adoption period, the number one firm would have the highest ESG rating; in the post-adoption period, the number one firm would have the lowest ESG Risk rating. Ties are given the same ranking and the next ranking reflects the number of ties in the previous ranking. We define  $\Delta\text{ESG RANK}_i$  as the difference in the stock's relative ranking, scaled by the number of firms, in the first month (October) after the adoption and in the last month (September) before the adoption.

Panel A of Figure 5 presents the distribution of the change in ranking of the firms around

the adoption of the new methodology. Most firms show little change in their ranking as the distribution is centered on zero (also confirmed in Panel B of Table 1) but there are firms who move rankings by more than 25% in either direction.

The second variable that incorporates a potential change in the firm’s actual ESG risk exposure is the change in the Morningstar Classification. At the time of the adoption of the new methodology, Morningstar also changed the definition of each “globe” in the classification but kept the same five-point scale. Table 2 Panel A defines both the old and the new categories. Under the old ESG rating methodology, firms are assigned to a classification based upon their ranking in their industry. Under the new ESG Risk rating methodology, firms are assigned to a classification based upon the level of their ESG Risk rating. Given that the same number of categories is used under both rating regimes, we define the classifications numerically from 1 to 5, with 1 being the best ESG category and 5 the worst (to mimic our ranking variable).

Table 2 presents the definition of each category and the transition matrix of each firm’s classification. Fewer firms are classified as having the best ESG risk after adoption (9 are classified as Negligible or Low) than before adoption (where 16 were classified as Industry Leaders). A number of firms move up in their classification after the new methodology adoption. For example, 265 firms that were listed in the Average Performer category pre-adoption are now in the Low category post-adoption. The majority of firms pre-adoption are considered average performers (57%), but post-adoption this number drops to only 33%. In the worst ESG categories pre-adoption, Underperformer and Industry Laggard, a number of firms descend a notch or two in their figures, i.e., their classification improves. Overall, firms below the diagonal improve their ranking (31%) and firms above the diagonal worsen their ranking (28%), while those on the diagonal do not change classification (41%).

Panel B of Figure 5 shows the percentage of firms that move up or down a category. Evidently, the majority of firms remain in their original classification, although many move up or down one or two notches. Panel B of Table 1 shows that the median change in the Morningstar Classification is zero. To capture changes in a firm’s Morningstar Classification, we construct  $\text{CLASSIFICATION\_UPGRADE}_i$  ( $\text{CLASSIFICATION\_DOWNGRADE}_i$ ), an indicator variable equal to one if the stock has an increase (decrease) in its Morningstar Classification after the adoption of the new methodology.

The third variable is designed to capture the change in actual ESG risk over the two transi-

tion months as assessed by Sustainalytics. For example, a firm could experience an ESG event or implement new policies in September 2019 that could have affected its ESG rating for October irrespective of the methodology change. Although Morningstar and Yahoo! Finance adopted the new ESG Risk rating in October 2019, it had already been available from Sustainalytics since September 2018. Therefore, we include  $\Delta\text{SUSTAINALYTICS RATING}_i$  defined as the difference in firm  $i$ 's average ESG Risk rating in the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption.

Panel A of Figure 4 shows the change in firms' Sustainalytics ESG Risk rating before and after adoption. As shown in the figure and Panel B of Table 1, most firms do not experience any meaningful change in their ESG Risk rating during the transition period, as most of the distribution is centered at zero. Indeed, this figure shows that  $\Delta\text{SUSTAINALYTICS RATING}_i$  is almost zero (between -5 and +5) for 98.6% of stocks.

Panel C of Table 1 presents the correlation matrix for our variables of interest. Both  $\Delta\text{ESG RANK}_i$  and  $\Delta\text{MORNINGSTAR CLASSIFICATION}_i$  are highly correlated. Thus, we do not include both of them in the same specification. Otherwise, the correlations between  $\Delta\text{ESG}_i$  and all other variables are generally low.

We are interested in whether investors' perceptions of the new ESG Risk ratings affect their trading behavior. Therefore, we collect daily returns, prices, and shares outstanding from the Center for Research in Security Prices (CRSP). To merge the ESG ratings data with the CRSP stock database, we convert the ISINs of U.S. companies (starting with 'US') from Morningstar into 8-digit CUSIPs. We eliminate small 'penny' stocks by requiring that the stock price at the end of the beginning of the sample period is greater than \$1.

To compute abnormal returns, we download information on daily and monthly risk factors for Fama and French (1993) three- and Carhart (1997) four-factor model from Kenneth French's website. We use daily stock excess returns over a 12-month period from July 2018 to June 2019 to estimate risk factor loadings and expected returns for each stock. Then, we compute abnormal returns in the following month by subtracting the firm's expected return from its actual return.<sup>18</sup>

Some types of investors are more likely to be confused by the change in ESG rating method-

---

<sup>18</sup>Our results are robust when using 12-month rolling-window regressions beginning in September 2018 or two sub-periods to estimate loadings on risk factors: from July 2018 to June 2019 (for the pre-adoption period) and from October 2018 to September 2019 (for the post-adoption period).



ology than others. Therefore, we collect information on the participation or holdings of four different types of investors: retail, institutional, mutual funds, and short sellers. We download data on the number of retail investors holding a given stock from the Robinhood ([Robintrack.net](https://robintrack.net)) website. Robintrack provides hourly intra-day information on the number of investors holding each stock.<sup>19</sup> We then average the reported number of retail investors holding the stock over the day and aggregate the daily means into monthly averages.<sup>20</sup>

Robinhood retail investor participation measure captures the number of investors currently holding a stock and *not* the number of shares of a given stock. Thus, there is no direct way to adjust retail investor participation for a firm’s importance or size since we do not have information on the total number of investors in the firm. We therefore follow Coval and Stafford (2007) and divide the mean number of Robinhood investors holding a stock  $i$  in month  $t$ ,  $\# \text{RETAIL}_{i,t}$ , by the average dollar trading volume from April to June 2019 (one quarter before the control period).<sup>21</sup> Finally, we merge the Robinhood data with the CRSP dataset using a stock’s ticker symbol.

We collect quarterly 13F institutional ownership from Thomson Reuters and aggregate holdings across all 13F institutional investors at a stock level. For the purpose of our analysis, our data consists of 13F long positions for the two quarters surrounding the adoption of the new ESG Risk rating methodology: at the end of September 2019 (the last quarter-end before the old ESG rating ends being reported) and December 2019 (the first quarter-end after the new ESG Risk rating begins being reported). In contrast to the Robinhood retail investor participation measure, the aggregated 13F ownership of a stock is expressed in the number of shares. Thus, we compute  $13F_{i,t}$  by dividing the aggregated position of a stock held by all 13F institutions at the end of a quarter by the number of shares outstanding.

For each mutual fund, we obtain data from Morningstar on the number of shares each mutual fund holds at the end of each quarter surrounding the adoption of the new methodology (September 2019 and December 2019). We do not collect intra-quarter information for two reasons. First, the data is more widely available at the end of the quarter than in months within the quarter. Second, it makes the determination of the holdings of ESG funds analogous

---

<sup>19</sup>In August 2020, Robinhood closed down the API for Robintrack, making data available only to this date.

<sup>20</sup>Our results remain unchanged if we use the median number of investors instead.

<sup>21</sup>Dividing the number of retail investors by the market capitalization in a previous quarter yields very similar results.

to the approach used for 13F institutions.

We further classify mutual funds into three categories and compute the holding of each type of mutual fund by dividing the aggregated position of all funds in a firm at the end of a quarter by the number of shares outstanding. Using textual analysis on keywords, we classify any U.S. mutual funds actively investing in U.S. equities in the Morningstar database as an ESG  $FUND_{i,t}$  if it has the following strings in its name: *esg*, *sust*, *impact*, *rspnb*, *env*, *scl*, *eco* (but not “econ”), *social*, and/or *green*. The sample of 58 ESG funds are listed in Appendix A.

Gantchev et al. (2021) argue that funds very close to Morningstar globe thresholds are more likely to try to improve or maintain their globe rating; one may wonder, therefore, if our results are driven by this effect. We follow their methodology and classify a mutual fund as a GGL  $FUND_{i,t}$  if its globe rating improves between September and December 2019. Finally, any mutual fund that is not considered an ESG or a GGL fund is classified as an OTHER  $FUND_{i,t}$ .

Last, we collect information from Compustat – Capital IQ on the month-end short interest for NYSE, Amex, and NASDAQ firms for the six month period around the introduction of the new methodology. We then average short interest during the three months before the adoption from July 2019 to September 2019 and during the three months after the adoption from October 2019 to December 2019.<sup>22</sup> We construct  $SHORT\ INTEREST_{i,t}$  by dividing the average number of shares sold short during the pre- or post-adoption period by the number of shares outstanding during the same period.

Table 1 reports summary statistics for the firms before (July 2019 to September 2019) and after the Morningstar ESG rating methodology change (October 2019 to December 2019). Consistent with Figures 2 and 3, the average ESG rating declines from 50.51 to 30.38. Mean returns change depending on whether we use a one-, three-, or four-factor model. Abnormal returns increase over the sample period when estimated with a one-factor model, and decrease when estimated with a three- or four-factor model.

The mean number of investors on the Robinhood platform holding a stock increases slightly in the periods surrounding the introduction of the new ESG Risk ratings. In the pre-adoption period, there are approximately 2,750 retail investors in a given stock, rising to 2,920 post-adoption. However, the median number of investors is much smaller, approximately a tenth of

---

<sup>22</sup>Although we ignore the short interest reported in the middle of the month, our results are robust to its inclusion in the average short interest.

the size of the mean. 13F institutional and all types of mutual fund holdings are roughly similar pre- and post-adoption (approximately 52% of shares outstanding). ESG Funds hold 0.07% of shares outstanding while GGL Funds own just over 0.60%. The share ownership of other funds is 23%.

## 4 Empirical Results

Our empirical strategy is to test the differences in abnormal returns and ownership surrounding the adoption of the new ESG Risk rating by Morningstar and Yahoo! Finance. If ESG ratings are salient to investors but some investors are unsophisticated, the change in rating scale may result in misinterpretation about its meaning. In other words, investors who rely on the ratings available through Morningstar and Yahoo! Finance to provide them with information about a firm’s ESG exposure, but who are unlikely to do their own due diligence, may mistakenly interpret the inversion of the rating scale in the wrong way.

If enough investors are confused by the inversion of the rating and rebalance their portfolio, then we expect that abnormal returns will be negative when the rating declines and positive when the rating increases, even after controlling for any new information that the change in rating may contain regarding ESG risk. Moreover, we predict that this effect will be primarily driven by the changes in participation by less informed investors and holdings of short sellers, but not by the change in holdings of sophisticated institutional investors such as those who report on Form 13F or funds whose primary objective is sustainable investing since they are more likely to understand the implications of the change.

### 4.1 Change in abnormal returns

We begin our analysis by examining the effect of the ESG rating methodology change on the firm’s abnormal returns. We estimate the following difference-in-difference specification:

$$\text{ARET}_{i,t} = \gamma_0 + \gamma_1 \Delta \text{ESG}_i \times \text{POST}_t + D_i + D_{s,t} + \varepsilon_{i,t}, \quad (1)$$

where  $\text{ARET}_{i,t}$  is stock  $i$ ’s abnormal return in month  $t$  computed using either a single-, three-, or four-factor model.  $\Delta \text{ESG}_i$  denotes stock  $i$ ’s change in its ESG rating due to the adoption of the new Sustainalytics ESG Risk rating by Morningstar and Yahoo! Finance. Thus  $\Delta \text{ESG}_i$

captures stock  $i$ 's exposure to the treatment. Abnormal returns of stocks, whose ESG ratings changed only slightly, are expected to remain unaffected by the methodology change. We measure the exposure to the treatment, that is, the change in the ESG rating in four ways: (1)  $\Delta\text{ESG}_i$ , the difference in the firm's ESG rating between October 2019 and September 2019; (2)  $\Delta\overline{\text{ESG}}_i$ , the difference in the average firm's ESG ratings in the three months (October-December 2019) after and the three months (July-September 2019) before the adoption; (3)  $\text{ESG PSEUDO-DOWNGRADE}_i$ , an indicator variable equal to one if  $\Delta\overline{\text{ESG}}_i$  is in the lower quartile, and zero otherwise; and (4)  $\text{ESG PSEUDO-UPGRADE}_i$ , an indicator variable equal to one if  $\Delta\overline{\text{ESG}}_i$  is positive, zero otherwise.  $D_i$  and  $D_{s,t}$  represent firm and industry  $\times$  year-month fixed effects. Standard errors are clustered at the firm level.<sup>23</sup>

If our conjectures about the effect of investor confusion are correct, then we expect the coefficient on the interaction terms that include our measures of ESG rating changes and  $\text{POST}_t$  to be positive and significant, meaning that, a decline (increase) in  $\Delta\text{ESG}_i$  would induce investors to sell (buy) the stock, causing negative (positive) abnormal returns from October 2019 onward. We report the regression estimates of equation (1) in Table 3. Panel A presents the baseline regression. Single-factor abnormal returns are presented in columns (1) to (4), three-factor abnormal returns are presented in columns (5) to (8), and in the last four columns, we show Carhart (1997) four-factor abnormal returns.

The coefficient estimates on the interaction terms,  $\Delta\text{ESG}_i \times \text{POST}_t$  and  $\Delta\overline{\text{ESG}}_i \times \text{POST}_t$ , are indeed positive and highly statistically significant in all specifications, regardless of how abnormal returns are constructed. This implies that firms that have greater declines (increases) in their new ESG Risk rating relative to their old ESG rating, experience more negative (positive) abnormal returns after adoption. In terms of economic significance, a one standard deviation decrease in a given firm's ESG rating translates into roughly a 1.08 percentage point drop in monthly abnormal returns.

To further understand the relationship between the change in the ESG rating and abnormal returns, we investigate whether abnormal returns are differentially impacted by firms that experience large ESG rating declines,  $\text{PSEUDO-ESG DOWNGRADE}_i$  and firms that experience

---

<sup>23</sup>Our time series consists of only six months around the methodology adoption. According to Angrist and Pischke (2008), six clusters are not sufficient for the standard cluster-time adjustment. See Chapter 8.2.3 'Fewer than 42 Clusters' of *Mostly Harmless Econometrics* for more details. Our results are robust to clustering at the industry  $\times$  year-month level. See Table IA.1 in the internet appendix.

an increase in their rating,  $\text{ESG PSEUDO-UPGRADE}_i$ . In columns (3), (7), and (11), we compare the average abnormal returns of firms with very large negative changes in their ESG ratings to the abnormal returns of all other firms. The coefficient on the interaction term,  $\text{ESG PSEUDO-DOWNGRADE}_i \times \text{POST}_t$ , is negative and statistically significant, indicating that returns are lower for firms with very large declines in their ESG ratings compared to all other firms. In economic terms, this translates to a decrease of between 0.66% and 1.56% in monthly abnormal returns depending on the specification. It is important to remember that the majority of the firms with a value of one for  $\text{ESG PSEUDO-DOWNGRADE}_i$  also do not experience any change in their Morningstar Classification. Therefore, this is preliminary evidence that the decline in abnormal returns documented here is most likely due to a misinterpretation in the meaning of the change in the scale of the ratings and is unlikely to be driven by investors rationally trading on new ESG information.

In columns (4), (8), and (12), we include the  $\text{ESG PSEUDO-UPGRADE}_i \times \text{POST}_t$  in the specification. We find that this interaction term is positive but insignificant. One reason for this is that too few firms experience an upgrade within an industry sector for us to have enough statistical power to detect a relationship. For example, in half of the industries, no firm experiences an ESG rating upgrade. As confirmation of our conjecture, the insignificant coefficient on  $\text{ESG PSEUDO-UPGRADE}_i \times \text{POST}_t$  becomes positive and highly significant when we remove industry $\times$ year-month fixed effects and only include year-month fixed effects (see Table IA.2 in the internet appendix).

To better understand the relationship between the change in ESG rating and abnormal returns, we use a semi-parametric regression as in Goldstein, Jiang, and Ng (2017), where the relationship between ESG ratings and abnormal returns is allowed to assume a flexible function form. The regression specification has as the dependent variable the firm's change in its single-factor abnormal return and as the independent variable the demeaned change in a firm's average ESG rating after adoption. Figure 6 presents the outcome of this analysis. The orange horizontal dashed line represents the zero change in a firm's abnormal return, while the vertical dashed line represents the mean change in ESG rating. The shaded area represents the 95% confidence interval.

It is evident from the graph that the change in a firm's abnormal returns is associated with a corresponding change in ESG rating relative to the mean. The change in abnormal returns

declines as the change in ESG rating becomes more negative and increases as the change in ESG rating becomes more positive. These results suggest that investors who value ESG ratings have an impact on stock returns even when they may incorrectly assess the meaning of the change in the firm’s ESG risk exposure. Next, we strengthen our argument that it is confusion and not a change in a firm’s ESG fundamentals that is driving the results by examining both the impact of potential new information on returns as well as restricting the sample to only those firms for which the interpretation of the change is unambiguous.

#### 4.1.1 Effect of new information on abnormal returns

In order to disentangle the inversion of the scale from new information about a firm’s ESG risk exposure conveyed by the change in methodology, we control for two possible types of new information. The first is the possibility that an ESG event (e.g., oil spill) may occur during the transition period from the old ESG rating to the new ESG Risk rating. Using the same specifications as in Panel A of Table 3, we add  $\Delta\text{SUSTAINALYTICS RATING}_i$ , the change in the Sustainalytics Risk rating over the transition period, as an independent variable in Panels B and C.

