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

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Abstract

We exploit the 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

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1 Introduction

The Environmental, Social, and Governance (ESG) activities of firms is of increasing importance to regulators and investors.[1] Numerous initiatives are underway to improve the disclosure and monitoring of ESG activities.[2] For example, the Principle for Responsible Regulation association counted up to 700 policy interventions since 2020.[3] The demand for "green" assets, whether by regulation 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 oftentimes makes ESG ratings incomparable (Chatterji, Durand, Levine, and Touboul, 2016; Chatterji, Levine, and Toffel, 2009; Semenova and Hassel, 2015; Dorfleitner, Halbritter, and Nguyen, 2015; Delmas and Blass, 2010; Berg, Koelbel, and Rigobon, 2019; Billio, Costola, Hristova, Latino, and Pelizzon, 2020; Berg, Fabisik, and Sautner, 2020). Such disparate criteria has led to calls for regulation but there still exists a substantial gap in our understanding of how investors use ESG ratings as well as their potential impact on asset prices.[4]

Determining if investors rely on ESG ratings as well as whether 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

[1] 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. Around the world, 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.

[2] 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.)

[3] For further details, see https://www.unpri.org/policy/regulation-database.

[4] 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.

sustainability activities, which may affect both its discount rate as well as its future cash flows.

To disentangle the effect of ESG ratings shifts from the changes in firm's fundamentals on stock returns, we exploit a quasi-natural shock that inverted the rating scale and thus the interpretation of the rating. The shock is 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 declined for over 2,000 US stocks that Sustainalytics rates. We provide evidence these rating "downgrades" are initially misinterpreted as 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, 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 Sustainanalytic's 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 goal 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 previously been rated closer to 100 but under the new methodology 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 the 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.

In order to make sure 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 highly ranked in their industry under the old methodology but now have a worse ranking when compared to all other firms. The inclusion of either of these measures of new information does not change our findings.[5]

In our second method, we restrict our sample to firms whose downgrade is not accompanied by a negative change in the firms' actual ESG exposure: firms whose ratings decline but their ESG ranking is the same or better than its peers after the 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. Our results, however, 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 for making investment decisions can have 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.

[5]We do a number of robustness tests to rule out alternative explanations or correlated variables.

We next examine what 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 investors into three groups: ESG funds, GGL funds (as in Gantchev, Giannetti, and Li (2020)), and all other funds.

Retail investors are generally perceived as less sophisticated, uninformed 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 have 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.[6]

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. (2020) as having an incentive to improve or maintain their globe ratings. These investors either do not react because they subscribe to Sustainalytics directly and thus, have been using the new ESG Risk ratings for a year prior to adoption or are savvy enough to understand implications of the change in methodology. We do show, however, that the category "Other Fund" appears to react similarly to retail investors. 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 uninformed, retail traders.

The finding that there is no portfolio rebalancing 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 be known in advance, we anticipate that short sellers will take advantage of unsophisticated investors' misinterpretation of the ratings change (Boehmer, Jones, and Zhang, 2008; Engelberg, Reed, and Ringgenberg, 2012; Cohen,

[6]Our findings are in contrast to Moss, Naughton, and Wang (2020) who find that the retail investors do not respond to ESG press releases.

Diether, and Malloy, 2007; Diether, Lee, and Werner, 2009; Boehmer, Huszar, and Jordan, 2010). 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 purchasing, short sellers increase their positions in the expectation that returns will have a subsequent reversal once investors' realize their error. On the other hand, when confused investors are selling, short sellers reduce their positions in order to take advantage of the price pressure on the stock.

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 works builds on that of Hartzmark and Sussman (2019) who use the introduction of Morningstar's sustainability globes for mutual funds that was implemented in March 2016. They show that highly-rated sustainable funds, those with five "globes," experience significant inflows after the introduction of mutual fund sustainability rankings while 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 theoretical link between mutual fund flows and company performance is not direct (Wardlaw, 2020) and thus, the answer to the question they posit remains ambiguous. Our contribution is to directly examine this question by analyzing whether investors incorporate sustainability information from ratings into their investment choices of *individual stocks* and whether these choices impact returns. Our findings suggest that investors view sustainability as a positive attribute of a company and these views are incorporated into the firm's share prices.