We also incorporate additional information that is generated by virtue of the new Sustainalytics ratings methodology on the change in the relative ESG risk of the firm by controlling for  $\Delta\text{ESG RANK}_i$  in Panel B, which is the difference in the stock’s relative ESG Risk ranking among all other firms and  $\text{CLASSIFICATION UPGRADE}_i$  ( $\text{CLASSIFICATION DOWNGRADE}_i$ ) in Panel C, which is an indicator variable equal to one if the firm becomes less (more) ESG risky according to the Morningstar Classification after the adoption of the new methodology.

In Panel B of Table 3, the coefficient of  $\Delta\text{SUSTAINALYTICS RATING}_i$  is never significant, indicating that a change in the average Sustainalytics ESG Risk rating does not impact returns. In other words, most firms do not experience an ESG event that could affect investors’ trading behavior and their impact on stock returns.

The coefficient of the change in the relative ranking of the firm,  $\Delta\text{ESG RANK}_i$ , is significant in columns (1)-(4), where the dependent variable is the single-factor abnormal return and the sign is in the correct direction. Abnormal returns are higher if the firm’s rank improves – i.e., becomes lower. The coefficient on this variable is insignificant in all other remaining columns when additional factors are included in the abnormal return model. More importantly, the

inclusion of these variables does not change the overall significance or the size of the coefficients on any of our main independent variables from Panel A or the level of the  $R^2$ .

A similar conclusion can be drawn from Panel C of Table 3. This panel includes indicator variables capturing whether the firm experiences a downgrade or an upgrade in its Morningstar Classification. The coefficients on the Morningstar Classification upgrade variable are always insignificant and remain generally insignificant for the Morningstar Classification downgrade variable. As with the previous panel, the statistical significance of the change in ESG ratings variables and the  $R^2$  of the specifications remain unaffected compared to Panel A. Thus, we conclude that both Panels B and C support our assumption that the relationship between the change in ESG rating after the adoption of the new methodology and subsequent abnormal returns is due to investor misinterpretation and not to new information about the firm's ESG risk exposure.

Finally, we provide further confirmation that investor misinterpretation is the likely driver of our results in Table 4. This table replicates our baseline analysis but restricts the sample to firms whose interpretation of the ratings change is clear. We use a subsample of firms that experience a decline in their ESG ratings but have either no corresponding change or an improvement in their relative sustainability ranking.<sup>24</sup> In other words, this subsample consists of firms similarly or better ranked under the new ratings regime. Thus, we exclude the possibility that an informed investor would view these firms as having been correctly downgraded in terms of ESG ratings after the adoption and therefore, be motivated to sell the security. Approximately 50% of the firms in our sample meet these criteria.

Less informed investors, however, will simply look to the ratings change without understanding the implications or doing due diligence. If our results are driven by the misperception of unsophisticated investors that a firm's ESG risk exposure has increased when its rating declines, then our results should remain the same when we restrict the sample to these firms. Table 4 presents the results for this set of firms; they remain similar to the results for the full sample. The coefficients of  $\Delta\text{ESG}_i$  and the corresponding  $R^2$  are relatively similar to Panel A of Table 3. As further evidence that investors are confused by the new rating methodology, the best firms in terms of ESG risk exposure, those in the lowest quartile of changes

---

<sup>24</sup>Our results are robust when restricting the sample to firms with negative changes in their ESG ranking and also those with no change or an upgrade in their Morningstar ESG Rating Assessment classification.

in ESG rating, continue to experience negative abnormal returns. We find that the coefficient on  $\text{ESG PSEUDO-DOWNGRADE}_i \times \text{POST}_t$  is negative and significant. (Note there is no  $\text{ESG PSEUDO-UPGRADE}_i$  by construction.) Overall, these results highlight the importance of ESG ratings to investors and the potential for investors' misinterpretation of these ratings to have a significant impact on firms' abnormal returns.

#### 4.1.2 Additional robustness tests

In addition to the tests above, we conduct four additional robustness tests that capture the potential for the new rating to either be correlated with an ESG event or contain new information. These results are presented in the internet appendix. First, we re-run the analysis but exclude firms classified as fossil fuels (NAICS=2211) or oil and gas extraction (NAICS=2111), as these firms could be more likely to experience an ESG event and are most affected (downgraded) by the new methodology. As shown in Table IA.3, our results remain unchanged.

Second, we include an additional measure of the potential for the firm to have an information-driven change in their ESG rating: the change in the MSCI ESG rating ( $\Delta\text{MSCI}_i$ ), which is not related to the methodology change by Sustainalytics. This variable is measured as the difference in the MSCI ESG rating between the three months after the adoption by Morningstar of the new methodology and the three months before (similar to  $\Delta\text{SUSTAINALYTICS RATING}_i$ ). Since not all firms have an MSCI ESG rating, we also include an indicator variable equal to one in the specification if the firm has an MSCI ESG rating, zero otherwise. Again, as shown in Table IA.4, our results are robust to the inclusion of this alternate measure of new information. Moreover, like our findings on  $\Delta\text{SUSTAINALYTICS RATING}_i$ , none of the coefficients of the change in the MSCI index are significant.

Third, around the same time as the adoption of the new Sustainalytics methodology by Morningstar, the Dow Jones Sustainability Index was reconstituted. We include  $\text{DOW JONES}_i$ , a dummy variable equal to one, if a stock was part of the Dow Jones Sustainability Index before and after reconstitution in the fall of 2019. To capture the effect of the reconstitution on returns, we include  $\text{ADD DOW JONES}_i$  ( $\text{DELETE DOW JONES}_i$ ), an indicator variable equal to one if a stock was added to (deleted from) the Dow Jones Sustainability Index in the fall of 2019 in Table IA.5. As with the previous robustness tests, the inclusion of this reconstitution in the specification does not change our findings and is consistent with Berk and van Binsbergen



(2021), who examine the inclusion/exclusion of firms from the FTSE USA 4Good.

Fourth, we include a measure of demand by GGL funds for stocks with high sustainability ratings as a potential driver of the returns after the adoption of the new methodology, as in Gantchev et al. (2021).  $\Delta\text{GGL FUNDS}_i$  is defined as the abnormal trading in stock  $i$  between September 2019 and December 2019 by funds whose globe rating improved during this period:

$$\Delta\text{GGL FUNDS}_i = \sum_{f=1}^F \frac{\text{SHARES}_{f,i,\text{Dec } 2019}^U - \text{SHARES}_{f,i,\text{Sep } 2019}^U}{\text{SHARES OUTSTANDING}_{i,\text{Sep } 2019}} - \text{the average change between September 2019 and December 2019 in the holdings of stock } i \text{ by all other funds in our sample,} \quad (2)$$

where  $\text{SHARES}_{f,i,\text{Sep } 2019}^U$  is the number of shares of stock  $i$  held at the end of September 2019 by fund  $f$ , which experienced globe rating upgrade ( $U$ ) between September 2019 and December 2019.

Table IA.6 presents the results. We find confirmation that the trading behavior of funds with an incentive to improve their own ratings affects returns. However, their inclusion in the specification neither reduces the significance of the coefficients on  $\Delta\text{ESG}_i$  nor changes the interpretations of our findings. Thus, we conclude that our findings are robust to a number of alternative explanations.

#### 4.1.3 The dynamics of abnormal returns

The findings of the previous section indicate that investor reliance on ESG ratings and their confusion about the new methodology impacts stock prices. This impact, however, should be short-lived and ultimately reversed as investors recognize their error and reverse their positions and/or market forces correct it. To test whether this is the case, we estimate a dynamic version of the regression equation (1) as follows (C  lerier and Matray, 2019):

$$\text{ARET}_{i,t} = \gamma_0 + \sum_{e=-4, e \neq -1}^5 \gamma_e \Delta\text{ESG PSEUDO-DOWNGRADE}_i \times \text{D}(e)_t + \text{D}_i + \text{D}_t + \varepsilon_{i,t}, \quad (3)$$

where  $\text{ARET}_{i,t}$  is the abnormal four-factor monthly return and  $\text{D}(e)_t$  is equal to one exactly  $e$  periods after (or before if  $e$  is negative) the implementation of the new ESG rating methodology. We use September 2019 as the reference month.  $\text{D}_i$  and  $\text{D}_t$  denote stock and year-month fixed

effects and standard errors are clustered by firm. The main coefficient of interest is  $\gamma_e$ , which captures the differential effect over time for firms that experience the most severe decline in the value of their ESG rating (treated firms where  $\text{ESG PSEUDO-DOWNGRADE}_i=1$ ) against those that have less severe declines (control firms where  $\text{ESG PSEUDO-DOWNGRADE}_i=0$ ). We expect that the difference in abnormal returns will become more negative after adoption, as investor confusion is greatest for firms with the largest declines in ESG rating. The difference in returns will most likely reverse once confused investors as they become more informed about the implications of the new methodology or arbitrageurs eliminate the effect.

Figure 7 plots the  $\gamma_e$  coefficients together with the 95% confidence intervals. In the months prior to the adoption of the new methodology, the two types of firms do not have statistically significant differences in their abnormal returns relative to September 2019. Once Morningstar and Yahoo! Finance begin disclosing the new ESG Risk ratings in October, firms with the largest declines in their ESG ratings begin to experience significantly lower abnormal returns than control firms, and this becomes most pronounced in November 2019. The magnitude of the effect is quite large as the abnormal returns of the ESG Pseudo-Downgraded firms drop by 2.5 percentage points more than the control firms one month after the methodology change. However, this difference in returns is short-lived and persists only until January 2020, when the gap between the abnormal returns of the treated and control firms again begins to converge. By the end of February 2020, five months after the adoption, the abnormal returns between the two types of firms are no longer statistically different. Thus, any investor confusion about the meaning of the change in the ESG rating scale has been either clarified or its effect eliminated a few months after adoption.

The results of this section suggest that investors find ESG ratings salient even when they may be confused about their interpretation. When investors believe a firm's ESG risk has increased, even without any change in ESG fundamentals, their trading behavior results in negative abnormal returns, at least in the short-run. Next, we examine whose trading behavior may be driving the change in stock prices.

## 4.2 Change in investor participation and ownership

The misinterpretation of some investors about the new methodology results in price pressure as they sell firms that experience a decline in their ESG rating and buy firms that experience

an increase. Since confusion is more likely among less informed investors, we anticipate that changes in ESG ratings will be associated with a change in the participation of retail investors. Sophisticated investors, such as institutional investors and ESG-oriented funds, are less likely to misunderstand the implications of the ESG rating change or have already incorporated the change when Sustainalytics revised the methodology in September 2018. Therefore, we expect that these investors will not rebalance their portfolio in response to the adoption of the new ratings regime by Morningstar and Yahoo! Finance. Finally, since Morningstar announced that it would adopt the new ESG Risk rating in July 2019, informed investors such as short sellers, may take advantage of the confusion of less informed investors. (It is also possible, of course, that institutional investors may similarly take the other side of less informed investors' trades.) In our analysis, we consider whether retail participation, institutional and mutual fund ownership, and short interest change in relation to the shift in the firm's ESG rating.

We follow Mian and Sufi (2011) and estimate the generalized difference-in-difference specification of the form:<sup>25</sup>

$$\Delta\text{OWNERSHIP}_i = \delta_0 + \delta_1\Delta\text{ESG}_i + \eta_{i,t}, \quad (4)$$

where  $\Delta\text{OWNERSHIP}_i$  is defined as the difference between the quarter after and the quarter before the adoption in (1) the average number of investors in a firm on the Robinhood platform, (2) the average percentage of shares outstanding held by 13F investors, (3) the average monthly short interest, (4) the average percentage of shares outstanding held by ESG funds, (5) the abnormal trading activity by GGL funds, and (6) the average percentage of shares outstanding held by all other U.S.-domiciled funds investing in U.S. equities.

As in the previous tables on abnormal returns, we measure the change in ESG rating in four ways, starting with: the difference in the rating from October 2019 and September 2019,  $\Delta\text{ESG}_i$ , and the average difference in the rating over the same time period,  $\overline{\Delta\text{ESG}_i}$ . We also substitute two indicator variables for  $\Delta\text{ESG}_i$  in the specification above that captures the direction and magnitude of the ESG rating change.  $\text{ESG PSEUDO-DOWNGRADE}_i$  and  $\text{ESG PSEUDO-UPGRADE}_i$  are indicator variables equal to one if the firm has a large negative

---

<sup>25</sup>This specification is equivalent to Mian and Sufi's (2011) first-stage regression from equation (2). We replace  $\text{HousePriceGrowth0206}_{2m}$  with  $\Delta\text{OWNERSHIP}_i$  on the left-hand side of the equation and  $\text{Elasticity}_{m,1997}$  with  $\Delta\text{ESG}_i$  on the right-hand side.

or a positive difference in the level of the rating, respectively.

We report the regression coefficients in Table 5. In Panel A columns (1)-(4), we focus on how retail investor participation responds to the methodology change. Since the data measures the number of retail investors in a particular stock, retail participation changes only when an investor sells her entire holdings or when an investor, who currently does not own the stock, purchases shares. The change in ESG rating is a positive and significant predictor of retail participation. Economically, the participation of retail investors drops by 8% relative to the mean for firms experiencing a one standard deviation decrease in their ESG rating.

In columns (3) and (4), we investigate how retail investors respond to ESG pseudo-downgrades or upgrades. The coefficient estimate on  $ESG\ PSEUDO-DOWNGRADE_i$  is negative and significant, while the coefficient on  $ESG\ PSEUDO-UPGRADE_i$  is positive and also significant. In other words, retail investors appear to misunderstand the nature of the change in ESG ratings and attribute a decline in the rating to bad news and therefore decide to sell all their holdings in the firm. Conversely, an increase in the ratings is interpreted as good news and more retail investors are attracted to the stock. In economic terms, the participation of retail investors increases (decreases) by roughly 10% relative to the mean as a result of an ESG rating upgrade (extreme downgrade) of a stock compared to firms that do not experience such changes.

Next, we shift our focus toward investors that are traditionally perceived as more informed, such as institutional investors. These investors are more likely to understand the implications of the adoption of the new ratings methodology by Morningstar and Yahoo! Finance. Moreover, they may have access to ratings directly from Sustainalytics and may thus have been aware of and using the new ESG Risk ratings since September 2018. We predict that the portfolios of 13F institutions will either not be affected by the ESG ratings change or rebalanced in the correct direction based on new information.<sup>26</sup>

In columns (5)-(8) of Panel A of Table 5, the dependent variable is the difference in the aggregate percentage of institutional ownership between December 2019 (the first quarter-end after new methodology implementation) and September 2019 (the last quarter-end before the methodology change). As expected, we find that institutional investors do not rebalance their portfolios in response to the adoption of the new methodology. The coefficients are insignificant for every measure of the change in ESG ratings ( $\Delta ESG_i$ ,  $\Delta \overline{ESG}_i$ ,  $ESG\ PSEUDO-DOWNGRADE_i$ ,

---

<sup>26</sup>Both the mutual funds holdings and 13F data are for long positions only.

ESG PSEUDO-UPGRADE<sub>*i*</sub>).

In the last four columns, we investigate how short sellers respond to the adoption of the new Sustainalytics ratings by Morningstar and Yahoo! Finance. In columns (9)-(12), we regress the change in the average percentage of shares sold short pre- and post-adoption. We find that short sellers behave in opposite ways to retail investors. Short interest changes in the same direction as the ESG change. For example, a decline in a firm's ESG rating is accompanied by lower abnormal returns after adoption, creating a profit opportunity for short sellers by allowing them to cover their position at a lower price. The relationship between the change in short interest and ESG ratings is economically relevant as a one standard deviation decrease in the ESG rating translates to a 3% decrease in short interest relative to the mean.

In column (12), short interest increases by 10% relative to the mean for firms that experience an increase in their ESG rating after the adoption. Short interest declines by a smaller amount, approximately 4%, for firms that have an extreme decline in their ESG ratings, as shown in columns (11) and (12).

Next, we examine the portfolio rebalancing of active mutual funds in response to the change in ESG rating methodology in Panel B. We look separately at ESG-focused funds: those funds that have some variant of sustainability in their name ( $\Delta$ ESG FUND in columns (1)-(4)) or funds that have an incentive to improve their ESG globe rating by portfolio rebalancing ( $\Delta$ GGL FUNDS in columns (5)-(8)). In columns (10)-(12), we examine the change in ownership for all other funds,  $\Delta$ OTHER FUNDS. Both types of ESG-oriented funds do not rebalance their portfolios in response to the adoption of the new methodology. Like 13F institutions, they either understand the implications of the new methodology or they have been using new Sustainalytics ESG Risk ratings since September 2018. All the coefficients of interest are insignificant, with one exception: a significant and positive coefficient on ESG PSEUDO-UPGRADE<sub>*i*</sub> for ESG funds.

In the last four columns of Panel B, we examine the response of all other funds. Like our findings on retail investors, the implications of the new rating methodology also seem to be confusing for this subset of funds. In column (12) of Panel B, mutual fund ownership declines by 19% relative to the mean, for firms that experience a downgrade in their ESG ratings and increases by 25% for firms that experience an upgrade in their ESG rating after adoption.

As the final test, we again restrict the sample to firms whose reduction in ESG rating does not translate into a decline in their relative ranking. Under the new methodology, these firms

are either unaffected or experience good news regarding their ESG risk. In Table 6, we find the same relationships between ESG ratings and changes in investor participation or ownership as in the analysis using the entire sample. Retail investors and other funds are clearly confused by the change because they sell firms with declines in their ESG rating and short sellers take advantage of this phenomenon. On the contrary, there is scant evidence that either 13F institutions or ESG-specialized funds misinterpret the meaning of the new ratings.

Overall, this section sheds additional light on the type of investor that may be driving the decline in abnormal returns. Less informed investors, such as retail investors and other non-ESG specialized funds, rebalance their portfolio under the mistaken assumption that a decline in the ESG rating signals worsened ESG risk. Short sellers appear to take advantage of this confusion and increase their positions, when less informed investors buy and decrease their positions when retail investors sell. Investors' portfolios that we predict may be more informed generally remain unchanged during this time.