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 (Merton (1987), Fama and French (2007), Pedersen, Fitzgibbons, and Pomorski (2020), and Pástor, Stambaugh, and Taylor (2020)), 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 on drivers of investors preferences for sustainable investments (Bialkowski and Starks (2016), Barber, Morse, and Yasuda (2021), Riedl and Smeets (2017), Alok, Kumar, and Wermers (2020), Krueger, Sautner, and Starks (2020), and Ilhan, Sautner, and Vilkov (2021)).

Unlike those studies, however, our empirical setup allows us to disentangle the effect on asset prices of investor preferences for sustainability that is devoid of any change in either the firm's cash flows or ESG activities. We provide empirical support for Pedersen et al.'s (2020) ESG-adjusted capital asset pricing model by showing that changes to a firm's perceived ESG performance may cause investor to trade and exert short-term price pressure on affected stocks. Our findings show the importance of "Type-M" investors, those investors that use ESG information and have preference for good ESG scores on asset prices.

Furthermore, our findings support the theoretical predictions of Goldstein, Kopytov, Shen, and Xiang (2021) who present a model in which firms have a monetary (cash flow) and non-monetary (e.g., carbon emissions) component and information is processed differently for each of these components depending on the investor's preference for sustainability. Traditional investors value only the monetary component while "green" investors value both the non-monetary component and the monetary component. If ESG ratings are a proxy for the non-monetary component and confused investors are more likely to be green investors, we confirm that "differential use of information by traditional and green investors have several profound impacts on the stock price."

Our setting is unique in that we are using investor confusion to shed light on the salience of ESG ratings. We are not, however, the first to find that investor confusion can affect asset prices. Rashes (2001) notes that investors may confuse one ticker symbol for another and this mix up causes 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 and thus, our results highlight the importance of the type of information these ratings convey. Our findings suggest that concerns about 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.[7] In September 2018, Sustainalytics launched its new enhanced ESG Risk rating.[8] 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.[9] Figure 1 shows the time series of Sustainalytics ESG ratings methodologies and the subsequent adoption by Morningstar and Yahoo! Finance.[10]

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."[11] The old ESG rating was on a scale from 0 to 100 and a firm with a high ESG rating

[7] Morningstar acquired a 40% stake in Sustainalytics in 2017 and purchased the remaining 60% in April 2020.

[8] 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/).

[9] 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/).

[10] Note the name changed on Morningstar and Yahoo! Finance from "ESG" ratings to "ESG Risk" ratings in October 2019.

[11] https://www.morningstar.com/articles/954595/enhancement-to-sustainability-rating-emphasizes-material-esg-risk.

was considered to be 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 ESG risk exposure a company faced in the first place."[12] One drawback to 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," that 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."[13] 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.[14] Finally, all ESG risks are standardized so they are on the same scale across all economic sectors.[15]

Sustainalytics implemented one additional change to the ratings, in order 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

[12] Ibid

[13] Ibid

[14] 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.

[15] 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.

ESG risk is given a *low* ESG Risk rating, rather than a high ESG rating as under the prior rating regime. Morningstar provides an example of how the methodology changes the interpretation of the ESG risk exposure:[16]

> 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 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 that 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 the rating without understanding the specific details of the new rating methodology. In other words, theses uninformed investors may be unaware of the components of 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

[16] https://www.morningstar.com/articles/954595/enhancement-to-sustainability-rating-emphasizes-material-esg-risk.

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. These actions are expected to affect asset prices and their effect is not due to any new 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 either have 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 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 take advantage of the possibility of unsophisticated investor misinterpretation. If so, then we expect an increase (a decrease) in short selling for firms that experience a decline (increase) 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 not been introduced. However, such a measure is not available to us and therefore, 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 highly ranked in its industry before but is considered to have more ESG risk exposure relative to other firms after. 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 firm's relative sustainability ranking provided by Morningstar. Specifically, we control for whether the firm had 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) and hereafter referred to as "Morningstar Classification"). Finally, during the quarter preceding the rating change, a firm may have 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 might reflect a change in a firm's ESG exposure or 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 rating 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.

Morningstar reports Sustainalytics monthly ESG ratings at the beginning of the following month, therefore, the first time the new September ESG Risk rating is available is at the beginning of October 2019. Thus, we define an indicator variable, $\textsc{Post}_t$, 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 firm's ESG rating as reported by Morningstar and Yahoo! Finance. First, ΔESG_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, $\Delta\overline{\text{ESG}}_i$ 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.

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 while 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 is 30.38 after, translating into an overall average change of -20.17 (Panel B). Further evidence on the impact of the new methodology on the change in numerical ratings is in Figure 3. This figure plots the difference between the two ratings, $\Delta\overline{\text{ESG}}_i$ and as can be seen in the figure, most firms experience a decline in their rating.

The last 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 indicator variable is ESG Pseudo- Downgrade$_i$ that 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$_i$ have the largest negative change in their ESG rating. For example, Microsoft has a value of one for this variable because it experienced a large change in its ESG rating from 75 to 13.8. In other words, firms that have a ESG Pseudo-Downgrade$_i$ equal to one generally have very low ESG risk both before and after the adoption. Moreover, 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%, are in the same or better Morningstar Classification after the change.

The second indicator variable is similar to the first but captures whether or not the firm has been "upgraded." We define ESG PSEUDO-UPGRADE$_i$ 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 be in any particular quartile because 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 number of firms in our sample) where one is the firm with the *best* ESG rating. In the pre-adoption period, the number one firm would have the highest ESG rating and 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 ΔESG 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 shows the distribution of the change in ranking of the firms around the adoption of the new methodology. Most of the firms have 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 ESG Rating Assessment 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. Because there are the same number of categories 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 (16 are classified as Industry Leaders). A number of firms move up in their classification after the new methodology adoption. For example, 265 firms that were 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 go down a notch or two in classifications, i.e., their classification improves. Overall, firms below the diagonal improve their ranking (31%) and firms above the diagonal worsen their ranking (28%), and those on diagonal do not change their classification (41%).

Panel B of Figure 5 shows the percentage of firms that move up or down a category. As can be seen in the figure, the majority of firms remain in their original classification, but 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. In order to capture changes in a firm's Morningstar Classification, we construct Classification Upgrade$_i$ (Classification Downgrade$_i$), an indicator variable equal to one if the stock has an increase (decrease) in its Morningstar ESG Rating Assessment classification after the adoption of the new methodology.

The third variable is designed to capture the change in actual ESG risk over the two transition 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 has been available from Sustainalytics since September 2018. Therefore we include ΔSustainalytics Rating$_i$ defined as the change in firm i's Sustainanalytics 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 the 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. This figure also shows that ΔSustainalytics Rating$_i$ is almost zero (between -5 and +5) for 98.6% of stocks.

Panel C of Table 1 presents the correlation matrix among our variables of interest. Both ΔESG Rank$_i$ and ΔMorningstar Classification$_i$ are highly correlated. Thus, we do not include both of them in the same specification. Otherwise, the correlations between ΔESG$_i$ and all other variables are generally low.

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

In order 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 compute abnormal returns as follows. 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.[17]

[17]Our results are robust to 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).