### **4.3 Firms with high institutional ownership**

The results of the previous sections suggest that confused investors, who value firms' sustainability, may impact prices and these investors are more likely to be less informed retail investors. In this section, we further examine whether the effect of confused investors on abnormal returns is mitigated in firms that have large institutional holdings compared to all other firms. First, less informed traders in firms with high institutional ownership are unlikely to be the marginal investors and to move prices to the same degree as firms with greater less informed investor participation. In addition, information is more widely available to investors in these firms. Consequently, we expect that firms with higher institutional holdings will not be as affected by the adoption of the new methodology by Morningstar and Yahoo! Finance as firms with lower institutional holdings.

In Table 7, we examine abnormal returns using a triple difference-in-difference regression where our main independent variable of interest is  $\Delta \overline{\text{ESG}}_i \times \text{POST}_t \times \text{HIGH INST}_i$ .  $\text{HIGH INST}_i$  is an indicator variable equal to one if the stock's ownership is in both the highest quartile of institutional ownership and the lowest quartile of retail participation, and zero otherwise. We also control for any change in the Sustainalytics ESG Risk rating over time as well as any new information conveyed by the change in methodology through the shift in the firm's relative

ranking.

The coefficient on the triple interaction term is negative and significant, indicating that the effect of investor confusion on abnormal returns is lower for firms with high institutional ownership but low retail participation compared to firms that have lower institutional ownership and higher retail participation. As a robustness test in untabulated results, we perform the same analysis but substitute an indicator variable equal to one if the stock is included in the S&P 500 Index, zero otherwise. S&P 500 firms are not only more likely to have high institutional ownership but also to be the largest publicly traded companies in the U.S. Indeed, we find a similar attenuation of the effect of the change in ESG ratings on abnormal returns.

#### 4.4 Firms with alternate ESG ratings

One way in which the impact of the adoption may be attenuated is if the firm's ESG activities are rated by another, widely available rating agency. If so, this information can be used to confirm or dispute the information content of the Morningstar ratings change.<sup>27</sup>

Like Morningstar and Yahoo! Finance, MSCI provides investors with ESG ratings for over 2,800 companies for free. The securities covered by MSCI are constituents of the MSCI ACWI Index. In Table 8, we include an indicator variable,  $MSCI_i$ , equal to one if stock's ESG rating is available on the MSCI website, zero otherwise.<sup>28</sup>

The triple interaction term,  $\Delta \overline{ESG}_i \times POST_t \times MSCI_i$ , measures the marginal effect of having an ESG rating provided by MSCI during the introduction of the new ESG rating methodology by Morningstar and Yahoo! Finance. As seen in the table, the coefficient on the triple interaction term is negative and significant for all specifications. The availability of alternate ESG ratings reduces the effect of the change in ESG ratings due to the change in the methodology. (Note that the correlation between a stock having high institutional holdings and being rated by MSCI in terms of sustainability is only 15%, so our results are not driven solely by high institutional holdings as in Table 7.) Therefore, we conclude that the information environment of the firm can act as a disciplining mechanism for potential investor confusion.

---

<sup>27</sup>As noted previously, there is some debate regarding divergence in ESG ratings. See Berg et al. (2020) for an analysis of the major sources.

<sup>28</sup>See <https://www.msci.com/our-solutions/esg-investing/esg-ratings/esg-ratings-corporate-search-tool>.

## 5 Conclusion

We provide evidence of the salience of ESG ratings in investors' investment decisions using a quasi-natural experiment of the adoption of the new Sustainalytics ESG Risk rating in October 2019 by Morningstar and Yahoo! Finance, which changed the ratings methodology and inverted the scale. We show that potentially incorrect assessments of the meaning of the change in ESG ratings shape investors' portfolio allocation decisions and result in temporary price pressure on the affected stocks, even when no new fundamental ESG information is conveyed by the ratings change.

We find that subsequent abnormal returns are positively related to the change in a firm's ESG rating. We show that firms with large negative changes in their ESG ratings experience significantly negative abnormal returns, while firms with positive changes have positive abnormal returns. We interpret this as evidence that investors view the decline or downgrade in ESG rating as bad news and the increase or upgrade as good news. We show, however, that this interpretation is often not true as many firms with declines in their ESG rating have no change or are better ranked in terms of their ESG exposure than their peers.

To understand the mechanism through which the implementation of the new ESG rating methodology affects prices of stocks, we investigate the responses of four types of investors: individual investors, 13F institutions, mutual funds, and short-sellers. Using novel data on investor participation from Robinhood, we find that a shift in individual investors' trading behavior is consistent with the direction of the change in stock prices. Retail investors increase their participation in stocks that they perceive as more sustainable, those with positive changes in their ESG rating, and reduce their participation in firms that appear to undergo a downgrade in their rating, those with negative changes in their ESG rating. We also find that mutual funds that do not specialize in sustainability are also confused by the change in the rating methodology and behave like (less informed) retail investors.

13F institutions and ESG-focused funds, on the other hand, do not rebalance their portfolios in response to the implementation of the new ESG rating methodology. The lack of 13F institutions' response is consistent with our hypothesis that 13F investors are more aware and understand the changes in the rating methodology and/or are using more sophisticated ESG information. Since less informed investor confusion creates a profit opportunity, we find that



short-sellers take the other side of these investors' trades. They increase their short positions for "upgraded" stocks and decrease their short positions for stocks with negative changes in their ESG ratings.

As investor interest in sustainability increases, their reliance on ESG ratings will also increase. Our results suggest that some investors use ESG ratings to make an investment decisions without adequate due diligence. Regulators have become keenly interested in an oversight authority of ESG ratings as the demand for information on the sustainability of firms and investment companies increases. In particular, European Securities and Markets Authority (ESMA) states "that increasing demand for assessments that provide insights on an entity's ESG profile should go hand in hand with safeguards that ensure the information referred to is robust and that the assessments are reliable."<sup>29</sup> While our analysis is agnostic on the merits of the change in Sustainalytics' methodology, it does highlight the importance of ratings in many investors' investment choices, particularly since the change in rating methodology we study affected a sizable portion of the U.S. stock market (70% of the total number of common stocks and 95% of U.S. market capitalization).<sup>30</sup> Given the unique setting of our paper, our results are informative to both market participants and regulators interested in how investors use third-party information providers, generally, and the role of ESG rating agencies, specifically. Our analysis clearly shows ESG ratings are salient to investors' decision-making and can be a determinant of firms' stock prices.

---

<sup>29</sup>ESMA letter to EC on ESG Ratings on January 28, 2021.

<sup>30</sup>Our sample is limited to U.S. firms; the effect of the adoption of the change in methodology may be even greater than we document because it also affects those foreign stocks that are rated by Sustainalytics and available on Morningstar.

## References

- Alok, S., N. Kumar, and R. Wermers (2020). Do fund managers misestimate climatic disaster risk. *Review of Financial Studies* 33(3), 1146–1183.
- Angrist, J. D. and J.-S. Pischke (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.
- Barber, B. M., A. Morse, and A. Yasuda (2021). Impact investing. *Journal of Financial Economics* 139(1), 162–185.
- Barber, B. M., T. Odean, and N. Zhu (2006). Do Noise Traders Move Markets? Haas School of Business Working Paper.
- Berg, F., K. Fabisik, and Z. Sautner (2020). Rewriting history II: The (un)predictable past of ESG ratings. *European Corporate Governance Institute–Finance Working Paper 708*.
- Berg, F., J. Koelbel, and R. Rigobon (2020). Aggregate confusion: The divergence of ESG ratings. MIT Sloan School Working Paper 5822-19.
- Berk, J. and J. van Binsbergen (2021). The Impact of Impact Investing. Working Paper SSRN 3909166.
- Białkowski, J. and L. T. Starks (2016). SRI funds: Investor demand, exogenous shocks and ESG profiles. University of Canterbury Working Papers in Economics 16/11.
- Billio, M., M. Costola, I. Hristova, C. Latino, and L. Pelizzon (2021). Inside the ESG Ratings: (Dis)agreement and performance. *Corporate Social Responsibility and Environmental Management Journal* Forthcoming.
- Boehmer, E., Z. R. Huszar, and B. D. Jordan (2010). The good news in short interest. *Journal of Financial Economics* 96(1), 80–97.
- Boehmer, E., C. M. Jones, and X. Zhang (2008). Unshackling short sellers: The repeal of the uptick rule. Columbia Business School Unpublished Manuscript.
- Bolton, P. and M. Kacperczyk (2021). Do investors care about carbon risk? *Journal of Financial Economics* Forthcoming.
- Calvet, L. E., J. Y. Campbell, and P. Sodini (2007). Down or out: Assessing the welfare costs of household investment mistakes. *Journal of Political Economy* 115(5), 707–747.
- Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance* 52(1), 57–82.
- Célerier, C. and A. Matray (2019). Bank-branch supply, financial inclusion, and wealth accumulation. *Review of Financial Studies* 32(12), 4767–4809.
- Chatterji, A. K., R. Durand, D. I. Levine, and S. Touboul (2016). Do ratings of firms converge? Implications for managers, investors and strategy researchers. *Strategic Management Journal* 37, 1597–1614.

- Chatterji, A. K., D. I. Levine, and M. W. Toffel (2009). How well do social ratings actually measure corporate social responsibility? *Journal of Economics and Management Strategy* 18(1), 125–169.
- Cohen, L., K. B. Diether, and C. J. Malloy (2007). Supply and demand shifts in the shorting market. *Journal of Finance* 62(5), 2061–2096.
- Coval, J. and E. Stafford (2007). Asset fire sales (and purchases) in equity markets. *Journal of Financial Economics* 86(2), 479–512.
- Delmas, M. and V. D. Blass (2010). Measuring corporate environmental performance: the trade-offs of sustainability ratings. *Business Strategy and the Environment* 19(4), 245–260.
- Diether, K. B., K.-H. Lee, and I. M. Werner (2009). It’s SHO time! Short-sale price tests and market quality. *Journal of Finance* 64(1), 37–73.
- Dorflleitner, G., G. Halbritter, and M. Nguyen (2015). Measuring the level and risk of corporate responsibility - An empirical comparison of different ESG rating approaches. *Journal of Asset Management* 16(7), 450–466.
- Engel, R. F., S. Giglio, B. Kelly, H. Lee, and J. Stroebe (2020). Hedging climate change news. *The Review of Financial Studies* 33(3), 1184–1216.
- Engelberg, J. E., A. V. Reed, and M. C. Ringgenberg (2012). How are shorts informed? Short sellers, news, and information processing. *Journal of Financial Economics* 105(2), 260–278.
- Fama, E. F. and K. R. French (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33, 3–56.
- Fama, E. F. and K. R. French (2007). Disagreement, tastes, and asset prices. *Journal of Financial Economics* 83(3), 667–689.
- Gantchev, N., M. Giannetti, and R. Li (2021). Sustainability or Performance? Ratings and Fund Managers’ Incentives. European Corporate Governance Institute – Finance Working Paper No. 747/2021.
- Giglio, S., B. Kelly, and J. Stroebe (2021). Climate finance. *Annual Review of Financial Economics* Forthcoming.
- Goldstein, I., H. Jiang, and D. T. Ng (2017). Investor flows and fragility in corporate bond funds. *Journal of Financial Economics* 126(3), 592–613.
- Goldstein, I., A. Kopytov, L. Shen, and H. Xiang (2021). On ESG Investing: Heterogeneous Preferences, Information, and Asset Prices. Working Paper SSRN 3823042.
- Hartzmark, S. M. and A. B. Sussman (2019). Do investors value sustainability? A natural experiment examining ranking and fund flows. *Journal of Finance* 74(6), 2789–2837.
- Hong, H. and M. Kacperczyk (2009). The price of sin: The effects of social norms on markets. *Journal of Financial Economics* 93(1), 15–36.

- Hong, H., F. W. Li, and J. Xu (2019). Climate risks and market efficiency. *Journal of Econometrics* 208(1), 265–281.
- Hsu, P.-H., K. Li, and C.-Y. Tsou (2020). The pollution premium. Working Paper SSRN 3578215.
- Ilhan, E., Z. Sautner, and G. Vilkov (2021). Carbon tail risk. *The Review of Financial Studies* 34(3), 1540–1571.
- Kirchler, M., J. Huber, and T. Stöckl (2012). Thar she bursts: Reducing confusion reduces bubbles. *American Economic Review* 102(2), 865–83.
- Krueger, P., Z. Sautner, and L. T. Starks (2020). The importance of climate risks for institutional investors. *The Review of Financial Studies* 33(3), 1067–1111.
- Merton, R. C. (1987). A simple model of capital market equilibrium with incomplete information. *Journal of Finance* 42(3), 483–510.
- Mian, A. and A. Sufi (2011). House prices, home equity-based borrowing, and the US household leverage crisis. *American Economic Review* 101(5), 2132–2156.
- Moss, A., J. P. Naughton, and C. Wang (2020). The irrelevance of ESG disclosure to retail investors: Evidence from Robinhood. Working Paper SSRN 3604847.
- Pástor, L., R. F. Stambaugh, and L. A. Taylor (2021). Sustainable investing in equilibrium. *Journal of Financial Economics* Forthcoming.
- Pedersen, L. H., S. Fitzgibbons, and L. Pomorski (2020). Responsible investing: The ESG-efficient frontier. *Journal of Financial Economics* Forthcoming.
- Rashes, M. S. (2001). Massively confused investors making conspicuously ignorant choices (mci–mcic). *Journal of Finance* 56(5), 1911–1927.
- Riedl, A. and P. Smeets (2017). Why do investors hold socially responsible mutual funds? *The Journal of Finance* 72(6), 2505–2550.
- Semenova, N. and L. G. Hassel (2015). On the validity of environmental performance metrics. *Journal of Business Ethics* 132(2), 249–258.
- Wardlaw, M. (2020). Measuring mutual fund flow pressure as shock to stock returns. *Journal of Finance* 75(6), 3221–3243.

**Table A.1: List of Variable Names**

| Variable Name                                 | Definition  |
|---|---|
| CLASSIFICATION UPGRADE <sub><i>i</i></sub>    | An indicator variable equal to one if the firm experienced an increase in its Morningstar ESG Rating Assessment classification after adoption of the new methodology – e.g., before the adoption it was an ‘Average Performer’ and after the adoption it belongs to the ‘Low’ ESG risk group.   |
| CLASSIFICATION DOWNGRADE <sub><i>i</i></sub>  | An indicator variable equal to one if the firm has a decrease in its Morningstar Classification after the adoption of the new methodology – e.g, before the adoption it was an ‘Outperformer’ and after the adoption it belongs to the ‘Medium’ ESG risk group.   |
| Δ13F <sub><i>i</i></sub>                      | The quarterly change in holdings by 13F institutions, measured as the difference in number of shares held by 13F institutions between the end of December 2019 and September 2019 divided by the number of shares outstanding.  |
| ΔESG <sub><i>i</i></sub>                      | The difference in firm <i>i</i> ’s ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.   |
| Δ $\overline{\text{ESG}}$ <sub><i>i</i></sub> | The difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  |
| ΔESG FUND                                     | The change in the holdings of funds identified as ESG-oriented funds, measured as the difference in number of shares held by ESG Funds between the end of December and September 2019 divided by the number of shares outstanding. Using textual analysis on keywords, we classify any U.S. mutual funds actively investing in U.S. equities in the Morningstar database as an ESG Fund if it has the following strings in its name: esg, sust, impact, rspnb, env, scl, eco (but not “econ”), social, and/or green.  |
| ΔESG RANK <sub><i>i</i></sub>                 | The difference in the firm’s relative ranking in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption.  |
| ΔGGL FUND <sub><i>i</i></sub>                 | The abnormal trading in stock <i>i</i> between December 2019 and September 2019 by funds, whose globe rating improved during this period. We follow Gantchev et al. (2021) and define<br>$\Delta\text{GGL FUND}_i = \sum_{f=1}^F \frac{\text{SHARES}_{f,i,\text{Dec } 2019}^U - \text{SHARES}_{f,i,\text{Sep } 2019}^U}{\text{SHARES\_OUTSTANDING}_{i,\text{Sep } 2019}} -$ the average difference in the holdings of stock <i>i</i> by all other funds in our sample between December 2019 and September 2019, where $\text{SHARES}_{f,i,\text{Sep } 2019}^U$ is the number of shares of stock <i>i</i> held at the end of September 2019 by fund <i>f</i> , which experienced globe rating upgrade ( <i>U</i> ) between December 2019 and September 2019. |
| ΔGGL PRESSURE <sub><i>i,t</i></sub>           | Aggregate abnormal ESG trading experienced by stock <i>i</i> in month <i>t</i> proposed by Gantchev et al. (2021) and defined as $\Delta\text{GGL PRESSURE}_{i,t} = \sum_{f=1}^F \text{TRADING}_{f,i,t}^U -$ the average change between <i>t</i> – 1 and <i>t</i> in the holdings of stock <i>i</i> by all other funds in our sample, where $\text{TRADING}_{f,i,t}^U$ is the change in the number of shares held in stock <i>i</i> as a fraction of the stock’s shares outstanding by fund <i>f</i> that improves its globe rating between months <i>t</i> – 1 and <i>t</i> .  |

|   |  |
|---|--|
| $\Delta$ MORNINGSTAR CLASSIFICATION <sub><i>i</i></sub> | The change in Morningstar ESG Rating Assessment classification in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption. Before the methodology change, Morningstar ranked each company in terms of its ESG rating relative to its peers and assigned it to one of five groups: Industry Leader, Outperformer, Average Performer, Underperformer, and Industry Laggard, where Laggard denotes a company that scores well below average relative to its peer group and Leader indicates a company that scores well above average relative to its peer group. After the adoption, Morningstar still consists of five groups. However, the naming of the groups changed to Negligible, Low, Medium, High, and Severe, where Negligible denotes a company with a very low ESG risk rating (between 0 and 10) and Severe indicates a firm with a very high ESG risk rating (above 40). Whereas previously the classification breakpoints were established annually, after the methodology change the breakpoints became fixed. |
| $\Delta$ OTHER FUND <sub><i>i</i></sub>                 | The change in the shares of stock <i>i</i> held by mutual funds domiciled in the U.S. and actively investing in U.S. equities, which are neither classified as ESG FUNDS nor GGL FUNDS – i.e., funds that experienced globe rating improvement. We define $\Delta$ OTHER FUNDS <sub><i>i</i></sub> as the difference in the number of shares held by non-ESG and non-GGL Funds between the end of December 2019 and September 2019 divided by the number of shares outstanding.  |
| $\Delta$ RETAIL <sub><i>i</i></sub>                     | The change in retail participation in stock <i>i</i> measured as the difference in the average number of Robinhood investors holding a stock between December 2019 and September 2019 divided by the average dollar trading volume between April 2019 and June 2019.   |
| $\Delta$ SHORT SELLERS <sub><i>i</i></sub>              | The change in short interest in stock <i>i</i> measured as the difference in the average number of shares sold short in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance and the average number of shares sold short in the three months (July-September 2019) before the adoption divided by the number of shares outstanding.  |
| $\Delta$ SUSTAINALYTICS RATING <sub><i>i</i></sub>      | The difference in firm <i>i</i> 's Sustainalytics average ESG Risk rating in the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  |
| ESG PSEUDO-DOWNGRADE <sub><i>i</i></sub>                | An indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise.  |
| ESG PSEUDO-UPGRADE <sub><i>i</i></sub>                  | An indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise.   |
| FOUR FACTOR ABNRET <sub><i>i,t</i></sub>                | Carhart's (1997) four-factor abnormal return for stock <i>i</i> in month <i>t</i> . We estimate the loadings using 12 months of daily return data from July 2018 to June 2019. We compute abnormal returns in a given month by subtracting the firm's expected return from its actual return.  |
| HIGH INST <sub><i>i</i></sub>                           | An indicator variable equal to one if the stock's ownership is in both the highest quartile of institutional ownership and the lowest quartile of retail participation, zero otherwise.  |
| MSCI <sub><i>i</i></sub>                                | An indicator variable equal to one if the stock's ESG ratings are also available through the MSCI ESG rating platform.   |
| POST <sub><i>t</i></sub>                                | An indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.   |

|                               |  |
|-------------------------------|--|
| #RETAIL $_{i,t}$              | Retail participation in stock $i$ in month $t$ . This gives a number of retail investors holding a given stock through the Robinhood trading platform.   |
| SINGLE FACTOR ABNRET $_{i,t}$ | A single factor abnormal return for stock $i$ in month $t$ . We estimate the loadings using 12 months of daily return data from July 2018 to June 2019. We compute abnormal returns in a given month by subtracting the firm's expected return from its actual return.                       |
| THREE FACTOR ABNRET $_{i,t}$  | Fama and French's (1993) three-factor abnormal return for stock $i$ in month $t$ . We estimate the loadings using 12 months of daily return data from July 2018 to June 2019. We compute abnormal returns in a given month by subtracting the firm's expected return from its actual return. |

---

**Table A.2: List of ESG Funds**

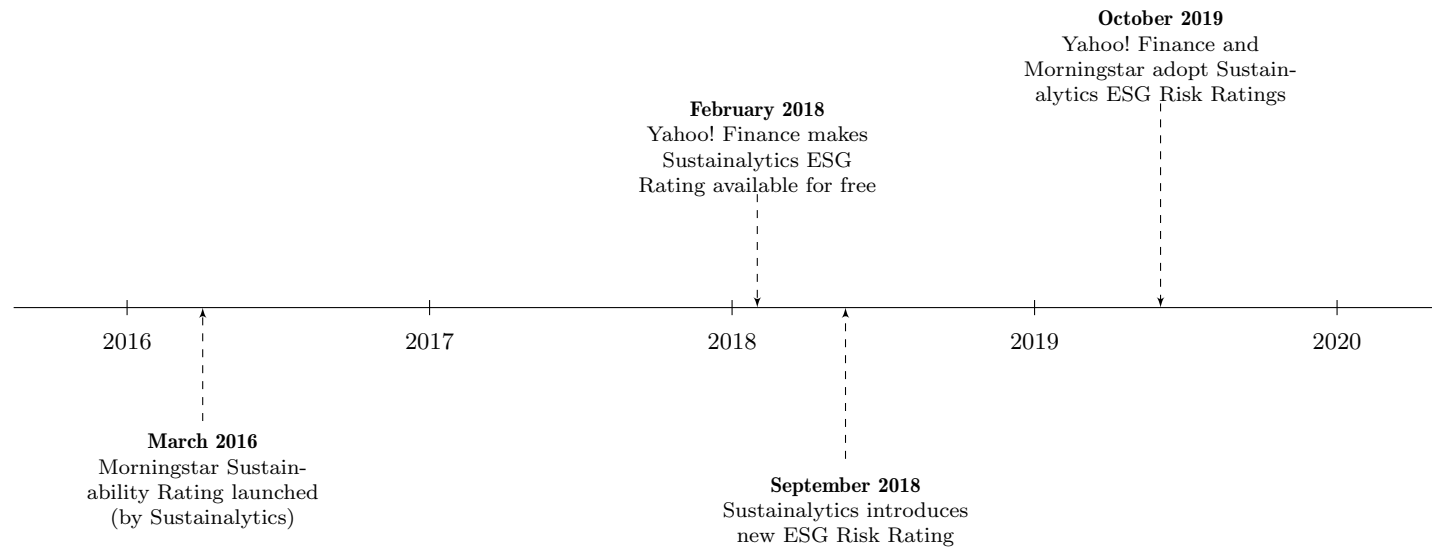
This table presents the ESG funds used in our analysis. Using textual analysis on keywords, we classify all U.S. mutual funds actively invested in U.S. equities in the Morningstar database as an ESG fund if it has the following strings in its name: esg, sust, impact, rspnb, env, scl, eco (but not “econ”), social, and/or green.

| FUND NAME                                | FUND ID    |
|--|------------|
| AIG ESG Dividend W                       | FS0000CSRZ |
| AMG Boston Common Global Impact I        | FSUSA0009F |
| AMG Managers Fairpointe ESG Equity I     | FS0000B6BF |
| Aberdeen US Sust Ldrs Smlr Coms C        | FSUSA04AWS |
| Aberdeen US Sustainable Leaders A        | FSUSA004VL |
| American Century Sustainable Equity A    | FSUSA067IH |
| BNY Mellon Sustainable US Eq Fd Z        | FSUSA000MG |
| BlackRock Advantage ESG US Eq Instl Shrs | FS0000C0EV |
| Boston Common ESG Impact US Equity       | FSUSA0B3Y9 |
| Brown Advisory Sustainable Growth I      | FS00009LFB |
| CCM Core Impact Equity Fund Advisor      | FSUSA004R4 |
| Calvert US Large Cap Core Rspnb Idx I    | FSUSA002Y7 |
| Calvert US Large Cap Growth Rspnb Idx I  | FS0000BOXA |
| Calvert US Large Cap Value Rspnb Idx I   | FS0000BOXB |
| Calvert US Mid Cap Core Rspnb Idx I      | FS0000C13N |
| ClearBridge Sustainability Leaders I     | FS0000BN1J |
| DFA US Social Core Equity 2 Portfolio    | FSUSA08DNF |
| DFA US Sustainability Core 1             | FSUSA08HSM |
| DWS ESG Core Equity Institutional        | FSUSA06DZZ |
| Dana Epiphany ESG Equity Inst            | FSUSA07XDP |
| Dana Epiphany ESG Small Cap Eq Instl     | FS0000C28P |
| Domini Impact Equity Investor            | FSUSA000KS |
| Domini Instl Social Equity               | FSUSA06G6L |
| Fidelity® Select Envir and Alt Engy Port | FSUSA000U8 |
| Fidelity® U.S. Sustainability Index      | FS0000D38F |
| Glenmede Responsible ESG US Equity       | FS0000C57P |
| Goldman Sachs U.S. Equity ESG Ins        | FSUSA0A6XX |
| Gotham ESG Large Value Institutional     | FS0000E3LF |
| Green Century Equity Individual Investor | FSUSA00DLL |
| Green Owl Intrinsic Value                | FS00008N6C |
| Harbor Robeco US Conservative Eqs Ret    | FS0000FLWB |
| Highland Socially Responsible Equity Y   | FSUSA003PP |
| Integrity ESG Growth & Income A          | FSUSA004LN |
| JHancock ESG All Cap Core R6             | FS0000CF4D |
| JHancock ESG Large Cap Core R6           | FS0000CF4E |
| JNL/Mellon MSCI KLD 400 Social Index A   | FS0000D09B |
| JPMorgan US Sustainable Leaders I        | FSUSA04CEA |
| Kennedy Capital ESG SMID Cap I           | FS0000E0WL |
| Lateef Focused Sustainable Growth CL I   | FSUSA08IEB |
| Mesirow Financial Sm Cp Value Sust Instl | FS0000DZLE |
| Neuberger Berman AMT Sustainable Eq I    | FSUSA00D77 |
| Neuberger Berman Sustainable Eq Investor | FSUSA000GZ |
| Northern US Quality ESG K                | FS0000CSFC |
| Nuveen Winslow Large-Cap Growth ESG I    | FSUSA09Q6S |
| Pax ESG Beta Dividend Fund Institutional | FS0000CSRX |
| Pax ESG Beta Quality Investor            | FSUSA0034E |
| Putnam Sustainable Future A              | FSUSA0098T |
| Putnam Sustainable Leaders A             | FSUSA00250 |
| Russell Inv Sustainable Equity Y         | FSUSA002UB |
| Second Nature Thematic Growth I          | FS0000D58H |
| TIAA-CREF Social Choice Eq Instl         | FSUSA00I37 |
| TIAA-CREF Social Choice Equity           | FSUSA06GEV |
| TIAA-CREF Social Choice LwCrbn Eq Instl  | FS0000BVON |
| Transamerica Sustainable Equity Inc I2   | FS00009SYC |
| Trillium ESG Small/Mid Cap Inst          | FS0000BVP7 |
| UBS US Sustainable Equity P              | FSUSA002ES |
| VALIC Company II U.S. Socially Rspnb     | FSUSA06UJ2 |
| Vanguard FTSE Social Index I             | FSUSA003PD |



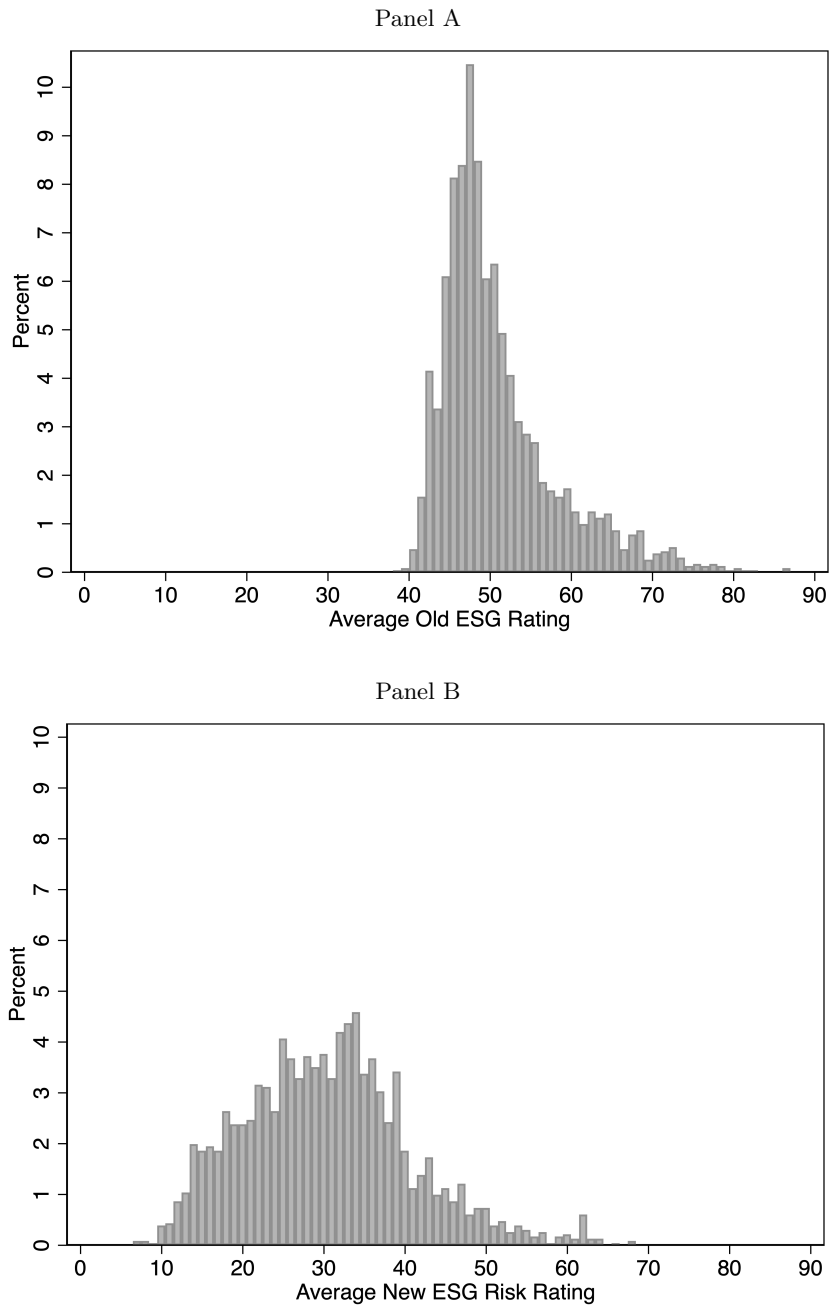
**Figure 1: Timeline of ESG rating adoption and changes in methodology**

This figure presents the timeline of the Sustainalytics ESG and ESG Risk ratings and their subsequent adoption by both Morningstar and Yahoo! Finance.



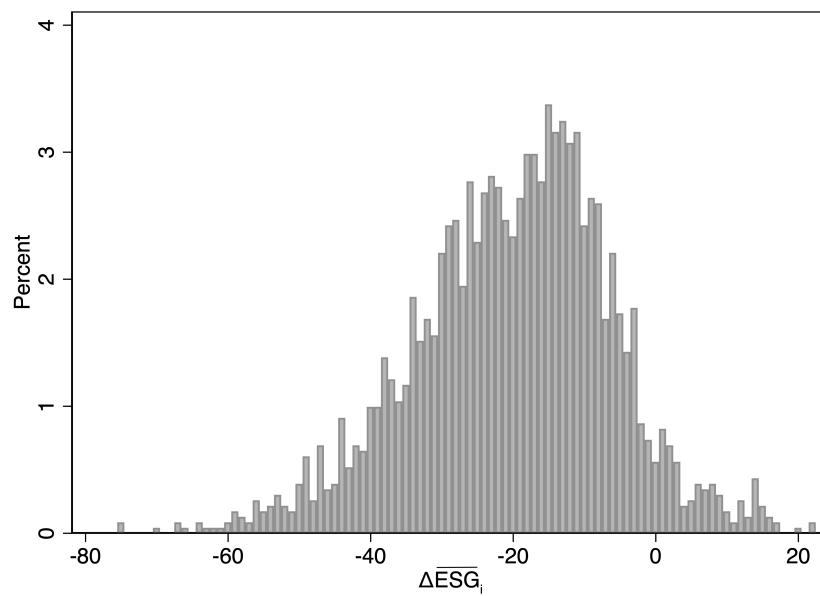
**Figure 2: Comparison of Old ESG rating with New ESG Risk rating**

This figure shows the distribution of the average old ESG rating in the three months (July-September 2019) before the adoption in Panel A and the average new ESG Risk rating in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance in Panel B.