Some types of investors are more likely to be confused by the change in ESG rating methodology 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) website. Robintrack provides hourly intra-day information on the number of investors holding each stock.[18] We then average the reported number of retail investors holding the stock over the day and aggregate the daily means into monthly averages.[19]

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, $\#\,\textsc{Retail}_{i,t}$, by the average dollar trading volume from April to June 2019 (one quarter before the control period).[20] Finally, we merge Robinhood data to 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 Robinhood retail investor participation measure, the aggregated 13F ownership of a stock is expressed in the number of shares. Thus, we compute $13\text{F}_{i,t}$ 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.

[18] In August 2020, Robinhood closed down the API for Robintrack making data available only to this date.

[19] Our results remain unchanged if we use the median number of investors instead.

[20] Dividing the number of retail investors by the market capitalization in a previous quarter yields very similar results.

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 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 key words, we classify any U.S. mutual funds actively investing in U.S. equities in the Morningstar database as an ESG $\textsc{Fund}_{i,t}$ 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. (2020) argues that funds very close to Morningstar globe thresholds are more likely to try to improve or maintain their globe rating. We follow their methodology and classify a mutual fund as a GGL $\textsc{Fund}_{i,t}$ if its globe rating improves prior to the methodology adoption between December and September 2019. Finally, any mutual fund that is not considered an ESG or a GGL fund is classified as an $\textsc{Other Fund}_{i,t}$.

Last, we collect information from Compustat – Capital IQ on the end of the month 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 prior to the adoption from July 2019 to September 2019 and during the three months after the adoption from October 2019 to December 2019.[21] We construct $\textsc{Short Interest}_{i,t}$ 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

[21] We ignore the short interest reported in the middle of the month, however our results are robust to its inclusion in the average short interest.

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 and in the post-adoption there are 2,920. However, the median number of investors is much smaller, approximately a tenth 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 methodology 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 and rebalance their portfolio based on their confusion, 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. Moreover, we predict that this effect will be primarily driven by the changes in participation by uninformed investors and holdings of short sellers, but not by the change in holdings of sophisticated institutional investors such as

those that report on Form 13F or funds whose primary objective is sustainable investing since they are 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-differences specification:

$$\text{ARET}_{i,t} \quad = \quad \gamma_0 + \gamma_1 \Delta\text{ESG}_i \times \text{POST}_t + \text{D}_i + \text{D}_t + \varepsilon_{i,t}, \tag{1}$$

where $\text{ARET}_{i,t}$ is stock i's abnormal return in month t computed with either a single-, three-, or four-factor model. ΔESG_i captures stock i's change in its ESG rating due to the adoption of the new Sustainalytics ESG Risk rating by Morningstar and Yahoo! Finance. We measure the change in the ESG rating in four ways: (1) ΔESG_i, the change in the firm's ESG rating between September 2019 and October 2019, (2) $\Delta\overline{\text{ESG}}_i$, the average change in the firm's ESG ratings in the three months (October-December 2019) after and the three months (July-September 2019) before the adoption, (3) ESG $\text{PSEUDO-DOWNGRADE}_i$, an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise, and (4) ESG PSEUDO-UPGRADE_i, an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. D_i and D_t represent firm and industry×year-month fixed effects. Standard errors are clustered at a firm level.[22]

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 POST_t to be positive and significant, i.e., a decline (increase) in ΔESG_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

[22]Our time-series consists of only six months around the methodology adoption. According to Angrist and Pischke (2008), six clusters is not enough for the standard cluster 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×year-month level. See Table IA.1 in the internet appendix.

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 firm's ESG rating translates into roughly a 1 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, PSEUDO-ESG DOWNGRADE$_i$ and firms that experience an increase in their rating, 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, ESG PSEUDO-DOWNGRADE$_i \times$ POST$_t$, is negative and statistically significant indicating that returns are lower for firms that have very large declines in the ESG ratings compared to all other firms. In economic terms, this translates to a decrease of between 0.66% and 1.56% change in monthly returns depending on the specification. It is important to remember that the majority of the firms that have a value of one for 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 we document is most likely due to a misinterpretation in the meaning of the ratings change and is unlikely to be driven by investors rationally trading on new information.