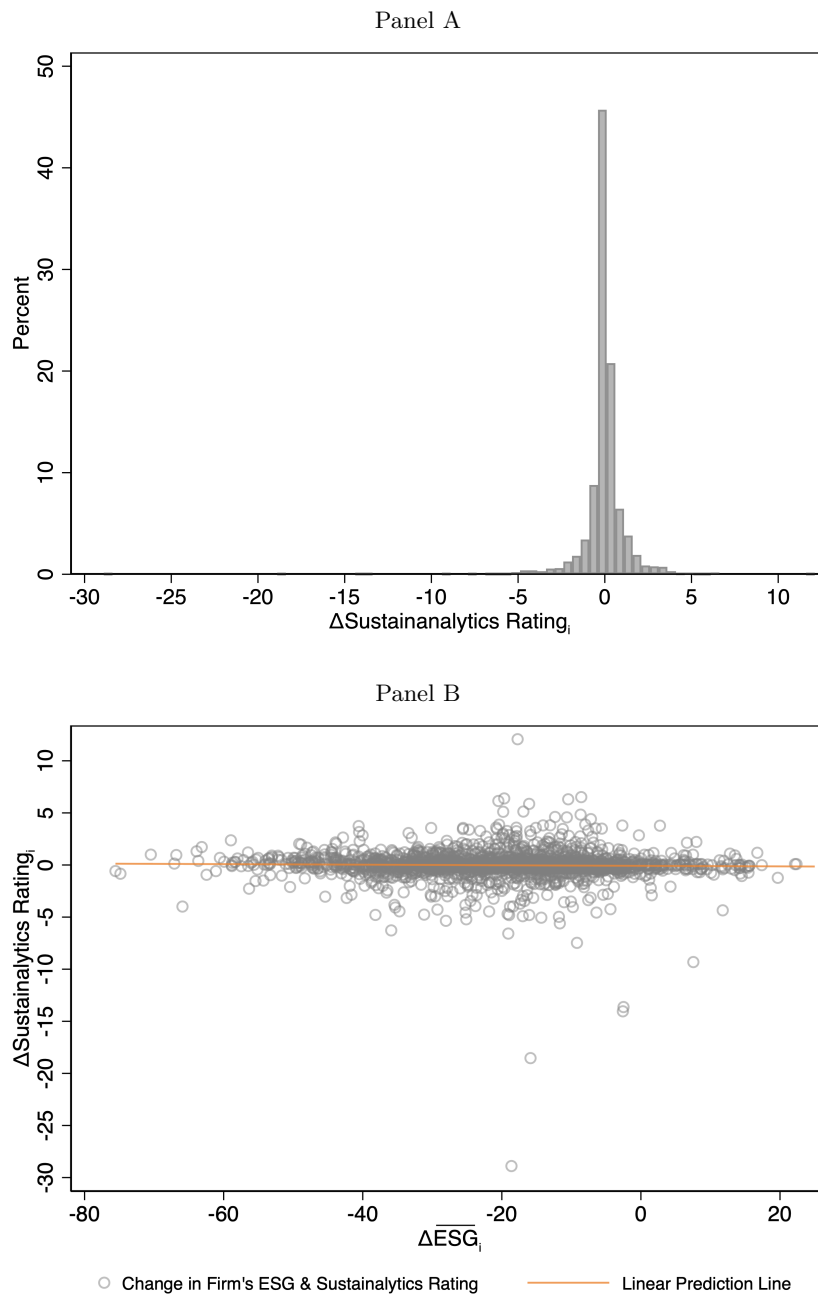
**Figure 3: Change in ESG ratings**

This figure shows the distribution of the change in the ESG rating,  $\Delta\overline{ESG}_i$ , defined as the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance and the average old ESG rating in the three months (July-September 2019) before the adoption.



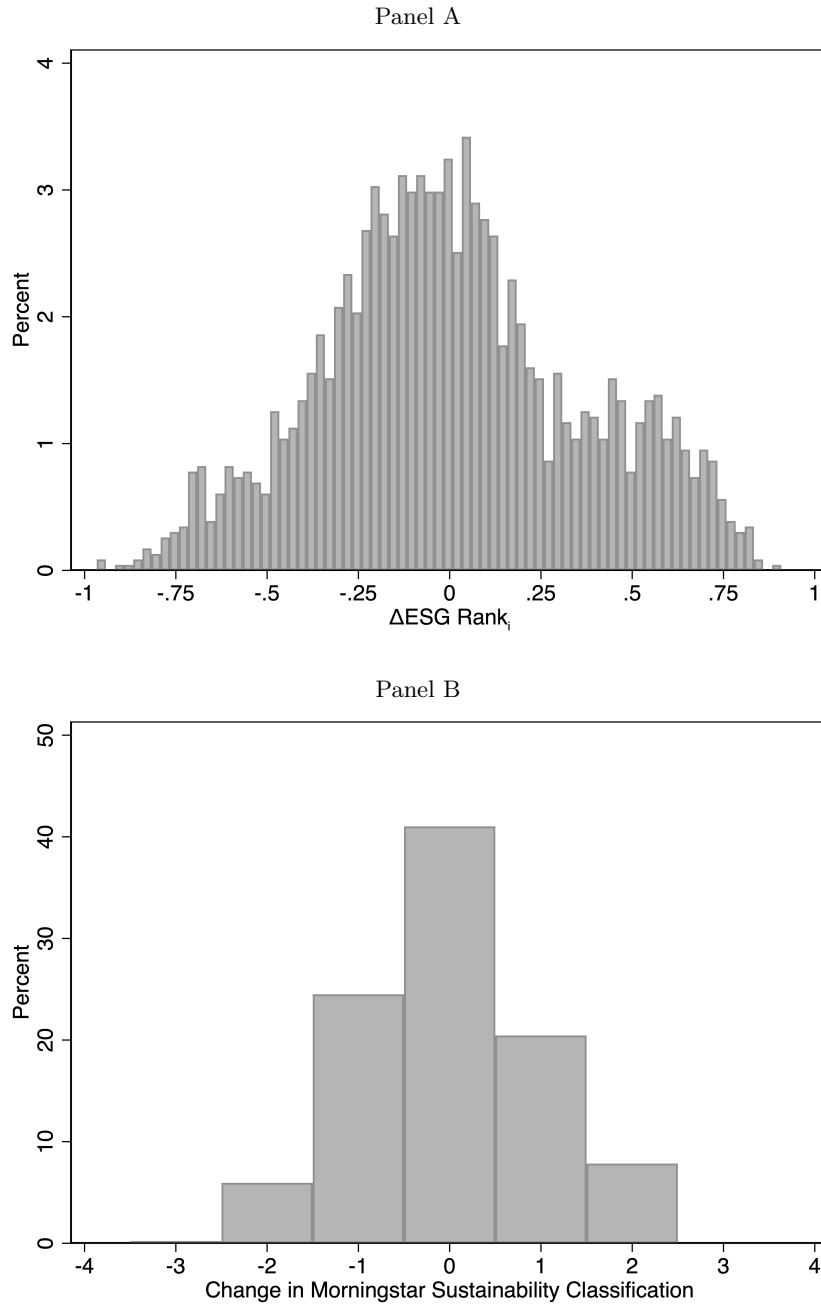
**Figure 4: Change in Sustainability ESG Risk ratings around adoption of new methodology**

This figure shows the distribution of the change in the Sustainalytics ESG Risk rating,  $\Delta\text{SUSTAINALYTICS RATING}_i$ , defined as the difference between the average ESG Risk rating in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance and the average old ESG rating in the three months (July-September 2019) before the adoption. Panel A presents the numerical change and Panel B shows the correlation between  $\Delta\text{SUSTAINALYTICS RATING}_i$  and  $\Delta\overline{\text{ESG}}_i$ , defined as the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance and the average old ESG rating in the three months (July-September 2019) before the adoption.



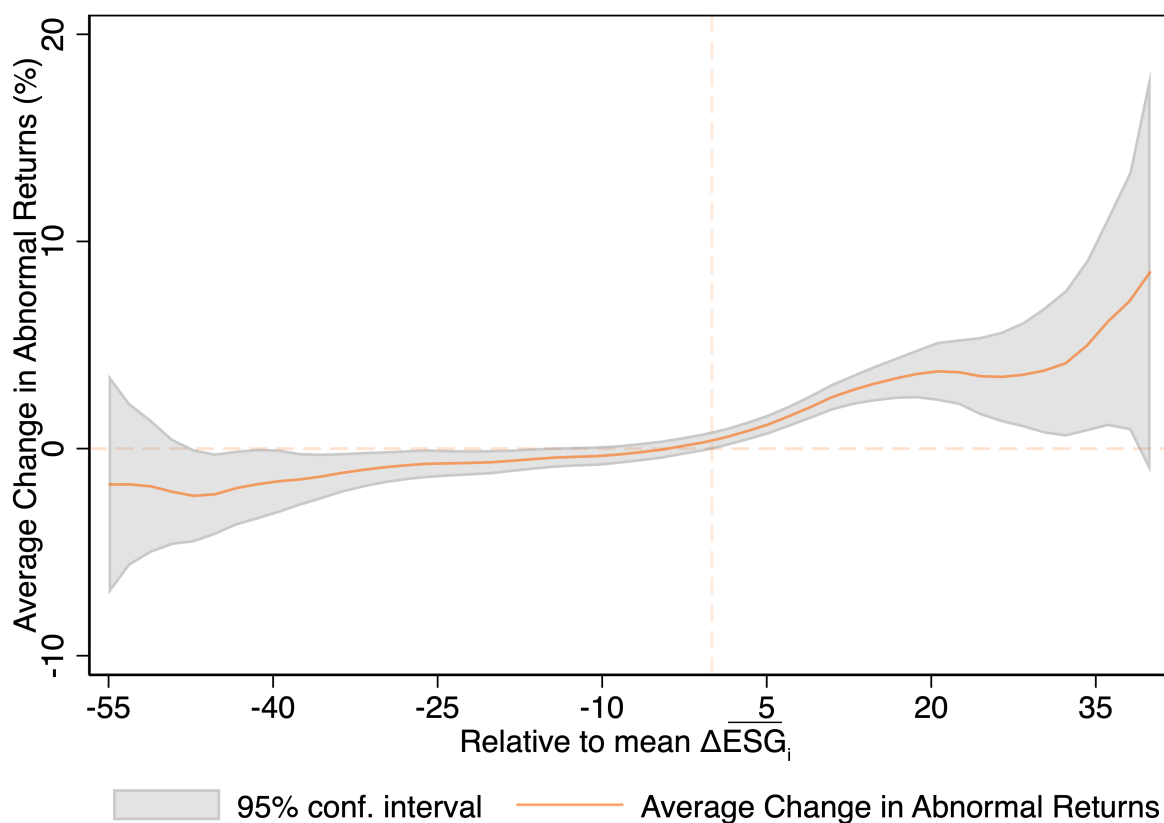
### Figure 5: Change in ranking and Morningstar Classification

This figure shows the change in the relative ranking of the firms after the adoption of the new methodology by Morningstar and Yahoo! Finance. Panel A shows the change in ranking,  $\Delta\text{ESG RANK}_i$ , defined as the difference in the ranking, scaled by the number of firms, in the ranking in the first month (October) after the adoption and the last month (September) before the adoption. Panel B shows the change in firms' Morningstar Classification after the adoption of the new methodology. See Table 2 for the definitions of the classifications before and after adoption.



**Figure 6: Abnormal return response to the change in ESG rating methodology**

This figure depicts the relationship between a change in ESG ratings due to the adoption of the new ESG risk rating methodology and subsequent abnormal returns using a semi-parametric regression. We define the change in a firm's single-factor abnormal return as the difference between the stock's average abnormal return during three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance. The change in the ESG rating,  $\Delta \overline{ESG}_i$ , is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance and the average old ESG rating in the three months (July-September 2019) before the adoption. The shaded areas represent 95% confidence intervals. The horizontal dashed orange line represents a zero change in firms' abnormal returns. The vertical dashed orange line represents the mean change in the ESG ratings.

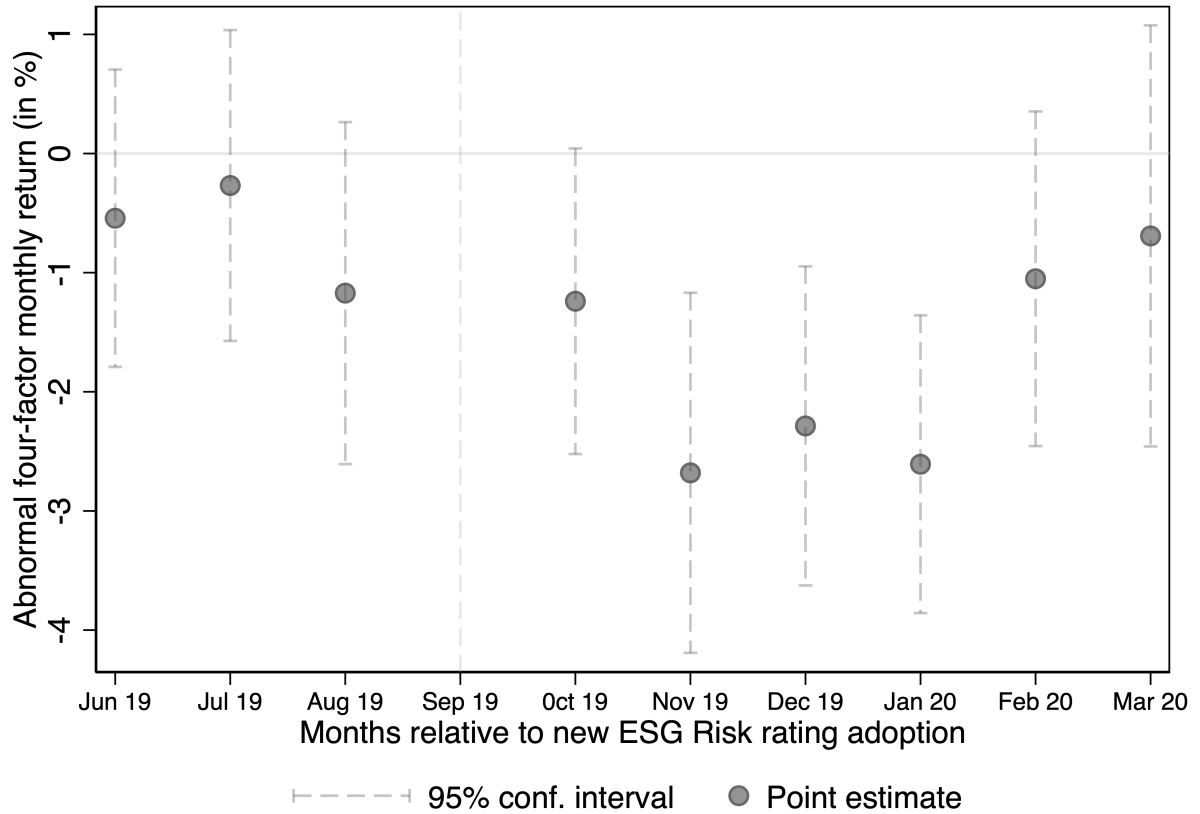


**Figure 7: Change in ESG rating methodology and abnormal returns using dynamic difference-in-difference analysis**

This figure shows the relative effect of the new ESG rating methodology by Morningstar and Yahoo! Finance on the abnormal returns of firms that experience a quasi-downgrade of their sustainability ratings. We plot  $\gamma_e$  regression coefficients on the interaction terms from the following specification:

$$\text{ARET}_{i,t} = \gamma_0 + \sum_{e=-4, e \neq -1}^5 \gamma_e \text{ESG PSEUDO-DOWNGRADE}_i \times \text{D}(e)_t + \text{D}_i + \text{D}_t + \varepsilon_{i,t}.$$

$\text{ARET}_{i,t}$  is a four-factor abnormal return estimated using market beta from 12-month rolling-window regression.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\Delta \text{ESG}_i$  is in the lower quartile, and zero otherwise. We use October 2019 as month 0.;  $\text{D}_i$  and  $\text{D}_t$  denote stock and year-month fixed effects. The grey circles represent point estimates and the dashed line is the 95% confidence interval with standard errors clustered at the stock level.



**Table 1: Summary statistics**

This table reports summary statistics for the main variables used in this paper. We report the variables in levels (Panel A) and in changes (Panel B). In Panel C, we report pairwise correlations between the main variables. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology). For the period before the adoption, ESG denotes the old ESG rating; for the period after the adoption, ESG denotes the new ESG Risk rating. Both ratings have values between 0 and 100. SINGLE FACTOR ABNRET, THREE FACTOR ABNRET, FOUR FACTOR ABNRET are stock  $i$ 's abnormal return in month  $t$  using single-factor, three-factor, and Carhart four-factor models, respectively. # RETAIL is the number of retail investors holding a given stock through the Robinhood trading platform. % 13F OWN is the percentage of shares outstanding held by 13F institutions. ESG FUNDS (%) is the percentage of shares outstanding held by active U.S. equity ESG funds domiciled in the U.S. We follow Gantchev et al. (2021) and define GGL FUNDS (%) as the abnormal percentage of shares outstanding held by funds that experienced ESG globe upgrade between the three months after the adoption (October-December 2019) and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance. OTHER FUNDS (%) is the percentage of shares outstanding held by U.S. active equity funds, which are neither GGL FUNDS nor ESG FUNDS. SHORT INT (%) is the percentage of shares outstanding that have been sold short.  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October – December 2019) after the adoption and the average old ESG rating in the three months (July – September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta\text{ESG RANK}_i$  is the difference in the firm's relative ranking in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption.  $\Delta\text{MORNINGSTAR CLASSIFICATION}_i$  is the difference in Morningstar Sustainability Classification in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption.  $\Delta\text{SUSTAINALYTICS RATING}_i$  is the difference in firm  $i$ 's Sustainalytics average ESG Risk rating in the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.

| Panel A: Levels          | PRE (JUL 2019 – SEP 2019) |       |        |        |       | POST (OCT 2019 – DEC 2020) |       |        |       |       |
|--------------------------|---------------------------|-------|--------|--------|-------|----------------------------|-------|--------|-------|-------|
|                          | Mean                      | P50   | SD     | P5     | P95   | Mean                       | SD    | P50    | P5    | P95   |
| ESG                      | 50.51                     | 48.00 | 7.23   | 42.00  | 65.00 | 30.38                      | 30.02 | 10.36  | 14.59 | 49.05 |
| SINGLE FACTOR ABNRET (%) | -0.91                     | -0.31 | 6.12   | -12.00 | 7.69  | 0.20                       | -0.11 | 6.25   | -8.73 | 10.85 |
| THREE FACTOR ABNRET (%)  | 0.39                      | 0.66  | 6.08   | -9.77  | 9.58  | -0.01                      | -0.34 | 6.23   | -8.97 | 10.48 |
| FOUR FACTOR ABNRET (%)   | 0.45                      | 0.66  | 6.12   | -9.84  | 9.73  | -0.09                      | -0.41 | 6.24   | -9.05 | 10.03 |
| # RETAIL ('00s)          | 27.50                     | 2.91  | 153.20 | 0.18   | 75.67 | 29.20                      | 3.09  | 164.63 | 0.18  | 78.73 |
| % 13F OWN                | 52.38                     | 58.11 | 32.29  | 0.00   | 95.54 | 51.59                      | 51.93 | 32.23  | 0.00  | 95.45 |
| SHORT INT (%)            | 5.72                      | 3.34  | 6.34   | 0.58   | 19.13 | 5.58                       | 3.27  | 6.36   | 0.44  | 18.32 |
| ESG FUNDS (%)            | 0.07                      | 0.04  | 0.14   | 0.00   | 0.22  | 0.07                       | 0.04  | 0.14   | 0.00  | 0.22  |
| GGL FUNDS (%)            | 0.63                      | 0.18  | 1.18   | 0.00   | 3.03  | 0.61                       | 0.18  | 1.16   | 0.00  | 2.94  |
| OTHER FUNDS (%)          | 23.08                     | 23.46 | 10.38  | 5.93   | 39.85 | 23.05                      | 23.23 | 10.31  | 6.05  | 39.91 |