In columns (4), (8), and (12), we include the ESG PSEUDO-UPGRADE$_i \times$ POST$_t$ in the specification. We find that this interaction term is positive but insignificant. One reason for this is that there are too few firms that 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 ESG Pseudo-Upgrade$_i$ × Post$_t$ becomes positive, and highly significant when we remove industry×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 is declining as the change in ESG rating becomes more negative and is increasing 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 confusion and not a change in firm fundamentals 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 ΔSustainalytics Rating$_i$,

the change in the Sustainalytics Risk rating over the transition period, as an independent variable in Panels B and C of the table.

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 ΔESG Rank$_i$ in Panel B, which is the difference in the stock's relative ESG Risk ranking among all other firms and Classification Upgrade$_i$ (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 ESG Rating Assessment classification after the adoption of the new methodology.

In Panel B of Table 3, the coefficient of ΔSustainalytics Rating$_i$ is never significant indicating that a change in the average Sustainalytics ESG Risk rating from after the adoption to before the adoption 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, ΔESG 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 gets better – i.e., 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 prior 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 assump-

tion 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.[23] In other words, this subsample consists of firms similarly or better ranked under the new ratings regime as under the old 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.

Uninformed 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 and they remain similar to the results for the full sample. The coefficients of ΔESG_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 in ESG rating, continue to experience negative abnormal returns. We find that the coefficient on ESG $\textsc{Pseudo-Downgrade}_i \times \textsc{Post}_t$ is negative and significant. (Note there is no ESG $\textsc{Pseudo-Upgrade}_i$ by construction.) Overall, these results highlight the importance of ESG ratings for investors and the potential for investors' misinterpretation of these ratings to have a significant impact on firms' abnormal returns.

[23] Our results are robust to restricting the sample of firms with negative changes in their ESG ranking and also have no change or an upgrade in their Morningstar ESG Rating Assessment classification.

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 a informational driven change in their ESG rating, the change in the MSCI ESG rating (ΔMSCI_i) that is not related to the methodology change by Sustainalytics. This variable is measured as the change in the MSCI ESG rating from the three months after the adoption by Morningstar of the new methodology to the three months before (similar to ΔSustainalytics Rating$_i$). Since not all firm 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 ΔSustainalytics Rating$_i$, none of the coefficients of the change in the MSCI index are significant.

Third, around the same time as adoption of the new Sustainalytics methodology by Morningstar, the Dow Jones Sustainability Index was reconstituted. We include Dow Jones$_i$, a dummy variable equal one, if a stock was part of Dow Jones Sustainability Index before and after reconstitution in the Fall of 2019. To capture the effect of the reconstitution on returns, we include Add Dow Jones$_i$ (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 prior 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. (2020). ΔGGL Funds$_i$ is defined as the abnormal trading in stock i between December 2019 and September 2019 by funds whose globe rating improved during this period:

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

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

Table IA.6 presents the results. We find confirmation that the trading behavior of funds, who have an incentive to improve their own ratings, affects returns. However, their inclusion in the specification neither reduces the significance of the coefficients on ΔESG_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 (Célerier 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. D_i and D_t denote stock and year-month fixed effects and standard errors are clustered by firm. The main coefficient of interest is γ_e, that captures the differential effect over time for firms that experience the most severe decline in the value of their ESG rating (treated firms where ESG Pseudo-Downgrade$_i$=1), against those that have less severe declines (control firms where ESG Pseudo-Downgrade$_i$=0). We expect that the difference in abnormal returns will become more negative after the adoption as investor confusion is greatest for firms with the largest declines in their ESG rating. The difference in returns will most likely reverse once confused investors become informed about the implications of the new methodology or arbitrageurs eliminate the effect.

Figure 7 plots the γ_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 ESG rating methodology 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, 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 uninformed 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 uninformed investors' trades.) In our analysis, we consider whether retail participation, institutional and mutual fund ownership, and short interest change in relation to the change in the firm's ESG rating.