Table 1: Summary statistics (continued)

| Panel B: Changes                       | Mean   | POST minus PRE |       |        |      |
|--|--------|----------------|-------|--------|------|
|  |        | P50            | SD    | P5     | P95  |
| $\Delta ESG_i$                         | -20.17 | -19.13         | 14.20 | -45.81 | 1.53 |
| $\Delta \overline{ESG}_i$              | -20.13 | -18.97         | 14.02 | -44.54 | 1.19 |
| $\Delta SUSTAINALYTICS\ RATING_i$      | -0.02  | -0.01          | 1.41  | -1.66  | 1.62 |
| $\Delta ESG\ RANK_i$                   | -0.00  | -0.02          | 0.36  | -0.60  | 0.64 |
| $\Delta MORNINGSTAR\ CLASSIFICATION_i$ | -0.01  | 0.00           | 1.01  | -2.00  | 2.00 |

46

| Panel C: Correlations                  | $\Delta ESG_i$ | $\Delta \overline{ESG}_i$ | $\Delta SUSTAINALYTICS\ RATING_i$ | $\Delta ESG\ RANK_i$ | $\Delta MORNINGSTAR\ CLASSIFICATION_i$ |
|--|----------------|---------------------------|-----------------------------------|----------------------|--|
| $\Delta ESG_i$                         | 1.0000         |                           |                                   |                      |  |
| $\Delta \overline{ESG}_i$              | 0.9956         | 1.0000                    |                                   |                      |  |
| $\Delta SUSTAINALYTICS\ RATING_i$      | -0.0968        | -0.0254                   | 1.0000                            |                      |  |
| $\Delta ESG\ RANK_i$                   | 0.1812         | 0.1843                    | -0.0146                           | 1.0000               |  |
| $\Delta MORNINGSTAR\ CLASSIFICATION_i$ | 0.3390         | 0.3383                    | -0.0821                           | 0.7257               | 1.0000                                 |

**Table 2: Morningstar Classifications definitions and the transition matrix from old to new Morningstar Classifications**

| Panel A: Definitions   |              |  |  |                             |  |
|--|--------------|--|--|-----------------------------|--|
| Old Morningstar Classification<br>(Score relative to industry peers) |              |  | New Morningstar Classification<br>(Risk relative to all firms) |                             |  |
| Industry Leader  | (highest 5%) |  | Negligible   | (Risk rating between 0-10)  |  |
| Outperformer   | (next 11%)   |  | Low  | (Risk rating between 10-20) |  |
| Average Performer  | (next 68%)   |  | Medium   | (Risk rating between 20-30) |  |
| Underperformer   | (next 11%)   |  | High   | (Risk rating between 30-40) |  |
| Industry Laggard   | (lowest 5%)  |  | Severe   | (Risk rating above 40)      |  |

| Panel B: Transition matrix        |                                |           |            |            |           |
|-----------------------------------|--------------------------------|-----------|------------|------------|-----------|
| Old Morningstar<br>Classification | New Morningstar Classification |           |            |            |           |
|                                   | Negligible                     | Low       | Medium     | High       | Severe    |
| Industry Leader                   | <b>1</b>                       | 9         | 5          | 1          | 0         |
| Outperformer                      | 3                              | <b>29</b> | 23         | 5          | 0         |
| Average Performer                 | 5                              | 265       | <b>538</b> | 320        | 167       |
| Underperformer                    | 0                              | 66        | 124        | <b>295</b> | 112       |
| Industry Laggard                  | 0                              | 5         | 64         | 164        | <b>68</b> |

**Table 3: ESG rating methodology change and abnormal returns**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over the 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is positive, zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.  $\Delta\text{SUSTAINALYTICS RATING}_i$  is the difference in firm  $i$ 's Sustainalytics average ESG Risk rating in the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta\text{ESG RANK}_i$  is the difference in the firm's relative ranking in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption.  $\text{CLASSIFICATION UPGRADE}_i$  ( $\text{CLASSIFICATION DOWNGRADE}_i$ ) is an indicator variable equal to one if the firm has an increase (decrease) in its Morningstar ESG Rating Assessment classification after the adoption of the new methodology. We control for stock and industry $\times$ year-month fixed effects. Standard errors are clustered at the firm level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

| Panel A:   | SINGLE FACTOR ABNRET |                     |                       |                       | THREE FACTOR ABNRET |                     |                      |                     | CARHART ABNRET      |                     |                       |                      |
|--|----------------------|---------------------|-----------------------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|---------------------|-----------------------|----------------------|
|  | (1)                  | (2)                 | (3)                   | (4)                   | (5)                 | (6)                 | (7)                  | (8)                 | (9)                 | (10)                | (11)                  | (12)                 |
| $\Delta\text{ESG}_i \times \text{POST}_t$            | 0.0819***<br>(5.60)  |                     |                       |                       | 0.0482***<br>(3.29) |                     |                      |                     | 0.0556***<br>(3.76) |                     |                       |                      |
| $\overline{\Delta\text{ESG}}_i \times \text{POST}_t$ |                      | 0.0832***<br>(5.58) |                       |                       |                     | 0.0492***<br>(3.28) |                      |                     |                     | 0.0566***<br>(3.76) |                       |                      |
| $\text{ESG PSEUDO DOWNGRADE}_i \times \text{POST}_t$ |                      |                     | -1.7262***<br>(-4.35) | -1.5670***<br>(-3.94) |                     |                     | -0.8041**<br>(-2.01) | -0.6617*<br>(-1.65) |                     |                     | -1.0765***<br>(-2.64) | -0.9353**<br>(-2.29) |
| $\text{ESG PSEUDO UPGRADE}_i \times \text{POST}_t$   |                      |                     |                       | 2.3902<br>(1.58)      |                     |                     |                      | 2.1378<br>(1.41)    |                     |                     |                       | 2.1196<br>(1.40)     |
| Stock FE   | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Industry $\times$ Year-Month FE                      | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Observations   | 12768                | 12768               | 12768                 | 12768                 | 12768               | 12768               | 12768                | 12768               | 12768               | 12768               | 12768                 | 12768                |
| $R^2$  | 0.191                | 0.191               | 0.190                 | 0.190                 | 0.179               | 0.179               | 0.178                | 0.178               | 0.176               | 0.176               | 0.175                 | 0.176                |

**Table 3: ESG rating methodology change and abnormal returns (continued)**

| Panel B:  | SINGLE FACTOR ABNRET |                      |                       |                       | THREE FACTOR ABNRET |                     |                      |                     | CARHART ABNRET      |                     |                       |                      |
|---|----------------------|----------------------|-----------------------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|---------------------|-----------------------|----------------------|
|   | (1)                  | (2)                  | (3)                   | (4)                   | (5)                 | (6)                 | (7)                  | (8)                 | (9)                 | (10)                | (11)                  | (12)                 |
| $\Delta\text{ESG}_i \times \text{POST}_t$                   | 0.0864***<br>(5.88)  |                      |                       |                       | 0.0501***<br>(3.39) |                     |                      |                     | 0.0579***<br>(3.90) |                     |                       |                      |
| $\Delta\overline{\text{ESG}}_i \times \text{POST}_t$        |                      | 0.0869***<br>(5.83)  |                       |                       |                     | 0.0504***<br>(3.36) |                      |                     |                     | 0.0584***<br>(3.87) |                       |                      |
| $\text{ESG PSEUDO DOWNGRADE}_i \times \text{POST}_t$        |                      |                      | -1.7660***<br>(-4.44) | -1.6019***<br>(-4.02) |                     |                     | -0.8155**<br>(-2.03) | -0.6737*<br>(-1.68) |                     |                     | -1.0939***<br>(-2.68) | -0.9519**<br>(-2.32) |
| $\text{ESG PSEUDO UPGRADE}_i \times \text{POST}_t$          |                      |                      |                       | 2.5181*<br>(1.67)     |                     |                     |                      | 2.1756<br>(1.44)    |                     |                     |                       | 2.1794<br>(1.45)     |
| $\Delta\text{ESG RANK}_i \times \text{POST}_t$              | -1.6324**<br>(-2.38) | -1.6349**<br>(-2.38) | -1.3451*<br>(-1.95)   | -1.4726**<br>(-2.15)  | -0.5588<br>(-0.82)  | -0.5604<br>(-0.82)  | -0.3805<br>(-0.55)   | -0.4906<br>(-0.72)  | -0.7856<br>(-1.14)  | -0.7880<br>(-1.14)  | -0.5880<br>(-0.85)    | -0.6984<br>(-1.01)   |
| $\Delta\text{SUSTAINALYTICS RATING}_i \times \text{POST}_t$ | 0.1402<br>(0.98)     | 0.0775<br>(0.54)     | 0.0801<br>(0.54)      | 0.0677<br>(0.47)      | 0.0878<br>(0.63)    | 0.0515<br>(0.37)    | 0.0528<br>(0.37)     | 0.0421<br>(0.30)    | 0.0866<br>(0.62)    | 0.0446<br>(0.32)    | 0.0463<br>(0.33)      | 0.0355<br>(0.26)     |
| Stock FE  | Yes                  | Yes                  | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Industry $\times$ Year-Month FE                             | Yes                  | Yes                  | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Observations  | 12768                | 12768                | 12768                 | 12768                 | 12768               | 12768               | 12768                | 12768               | 12768               | 12768               | 12768                 | 12768                |
| $R^2$   | 0.192                | 0.192                | 0.190                 | 0.191                 | 0.179               | 0.179               | 0.178                | 0.178               | 0.176               | 0.176               | 0.176                 | 0.176                |

**Table 3: ESG rating methodology change and abnormal returns (continued)**

| Panel C:  | SINGLE FACTOR ABNRET |                     |                       |                       | THREE FACTOR ABNRET |                     |                    |                    | CARHART ABNRET      |                     |                      |                     |
|---|----------------------|---------------------|-----------------------|-----------------------|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|---------------------|
|   | (1)                  | (2)                 | (3)                   | (4)                   | (5)                 | (6)                 | (7)                | (8)                | (9)                 | (10)                | (11)                 | (12)                |
| $\Delta\text{ESG}_i \times \text{POST}_t$                   | 0.0810***<br>(5.59)  |                     |                       |                       | 0.0439***<br>(3.03) |                     |                    |                    | 0.0514***<br>(3.54) |                     |                      |                     |
| $\Delta\overline{\text{ESG}}_i \times \text{POST}_t$        |                      | 0.0814***<br>(5.53) |                       |                       |                     | 0.0441***<br>(3.00) |                    |                    |                     | 0.0518***<br>(3.51) |                      |                     |
| ESG PSEUDO DOWNGRADE <sub>i</sub> × POST <sub>t</sub>       |                      |                     | -1.5834***<br>(-3.94) | -1.4692***<br>(-3.62) |                     |                     | -0.5845<br>(-1.45) | -0.4869<br>(-1.19) |                     |                     | -0.8584**<br>(-2.09) | -0.7616*<br>(-1.83) |
| ESG PSEUDO UPGRADE <sub>i</sub> × POST <sub>t</sub>         |                      |                     |                       | 2.2756<br>(1.51)      |                     |                     |                    | 1.9460<br>(1.29)   |                     |                     |                      | 1.9301<br>(1.29)    |
| $\Delta\text{SUSTAINALYTICS RATING}_i \times \text{POST}_t$ | 0.1225<br>(0.86)     | 0.0637<br>(0.44)    | 0.0733<br>(0.50)      | 0.0587<br>(0.41)      | 0.0871<br>(0.63)    | 0.0552<br>(0.40)    | 0.0613<br>(0.44)   | 0.0488<br>(0.36)   | 0.0833<br>(0.60)    | 0.0459<br>(0.33)    | 0.0525<br>(0.37)     | 0.0401<br>(0.29)    |
| CLASSIFICATION UPGRADE <sub>i</sub> × POST <sub>t</sub>     | -0.3289<br>(-0.80)   | -0.3303<br>(-0.80)  | -0.3041<br>(-0.73)    | -0.2310<br>(-0.56)    | -0.5636<br>(-1.37)  | -0.5643<br>(-1.37)  | -0.5782<br>(-1.40) | -0.5156<br>(-1.24) | -0.6384<br>(-1.52)  | -0.6391<br>(-1.52)  | -0.6378<br>(-1.51)   | -0.5757<br>(-1.36)  |
| CLASSIFICATION DONWGRADE <sub>i</sub> × POST <sub>t</sub>   | 0.0232<br>(0.04)     | 0.0162<br>(0.03)    | 0.3911<br>(0.68)      | 0.2831<br>(0.50)      | 0.2585<br>(0.46)    | 0.2546<br>(0.46)    | 0.5078<br>(0.90)   | 0.4154<br>(0.75)   | 0.1910<br>(0.34)    | 0.1853<br>(0.33)    | 0.4514<br>(0.79)     | 0.3598<br>(0.65)    |
| Stock FE  | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                | Yes                | Yes                 | Yes                 | Yes                  | Yes                 |
| Industry×Year-Month FE                                      | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                | Yes                | Yes                 | Yes                 | Yes                  | Yes                 |
| Observations  | 12768                | 12768               | 12768                 | 12768                 | 12768               | 12768               | 12768              | 12768              | 12768               | 12768               | 12768                | 12768               |
| R <sup>2</sup>  | 0.191                | 0.191               | 0.190                 | 0.191                 | 0.179               | 0.179               | 0.178              | 0.179              | 0.176               | 0.176               | 0.176                | 0.176               |

**Table 4: Change in abnormal returns for firms that have a decline in their ESG ratings and either no change or increase in ranking**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The sample is restricted to only those firms that have a decline in their ESG ratings and either no change or increase in ranking. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October – December 2019) after the adoption and the average old ESG rating in the three months (July – September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology is introduced in October 2019, zero otherwise. Standard errors are clustered at the firm level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

|  | SINGLE FACTOR ABNRET |                     |                       | THREE FACTOR ABNRET |                     |                      | CARHART ABNRET      |                     |                      |
|--|----------------------|---------------------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|----------------------|
|  | (1)                  | (2)                 | (3)                   | (4)                 | (5)                 | (6)                  | (7)                 | (8)                 | (9)                  |
| $\Delta\text{ESG}_i \times \text{POST}_t$            | 0.1486***<br>(4.96)  |                     |                       | 0.1140***<br>(3.78) |                     |                      | 0.1153***<br>(3.72) |                     |                      |
| $\overline{\Delta\text{ESG}}_i \times \text{POST}_t$ |                      | 0.1541***<br>(5.08) |                       |                     | 0.1186***<br>(3.89) |                      |                     | 0.1205***<br>(3.85) |                      |
| $\text{ESG PSEUDO-DOWNGRADE}_i \times \text{POST}_t$ |                      |                     | -2.2416***<br>(-3.07) |                     |                     | -1.6211**<br>(-2.23) |                     |                     | -1.8214**<br>(-2.43) |
| Stock FE   | Yes                  | Yes                 | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                  |
| Industry×Year-Month FE                               | Yes                  | Yes                 | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                  |
| Observations   | 6403                 | 6403                | 6403                  | 6403                | 6403                | 6403                 | 6403                | 6403                | 6403                 |
| $R^2$  | 0.204                | 0.204               | 0.202                 | 0.193               | 0.193               | 0.192                | 0.190               | 0.190               | 0.189                |

**Table 5: ESG rating methodology change and change in ownership**

This table reports OLS regressions of the adoption of the new ESG Risk rating methodology by Morningstar on the change in share ownership or investor participation. The dependent variables are measured as the change from the three month period (or quarter) after the adoption to the three month period (or quarter) before the adoption of the new methodology by Morningstar and Yahoo! Finance. The dependent variables in Panel A are as follows: in columns (1)-(4), the change in retail participation measured as the change in the average number of Robinhood investors holding a stock divided by the average dollar trading volume between April and June 2019; in columns (5)-(8), the quarterly change in holdings by 13F institutions; and in columns (9)-(12), the change in short interest. In Panel B, we focus on U.S.-domicile mutual funds actively investing in U.S. equities. The dependent variables in Panel B are as follows: in columns (1)-(4), the change in the holdings of funds identified as ESG-oriented funds; in columns (5)-(8), Gantchev et al.'s (2021) measure of abnormal trading activity of funds that improve their globe rating; and in columns (9)-(12), the change in the holdings of funds that are neither ESG nor GGL FUNDS. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta\overline{\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\Delta\overline{\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\Delta\text{ESG}_i$  is positive, zero otherwise. Standard errors are adjusted for heteroscedasticity and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

| Panel A:                        | $\Delta\#\text{RETAIL}$ |                     |                       |                       | $\Delta\text{13F}$ |                  |                    |                    | $\Delta\text{SHORT SELLERS}$ |                     |                      |                     |
|---------------------------------|-------------------------|---------------------|-----------------------|-----------------------|--------------------|------------------|--------------------|--------------------|------------------------------|---------------------|----------------------|---------------------|
|                                 | (1)                     | (2)                 | (3)                   | (4)                   | (5)                | (6)              | (7)                | (8)                | (9)                          | (10)                | (11)                 | (12)                |
| $\Delta\text{ESG}_i$            | 0.0041***<br>(4.80)     |                     |                       |                       | 0.0026<br>(0.27)   |                  |                    |                    | 0.0120***<br>(4.42)          |                     |                      |                     |
| $\Delta\overline{\text{ESG}}_i$ |                         | 0.0041***<br>(4.79) |                       |                       |                    | 0.0026<br>(0.27) |                    |                    |                              | 0.0124***<br>(4.47) |                      |                     |
| $\text{ESG PSEUDO-DOWNGRADE}_i$ |                         |                     | -0.0807***<br>(-4.33) | -0.0743***<br>(-3.80) |                    |                  | -0.0079<br>(-0.02) | -0.0089<br>(-0.03) |                              |                     | -0.2164**<br>(-2.19) | -0.1739*<br>(-1.74) |
| $\text{ESG PSEUDO-UPGRADE}_i$   |                         |                     |                       | 0.0829**<br>(1.99)    |                    |                  |                    | -0.0131<br>(-0.02) |                              |                     |                      | 0.5472***<br>(2.88) |
| Observations                    | 2310                    | 2310                | 2310                  | 2310                  | 2310               | 2310             | 2310               | 2310               | 2310                         | 2310                | 2310                 | 2310                |
| $R^2$                           | 0.010                   | 0.010               | 0.004                 | 0.005                 | 0.000              | 0.000            | 0.000              | 0.000              | 0.007                        | 0.007               | 0.002                | 0.006               |

**Table 5: ESG rating methodology change and change in ownership (continued)**

| Panel B:                                 | $\Delta$ ESG FUNDS |                    |                  |                    | $\Delta$ GGL FUNDS |                    |                    |                    | $\Delta$ OTHER FUNDS |                     |                       |                       |
|--|--------------------|--------------------|------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------------|---------------------|-----------------------|-----------------------|
|  | (1)                | (2)                | (3)              | (4)                | (5)                | (6)                | (7)                | (8)                | (9)                  | (10)                | (11)                  | (12)                  |
| $\Delta$ ESG <sub><i>i</i></sub>         | -0.0001<br>(-0.58) |                    |                  |                    | -0.0003<br>(-0.72) |                    |                    |                    | 0.0134***<br>(4.50)  |                     |                       |                       |
| $\Delta\overline{\text{ESG}}_i$          |                    | -0.0001<br>(-0.54) |                  |                    |                    | -0.0003<br>(-0.73) |                    |                    |                      | 0.0137***<br>(4.56) |                       |                       |
| ESG PSEUDO DOWNGRADE <sub><i>i</i></sub> |                    |                    | 0.0050<br>(1.28) | 0.0058<br>(1.47)   |                    |                    | -0.0002<br>(-0.02) | -0.0019<br>(-0.12) |                      |                     | -0.3399***<br>(-3.56) | -0.3073***<br>(-3.21) |
| ESG PSEUDO UPGRADE <sub><i>i</i></sub>   |                    |                    |                  | 0.0101**<br>(2.05) |                    |                    |                    | -0.0207<br>(-1.10) |                      |                     |                       | 0.4199*<br>(1.92)     |
| Observations                             | 2310               | 2310               | 2310             | 2310               | 2310               | 2310               | 2310               | 2310               | 2310                 | 2310                | 2310                  | 2310                  |
| $R^2$                                    | 0.000              | 0.000              | 0.001            | 0.002              | 0.000              | 0.000              | 0.000              | 0.000              | 0.009                | 0.009               | 0.006                 | 0.008                 |



**Table 6: Change in ownership for firms that have a decline in their ESG ratings and either no change or increase in ranking**

This table reports OLS regressions of the adoption of the new ESG Risk rating methodology by Morningstar on the change in share ownership or investor participation. The sample is restricted to only those firms that have a decline in their ESG ratings and either no change or increase in ranking. The dependent variables are measured as the percentage change from the three month period (or quarter) after the adoption to the three month period (or quarter) before the adoption of the new methodology by Morningstar and Yahoo! Finance. The dependent variables in Panel A are as follows: in columns (1)-(4), the change in retail participation measured as the change in the average number of Robinhood investors holding a stock divided by the average dollar trading volume between April and June 2019; in columns (5)-(8), the quarterly change in holdings by 13F institutions; and in columns (9)-(12), the change in short interest. In Panel B, we focus on U.S.-domicile mutual funds actively investing in U.S. equities. The dependent variables in Panel B are as follows: in columns (1)-(4), the change in the holdings of funds identified as ESG-oriented funds; in columns (5)-(8), Gantchev et al.'s (2021) measure of abnormal trading activity of funds that improve their globe rating; and in columns (9)-(12), the change in the holdings of funds that are neither ESG nor GGL FUNDS. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta\overline{\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\Delta\overline{\text{ESG}}_i$  is in the lower quartile, and zero otherwise. Standard errors are clustered at the firm level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

| Panel A:                        | $\Delta\#\text{RETAIL}$ |                     |                       | $\Delta\text{13F}$ |                   |                    | $\Delta\text{SHORT SELLERS}$ |                     |                     |
|---------------------------------|-------------------------|---------------------|-----------------------|--------------------|-------------------|--------------------|------------------------------|---------------------|---------------------|
|                                 | (1)                     | (2)                 | (3)                   | (4)                | (5)               | (6)                | (7)                          | (8)                 | (9)                 |
| $\Delta\text{ESG}_i$            | 0.0085***<br>(3.32)     |                     |                       | 0.0344*<br>(1.90)  |                   |                    | 0.0175***<br>(3.00)          |                     |                     |
| $\Delta\overline{\text{ESG}}_i$ |                         | 0.0084***<br>(3.29) |                       |                    | 0.0347*<br>(1.89) |                    |                              | 0.0182***<br>(3.06) |                     |
| $\text{ESG PSEUDO DOWNGRADE}_i$ |                         |                     | -0.1132***<br>(-3.26) |                    |                   | -0.7114<br>(-1.22) |                              |                     | -0.3234*<br>(-1.82) |
| Observations                    | 1190                    | 1190                | 1190                  | 1190               | 1190              | 1190               | 1190                         | 1190                | 1190                |
| $R^2$                           | 0.016                   | 0.015               | 0.004                 | 0.002              | 0.002             | 0.001              | 0.007                        | 0.007               | 0.003               |

**Table 6: Change in ownership for firms that have a decline in their ESG ratings and either no change or increase in ranking (continued)**

| Panel B:                                 | $\Delta$ ESG FUNDS |                    |                  | $\Delta$ GGL FUNDS |                    |                    | $\Delta$ OTHER FUNDS |                     |                      |
|--|--------------------|--------------------|------------------|--------------------|--------------------|--------------------|----------------------|---------------------|----------------------|
|  | (1)                | (2)                | (3)              | (4)                | (5)                | (6)                | (7)                  | (8)                 | (9)                  |
| $\Delta$ ESG <sub><i>i</i></sub>         | -0.0001<br>(-0.50) |                    |                  | -0.0006<br>(-0.76) |                    |                    | 0.0172***<br>(2.88)  |                     |                      |
| $\Delta\overline{\text{ESG}}_i$          |                    | -0.0001<br>(-0.50) |                  |                    | -0.0006<br>(-0.73) |                    |                      | 0.0177***<br>(2.96) |                      |
| ESG PSEUDO DOWNGRADE <sub><i>i</i></sub> |                    |                    | 0.0044<br>(0.63) |                    |                    | -0.0079<br>(-0.30) |                      |                     | -0.3979**<br>(-2.44) |
| Observations                             | 1190               | 1190               | 1190             | 1190               | 1190               | 1190               | 1190                 | 1190                | 1190                 |
| $R^2$                                    | 0.000              | 0.000              | 0.001            | 0.000              | 0.000              | 0.000              | 0.008                | 0.008               | 0.006                |

**Table 7: ESG rating methodology change and high institutional ownership**

This table reports triple difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns for firms with high and firms with low institutional ownership.  $\text{HIGH INST}_i$  is an indicator variable equal to one if the stock's ownership is in both the highest quartile of institutional ownership and the lowest quartile of retail participation, and zero otherwise. The dependent variables are as follows: in columns (1)-(2), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (3)-(4), three-factor abnormal returns, and in columns (5)-(6), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar and Yahoo! Finance of the new methodology).  $\Delta\overline{\text{ESG}}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta\overline{\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.  $\Delta\text{ESG RANK}_i$  is the difference in the firm's relative ranking in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption.  $\Delta\text{SUSTAINALYTICS RATING}_i$  is the difference in firm  $i$ 's Sustainalytics average ESG Risk rating between the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance. We include firm and industry $\times$ year-month fixed effects. Standard errors are clustered at the firm level.  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

| Panel A:   | SINGLE FACTOR ABNRET  |                      | THREE FACTOR ABNRET  |                      | CARHART ABNRET      |                      |
|--|-----------------------|----------------------|----------------------|----------------------|---------------------|----------------------|
|  | (1)                   | (2)                  | (3)                  | (4)                  | (5)                 | (6)                  |
| $\Delta\overline{\text{ESG}}_i \times \text{POST}_t \times \text{HIGH INST}_i$ | -0.0569**<br>(-2.03)  | -0.0571**<br>(-2.03) | -0.0560**<br>(-2.02) | -0.0561**<br>(-2.02) | -0.0726*<br>(-1.96) | -0.0727**<br>(-1.96) |
| $\Delta\overline{\text{ESG}}_i \times \text{POST}_t$                           | 0.0919***<br>(5.24)   | 0.0958***<br>(5.49)  | 0.0594***<br>(3.37)  | 0.0607***<br>(3.45)  | 0.0846***<br>(4.08) | 0.0873***<br>(4.18)  |
| $\Delta\text{POST}_t \times \text{HIGH INST}_i$                                | -2.0413***<br>(-2.62) | -1.9853**<br>(-2.55) | -1.6776**<br>(-2.19) | -1.6550**<br>(-2.16) | -2.0506*<br>(-1.95) | -2.0147*<br>(-1.92)  |
| $\Delta\text{ESG RANK}_i \times \text{POST}_t$                                 |                       | -1.5885**<br>(-2.33) |                      | -0.5365<br>(-0.79)   |                     | -1.0673<br>(-1.39)   |
| $\Delta\text{SUSTAINALYTICS RATING}_i \times \text{POST}_t$                    |                       | 0.0683<br>(0.47)     |                      | 0.0453<br>(0.32)     |                     | 0.0352<br>(0.25)     |
| Stock FE   | Yes                   | Yes                  | Yes                  | Yes                  | Yes                 | Yes                  |
| Industry $\times$ Year-Month FE  | Yes                   | Yes                  | Yes                  | Yes                  | Yes                 | Yes                  |
| Observations   | 12768                 | 12768                | 12768                | 12768                | 12768               | 12768                |
| $R^2$  | 0.192                 | 0.192                | 0.179                | 0.179                | 0.170               | 0.170                |

**Table 8: ESG rating methodology change and the availability of MSCI sustainability ratings**

This table reports triple difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns for firms whose ESG practices are also rated by MSCI and for firms only evaluated by Sustainalytics.  $MSCI_i$  is an indicator variable equal to one if the stock's ESG ratings are also available through the MSCI ESG Rating website, zero otherwise. The dependent variables are as follows: in columns (1)-(2), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (3)-(4), three-factor abnormal returns; and in columns (5)-(6), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar and Yahoo! Finance of the new methodology).  $\Delta ESG_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta \overline{ESG}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $POST_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.  $\Delta ESG\ RANK_i$  is the difference in the firm's relative ranking in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption.  $\Delta SUSTAINALYTICS\ RATING_i$  is the difference in firm  $i$ 's Sustainalytics average ESG Risk rating between the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance. We include firm and industry $\times$ year-month fixed effects. Standard errors are clustered at the firm level.  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

| Panel B:  | SINGLE FACTOR ABNRET  |                       | THREE FACTOR ABNRET   |                       | CARHART ABNRET        |                       |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|   | (1)                   | (2)                   | (3)                   | (4)                   | (5)                   | (6)                   |
| $\Delta \overline{ESG}_i \times POST_t \times MSCI_i$ | -0.0880***<br>(-2.95) | -0.0997***<br>(-3.31) | -0.0921***<br>(-3.13) | -0.0981***<br>(-3.30) | -0.1009***<br>(-3.11) | -0.1110***<br>(-3.35) |
| $\Delta \overline{ESG}_i \times POST_t$               | 0.1004***<br>(4.63)   | 0.1107***<br>(5.01)   | 0.0839***<br>(3.83)   | 0.0892***<br>(4.00)   | 0.1097***<br>(4.18)   | 0.1186***<br>(4.39)   |
| $POST_t \times MSCI_i$                                | -2.8714***<br>(-3.10) | -2.9731***<br>(-3.23) | -1.8049**<br>(-2.01)  | -1.8565**<br>(-2.07)  | -1.9080**<br>(-2.00)  | -1.9990**<br>(-2.09)  |
| $\Delta ESG\ RANK_i \times POST_t$                    |                       | -1.8203***<br>(-2.61) |                       | -0.9473<br>(-1.36)    |                       | -1.5457**<br>(-1.97)  |
| $\Delta SUSTAINALYTICS\ RATING_i \times POST_t$       |                       | 0.0700<br>(0.49)      |                       | 0.0441<br>(0.32)      |                       | 0.0335<br>(0.24)      |
| Stock FE  | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   |
| Industry $\times$ Year-Month FE                       | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   |
| Observations  | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 |
| $R^2$   | 0.192                 | 0.192                 | 0.179                 | 0.179                 | 0.170                 | 0.171                 |

**Internet Appendix**  
**The Salience of ESG Ratings for Stock Pricing: Evidence From (Potentially)**  
**Confused Investors**

**Table IA.1: ESG rating methodology change and abnormal returns – standard errors clustered at the industry×year-month level**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is positive, zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise. We include stock and year-month fixed effects. Standard errors are clustered at the industry×year-month level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

59

|  | SINGLE FACTOR ABNRET |                     |                       |                      | THREE FACTOR ABNRET |                    |                     |                    | CARHART ABNRET     |                    |                      |                      |
|--|----------------------|---------------------|-----------------------|----------------------|---------------------|--------------------|---------------------|--------------------|--------------------|--------------------|----------------------|----------------------|
|  | (1)                  | (2)                 | (3)                   | (4)                  | (5)                 | (6)                | (7)                 | (8)                | (9)                | (10)               | (11)                 | (12)                 |
| $\Delta\text{ESG}_i \times \text{POST}_t$            | 0.1067***<br>(3.00)  |                     |                       |                      | 0.0763**<br>(2.47)  |                    |                     |                    | 0.0796**<br>(2.61) |                    |                      |                      |
| $\overline{\Delta\text{ESG}}_i \times \text{POST}_t$ |                      | 0.1076***<br>(2.97) |                       |                      |                     | 0.0770**<br>(2.44) |                     |                    |                    | 0.0805**<br>(2.60) |                      |                      |
| $\text{ESG PSEUDO DOWNGRADE}_i \times \text{POST}_t$ |                      |                     | -2.1050***<br>(-2.80) | -1.7678**<br>(-2.54) |                     |                    | -1.2724*<br>(-1.81) | -0.9572<br>(-1.44) |                    |                    | -1.5663**<br>(-2.33) | -1.2885**<br>(-2.05) |
| $\text{ESG PSEUDO UPGRADE}_i \times \text{POST}_t$   |                      |                     |                       | 4.4424<br>(1.65)     |                     |                    |                     | 4.1523*<br>(1.66)  |                    |                    |                      | 3.6587<br>(1.46)     |
| Stock FE   | Yes                  | Yes                 | Yes                   | Yes                  | Yes                 | Yes                | Yes                 | Yes                | Yes                | Yes                | Yes                  | Yes                  |
| Year-Month FE  | Yes                  | Yes                 | Yes                   | Yes                  | Yes                 | Yes                | Yes                 | Yes                | Yes                | Yes                | Yes                  | Yes                  |
| Observations   | 12768                | 12768               | 12768                 | 12768                | 12768               | 12768              | 12768               | 12768              | 12768              | 12768              | 12768                | 12768                |
| $R^2$  | 0.146                | 0.146               | 0.143                 | 0.145                | 0.137               | 0.137              | 0.135               | 0.137              | 0.136              | 0.136              | 0.134                | 0.135                |

**Table IA.2: ESG rating methodology change and abnormal returns – with stock and year-month fixed effects**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from 12-month rolling-window regression; in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta\overline{\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\Delta\overline{\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\Delta\overline{\text{ESG}}_i$  is positive, zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise. We include stock and year-month fixed effects. Standard errors are clustered at the firm level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

|  | SINGLE FACTOR ABNRET |                     |                       |                       | THREE FACTOR ABNRET |                     |                       |                      | CARHART ABNRET      |                     |                       |                       |
|--|----------------------|---------------------|-----------------------|-----------------------|---------------------|---------------------|-----------------------|----------------------|---------------------|---------------------|-----------------------|-----------------------|
|  | (1)                  | (2)                 | (3)                   | (4)                   | (5)                 | (6)                 | (7)                   | (8)                  | (9)                 | (10)                | (11)                  | (12)                  |
| $\Delta\text{ESG}_i \times \text{POST}_t$            | 0.1067***<br>(7.30)  |                     |                       |                       | 0.0763***<br>(5.21) |                     |                       |                      | 0.0796***<br>(5.43) |                     |                       |                       |
| $\Delta\overline{\text{ESG}}_i \times \text{POST}_t$ |                      | 0.1076***<br>(7.22) |                       |                       |                     | 0.0770***<br>(5.15) |                       |                      |                     | 0.0805***<br>(5.38) |                       |                       |
| $\text{ESG PSEUDO DOWNGRADE}_i \times \text{POST}_t$ |                      |                     | -2.1050***<br>(-5.62) | -1.7678***<br>(-4.79) |                     |                     | -1.2724***<br>(-3.38) | -0.9572**<br>(-2.58) |                     |                     | -1.5663***<br>(-4.08) | -1.2885***<br>(-3.40) |
| $\text{ESG PSEUDO UPGRADE}_i \times \text{POST}_t$   |                      |                     |                       | 4.4424***<br>(3.18)   |                     |                     |                       | 4.1523***<br>(2.97)  |                     |                     |                       | 3.6587***<br>(2.63)   |
| Stock FE   | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                   | Yes                  | Yes                 | Yes                 | Yes                   | Yes                   |
| Year-Month FE  | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                   | Yes                  | Yes                 | Yes                 | Yes                   | Yes                   |
| Observations   | 12768                | 12768               | 12768                 | 12768                 | 12768               | 12768               | 12768                 | 12768                | 12768               | 12768               | 12768                 | 12768                 |
| $R^2$  | 0.146                | 0.146               | 0.143                 | 0.145                 | 0.137               | 0.137               | 0.135                 | 0.137                | 0.136               | 0.136               | 0.134                 | 0.135                 |

**Table IA.3: ESG rating methodology change and abnormal returns – excluding fossil fuels (NAICS = 2211) and oil and gas extraction (NAICS = 2111) firms**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology), but excludes firms with NAICS 2211 and 2111.  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\Delta\text{ESG}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is positive, zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise. We include stock and year-month fixed effects. Standard errors are clustered at the firm level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

|  | SINGLE FACTOR ABNRET |                     |                       |                       | THREE FACTOR ABNRET |                     |                     |                     | CARHART ABNRET      |                     |                      |                      |
|--|----------------------|---------------------|-----------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|----------------------|
|  | (1)                  | (2)                 | (3)                   | (4)                   | (5)                 | (6)                 | (7)                 | (8)                 | (9)                 | (10)                | (11)                 | (12)                 |
| $\Delta\text{ESG}_i \times \text{POST}_t$            | 0.0788***<br>(5.23)  |                     |                       |                       | 0.0442***<br>(2.92) |                     |                     |                     | 0.0514***<br>(3.37) |                     |                      |                      |
| $\overline{\Delta\text{ESG}}_i \times \text{POST}_t$ |                      | 0.0802***<br>(5.21) |                       |                       |                     | 0.0451***<br>(2.92) |                     |                     |                     | 0.0525***<br>(3.37) |                      |                      |
| $\text{ESG PSEUDO DOWNGRADE}_i \times \text{POST}_t$ |                      |                     | -1.7412***<br>(-4.24) | -1.6246***<br>(-3.95) |                     |                     | -0.8089*<br>(-1.96) | -0.7077*<br>(-1.71) |                     |                     | -1.0812**<br>(-2.56) | -0.9821**<br>(-2.32) |
| $\text{ESG PSEUDO UPGRADE}_i \times \text{POST}_t$   |                      |                     |                       | 1.8773<br>(1.09)      |                     |                     |                     | 1.6290<br>(0.95)    |                     |                     |                      | 1.5955<br>(0.93)     |
| Stock FE   | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                 | Yes                 | Yes                 | Yes                 | Yes                  | Yes                  |
| Industry $\times$ Year-Month FE                      | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                 | Yes                 | Yes                 | Yes                 | Yes                  | Yes                  |
| Observations   | 12235                | 12235               | 12235                 | 12235                 | 12235               | 12235               | 12235               | 12235               | 12235               | 12235               | 12235                | 12235                |
| $R^2$  | 0.178                | 0.178               | 0.177                 | 0.177                 | 0.170               | 0.170               | 0.170               | 0.170               | 0.168               | 0.168               | 0.168                | 0.168                |



**Table IA.4: ESG rating methodology change and abnormal returns – MSCI ESG ratings**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is positive, zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.  $\Delta\text{MSCI}_i$  denotes the difference in MSCI rating from the three months after the adoption by Morningstar of the new methodology to the three months before. Firms that are not available through the MSCI-website are assigned a value of zero for  $\Delta\text{MSCI}_i$ .  $\text{MSCI AVAILABLE}_i$  is an indicator variable that takes the value of one if a stock's ESG ratings are available through the MSCI online platform, otherwise zero. We include stock and industry $\times$ year-month fixed effects. Standard errors are clustered at the stock level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

|  | SINGLE FACTOR ABNRET |                     |                       |                       | THREE FACTOR ABNRET |                     |                      |                     | CARHART ABNRET      |                     |                       |                      |
|--|----------------------|---------------------|-----------------------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|---------------------|-----------------------|----------------------|
|  | (1)                  | (2)                 | (3)                   | (4)                   | (5)                 | (6)                 | (7)                  | (8)                 | (9)                 | (10)                | (11)                  | (12)                 |
| $\Delta\text{ESG}_i \times \text{POST}_t$            | 0.0769***<br>(4.53)  |                     |                       |                       | 0.0596***<br>(3.50) |                     |                      |                     | 0.0688***<br>(4.01) |                     |                       |                      |
| $\overline{\Delta\text{ESG}}_i \times \text{POST}_t$ |                      | 0.0783***<br>(4.52) |                       |                       |                     | 0.0607***<br>(3.49) |                      |                     |                     | 0.0700***<br>(4.00) |                       |                      |
| $\text{ESG PSEUDO DOWNGRADE}_i \times \text{POST}_t$ |                      |                     | -1.3475***<br>(-3.01) | -1.2334***<br>(-2.75) |                     |                     | -0.9314**<br>(-2.06) | -0.8222*<br>(-1.82) |                     |                     | -1.2581***<br>(-2.74) | -1.1490**<br>(-2.50) |
| $\text{ESG PSEUDO UPGRADE}_i \times \text{POST}_t$   |                      |                     |                       | 2.2867<br>(1.51)      |                     |                     |                      | 2.1874<br>(1.44)    |                     |                     |                       | 2.1852<br>(1.44)     |
| $\Delta\text{MSCI}_i \times \text{POST}_t$           | 0.1094<br>(0.15)     | 0.0626<br>(0.09)    | 0.0441<br>(0.06)      | 0.0713<br>(0.10)      | 0.1462<br>(0.21)    | 0.1101<br>(0.16)    | 0.0779<br>(0.11)     | 0.1039<br>(0.15)    | 0.5280<br>(0.77)    | 0.4862<br>(0.70)    | 0.4779<br>(0.71)      | 0.5039<br>(0.73)     |
| $\text{MSCI AVAILABLE}_i \times \text{POST}_t$       | -0.3647<br>(-0.89)   | -0.3597<br>(-0.87)  | -0.9544**<br>(-2.45)  | -0.8604**<br>(-2.20)  | 0.8179**<br>(2.00)  | 0.8223**<br>(2.01)  | 0.3142<br>(0.81)     | 0.4041<br>(1.04)    | 0.9281**<br>(2.26)  | 0.9325**<br>(2.27)  | 0.4223<br>(1.09)      | 0.5121<br>(1.31)     |
| Stock FE   | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Industry $\times$ Year-Month FE                      | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Observations   | 12768                | 12768               | 12768                 | 12768                 | 12768               | 12768               | 12768                | 12768               | 12768               | 12768               | 12768                 | 12768                |
| $R^2$  | 0.191                | 0.191               | 0.190                 | 0.191                 | 0.179               | 0.179               | 0.178                | 0.178               | 0.176               | 0.176               | 0.176                 | 0.176                |

**Table IA.5: ESG rating methodology change and abnormal returns – Dow Jones Sustainability Index reconstitution**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is positive, zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.  $\text{DOW JONES}_i$  is a dummy variable equal to one, if a stock was part of the Dow Jones Sustainability Index before and after reconstitution in the fall of 2019.  $\text{ADD DOW JONES}_i$  ( $\text{DELETE DOW JONES}_i$ ) is a dummy variable equal to one if a stock was added to (deleted from) the Dow Jones Sustainability Index in the fall of 2019. We include stock and industry $\times$ year-month fixed effects. Standard errors are clustered at the stock level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

|  | SINGLE FACTOR ABNRET |                     |                       |                       | THREE FACTOR ABNRET |                     |                      |                     | CARHART ABNRET      |                     |                       |                      |
|--|----------------------|---------------------|-----------------------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|---------------------|-----------------------|----------------------|
|  | (1)                  | (2)                 | (3)                   | (4)                   | (5)                 | (6)                 | (7)                  | (8)                 | (9)                 | (10)                | (11)                  | (12)                 |
| $\Delta\text{ESG}_i \times \text{POST}_t$            | 0.0851***<br>(5.13)  |                     |                       |                       | 0.0568***<br>(3.41) |                     |                      |                     | 0.0647***<br>(3.86) |                     |                       |                      |
| $\overline{\Delta\text{ESG}}_i \times \text{POST}_t$ |                      | 0.0865***<br>(5.11) |                       |                       |                     | 0.0578***<br>(3.40) |                      |                     |                     | 0.0659***<br>(3.85) |                       |                      |
| $\text{ESG PSEUDO-DOWNGRADE}_i \times \text{POST}_t$ |                      |                     | -1.6379***<br>(-3.78) | -1.4851***<br>(-3.43) |                     |                     | -0.9120**<br>(-2.09) | -0.7747*<br>(-1.78) |                     |                     | -1.2021***<br>(-2.70) | -1.0658**<br>(-2.39) |
| $\text{ESG PSEUDO-UPGRADE}_i \times \text{POST}_t$   |                      |                     |                       | 2.3774<br>(1.57)      |                     |                     |                      | 2.1356<br>(1.41)    |                     |                     |                       | 2.1183<br>(1.40)     |
| $\text{DOW JONES}_i \times \text{POST}_t$            | 0.7717<br>(1.09)     | 0.7713<br>(1.09)    | -0.1749<br>(-0.27)    | -0.1561<br>(-0.24)    | 1.5778**<br>(2.27)  | 1.5798**<br>(2.27)  | 0.8148<br>(1.27)     | 0.8316<br>(1.31)    | 1.6770**<br>(2.40)  | 1.6790**<br>(2.40)  | 0.9247<br>(1.44)      | 0.9414<br>(1.47)     |
| $\text{ADD DOW JONES}_i \times \text{POST}_t$        | -1.0468<br>(-0.58)   | -1.0713<br>(-0.60)  | -2.2149<br>(-1.26)    | -2.0879<br>(-1.20)    | -0.5033<br>(-0.30)  | -0.5174<br>(-0.30)  | -1.3985<br>(-0.84)   | -1.2844<br>(-0.78)  | -0.3504<br>(-0.23)  | -0.3667<br>(-0.24)  | -1.2674<br>(-0.85)    | -1.1542<br>(-0.78)   |
| $\text{DELETE DOW JONES}_i \times \text{POST}_t$     | -1.0425<br>(-0.75)   | -1.0954<br>(-0.78)  | -1.9804<br>(-1.53)    | -1.9374<br>(-1.50)    | 0.0715<br>(0.05)    | 0.0381<br>(0.03)    | -0.6647<br>(-0.47)   | -0.6260<br>(-0.44)  | -0.1020<br>(-0.07)  | -0.1403<br>(-0.09)  | -0.8426<br>(-0.57)    | -0.8042<br>(-0.55)   |
| Stock FE   | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Industry $\times$ Year-Month FE                      | Yes                  | Yes                 | Yes                   | Yes                   | Yes                 | Yes                 | Yes                  | Yes                 | Yes                 | Yes                 | Yes                   | Yes                  |
| Observations   | 12768                | 12768               | 12768                 | 12768                 | 12768               | 12768               | 12768                | 12768               | 12768               | 12768               | 12768                 | 12768                |
| $R^2$  | 0.191                | 0.191               | 0.190                 | 0.191                 | 0.179               | 0.179               | 0.178                | 0.178               | 0.176               | 0.176               | 0.176                 | 0.176                |

**Table IA.6: ESG rating methodology change and abnormal returns – GGL ESG trading pressure**

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology).  $\Delta\text{ESG}_i$  is defined as the difference in firm  $i$ 's ESG rating between the first month after the adoption (October 2019) and the last month (September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\overline{\Delta\text{ESG}}_i$  is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption and the average old ESG rating in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\text{ESG PSEUDO-DOWNGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is in the lower quartile, and zero otherwise.  $\text{ESG PSEUDO-UPGRADE}_i$  is an indicator variable equal to one if  $\overline{\Delta\text{ESG}}_i$  is positive, zero otherwise.  $\text{POST}_t$  is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.  $\Delta\text{SUSTAINALYTICS RATING}_i$  is the difference in firm  $i$ 's Sustainalytics average ESG Risk rating between the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance.  $\Delta\text{GGL PRESSURE}_{i,t}$  denotes Gantchev et al.'s (2021) ESG abnormal trading pressure measure of stock  $i$  in month  $t$ . We control for stock and industry $\times$ year-month fixed effects. Standard errors are clustered at the stock level and  $t$ -statistics are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

|   | SINGLE FACTOR ABNRET |                      |                       |                       | THREE FACTOR ABNRET   |                       |                       |                       | CARHART ABNRET        |                       |                       |                       |
|---|----------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|   | (1)                  | (2)                  | (3)                   | (4)                   | (5)                   | (6)                   | (7)                   | (8)                   | (9)                   | (10)                  | (11)                  | (12)                  |
| $\Delta\text{ESG}_i \times \text{POST}_t$                   | 0.0826***<br>(5.61)  |                      |                       |                       | 0.0486***<br>(3.29)   |                       |                       |                       | 0.0559***<br>(3.76)   |                       |                       |                       |
| $\overline{\Delta\text{ESG}}_i \times \text{POST}_t$        |                      | 0.0830***<br>(5.56)  |                       |                       |                       | 0.0489***<br>(3.26)   |                       |                       |                       | 0.0564***<br>(3.73)   |                       |                       |
| $\text{ESG PSEUDO DOWNGRADE}_i \times \text{POST}_t$        |                      |                      | -1.7079***<br>(-4.30) | -1.5484***<br>(-3.89) |                       |                       | -0.7840*<br>(-1.96)   | -0.6409<br>(-1.60)    |                       |                       | -1.0558***<br>(-2.59) | -0.9137**<br>(-2.24)  |
| $\text{ESG PSEUDO UPGRADE}_i \times \text{POST}_t$          |                      |                      |                       | 2.3929<br>(1.58)      |                       |                       |                       | 2.1457<br>(1.42)      |                       |                       |                       | 2.1301<br>(1.41)      |
| $\Delta\text{SUSTAINALYTICS RATING}_i \times \text{POST}_t$ | 0.1194<br>(0.84)     | 0.0594<br>(0.41)     | 0.0650<br>(0.44)      | 0.0519<br>(0.36)      | 0.0805<br>(0.58)      | 0.0452<br>(0.33)      | 0.0484<br>(0.34)      | 0.0367<br>(0.27)      | 0.0764<br>(0.55)      | 0.0358<br>(0.26)      | 0.0396<br>(0.28)      | 0.0279<br>(0.20)      |
| $\Delta\text{GGL PRESSURE}_{i,t}$                           | -1.9307**<br>(-2.51) | -1.9311**<br>(-2.51) | -1.9163**<br>(-2.49)  | -1.9256**<br>(-2.51)  | -2.1069***<br>(-3.07) | -2.1071***<br>(-3.07) | -2.1022***<br>(-3.06) | -2.1105***<br>(-3.08) | -2.1660***<br>(-3.21) | -2.1663***<br>(-3.21) | -2.1580***<br>(-3.19) | -2.1662***<br>(-3.21) |
| Stock FE  | Yes                  | Yes                  | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   |
| Industry $\times$ Year-Month FE                             | Yes                  | Yes                  | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   |
| Observations  | 12768                | 12768                | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 | 12768                 |
| $R^2$   | 0.192                | 0.192                | 0.191                 | 0.191                 | 0.179                 | 0.179                 | 0.179                 | 0.179                 | 0.177                 | 0.177                 | 0.176                 | 0.177                 |

## Recent Issues

|         |  |   |
|---------|--|---|
| No. 309 | Tabea Bucher-Koenen, Andreas Hackethal, Johannes Koenen, Christine Laudenbach          | Gender Differences in Financial Advice  |
| No. 308 | Thomas Pauls   | The Impact of Temporal Framing on the Marginal Propensity to Consume  |
| No. 307 | Ester Faia, Andreas Fuster, Vincenzo Pezone, Basit Zafar                               | Biases in Information Selection and Processing: Survey Evidence from the Pandemic                             |
| No. 306 | Aljoscha Janssen, Johannes Kasinger  | Obfuscation and Rational Inattention in Digitalized Markets   |
| No. 305 | Sabine Bernard, Benjamin Loos, Martin Weber  | The Disposition Effect in Boom and Bust Markets   |
| No. 304 | Monica Billio, Andrew W. Lo, Loriana Pelizzon, Mila Getmansky Sherman, Abalfazl Zareei | Global Realignment in Financial Market Dynamics: Evidence from ETF Networks                                   |
| No. 303 | Ankit Kalda, Benjamin Loos, Alessandro Previtero, Andreas Hackethal                    | Smart (Phone) Investing? A Within Investor-Time Analysis of New Technologies and Trading Behavior             |
| No. 302 | Tim A. Kroencke, Maik Schmeling, Andreas Schrimpf                                      | The FOMC Risk Shift   |
| No. 301 | Di Bu, Tobin Hanspal, Yin Liao, Yong Liu   | Risk Taking, Preferences, and Beliefs: Evidence from Wuhan  |
| No. 300 | Dennis Gram, Pantelis Karapanagiotis, Jan Krzyzanowski, Marius Liebald, Uwe Walz       | An Extensible Model for Historical Financial Data with an Application to German Company and Stock Market Data |
| No. 299 | Ferdinand A. von Siemen  | Motivated Beliefs and the Elderly's Compliance with COVID-19 Measures   |
| No. 298 | Calebe de Roure, Emanuel Moench, Loriana Pelizzon, Michael Schneider                   | OTC Discount  |
| No. 297 | Dimitrios Kostopoulos, Steffen Meyer, Charline Uhr                                     | Ambiguity and Investor Behavior   |