We follow Mian and Sufi (2011) and estimate the generalized difference-in-differences specification of the form:[24]

$$\Delta\text{Ownership}_i = \delta_0 + \delta_1 \Delta\text{ESG}_i + \eta_{i,t}, \tag{4}$$

where ΔOwnership$_i$ is defined as the change from the quarter after to the quarter before

[24]This specification is equivalent to Mian and Sufi's (2011) first-stage regression from equation (2). We replace $HousePriceGrowth0206_{zm}$ with ΔOwnership$_i$ on the left hand side of the equation and $Elasticity_{m,1997}$ with ΔESG$_i$ on the right hand side of the equation.

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 held by all other U.S.-domiciled funds investing in U.S. equities.

We measure the change in the ESG rating in four ways as in the prior tables on abnormal returns: the change between October 2019 and September 2019, ΔESG_i, and the average change three months before and three months after the adoption, $\Delta \overline{\text{ESG}}_i$. We also substitute two indicator variables for ΔESG_i in the specification above that capture the direction and magnitude of the ESG rating change. ESG Pseudo-Downgrade$_i$ and ESG Pseudo-Upgrade$_i$ are indicator variables equal to one if the firm has a large negative or has a positive change in 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 the 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 sell all of their holdings in the firm. Conversely, an increase in the ratings is interpreted as good news and therefore, 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 which 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 therefore, could 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.[25]

In columns (5)-(8) of Panel A of Table 5, the dependent variable is the change 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 the ESG ratings (ΔESG_i, $\Delta\overline{\text{ESG}}_i$, ESG Pseudo-Downgrade$_i$, ESG Pseudo-Upgrade$_i$).

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

[25]Both the mutual funds holdings and 13F data are for long positions only.

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 (ΔESG Fund in columns (1)-(4)) or funds that have an incentive to improve their ESG globe rating by portfolio rebalancing (ΔGGL Funds in columns (5) – (8)). In columns (10)-(12), we examine the change in ownership for all other funds, ΔOther 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$_i$ 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 seems 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 the 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. We do not find much 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. Uninformed 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 their confusion and increase their positions when retail investors are buying and decrease their positions when retail investors sell. Informed investors portfolios generally remain unchanged during this time.

4.3 Firms with high institutional ownership

The results of the prior sections suggests that confused investors, who value firms' sustainability, may impact prices and these investors are more likely to be uninformed 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, uninformed 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 uninformed investor participation. In addition, information is more widely available to investors in these firms. We, therefore, 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-differences regression where our main independent variable of interest is $\Delta\overline{\text{ESG}}_i \times \text{Post}_t \times \text{High Inst}_i$. 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 change 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 that have 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. These findings are consistent with misinterpretation by uninformed investors in less well-known firms as the channel by which incorrect assessments of ESG risk become impounded in stock prices.

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.[26]

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 MSCI website, zero otherwise.[27]

The triple interaction term, $\Delta\overline{\text{ESG}}_i \times \text{Post}_t \times \text{MSCI}_i$, 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 can be 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.) We, therefore, conclude that the information environment of the firm can act as a disciplining

[26] As noted previously, there is some debate regarding divergence in ESG ratings. See Berg et al. (2020) for an analysis of the major sources.

[27] See, https://www.msci.com/our-solutions/esg-investing/esg-ratings/esg-ratings-corporate-search-tool.

mechanism for potential investor confusion.

5 Conclusion

We provide evidence that investors pay attention to ESG ratings and use them in their investment decisions. Using a quasi-natural experiment, of the adoption of Sustainalytics new ESG Risk rating in October 2019 by Morningstar and Yahoo! Finance that changed the ratings methodology and inverted the scale, we show that potentially incorrect assessments about the meaning of the change in ESG ratings shape investors portfolio allocation decisions and result in temporary price pressure on the affected stocks.

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. Many firms with declines in their ESG rating have no change or are better ranked in terms of their ESG exposure than their peers. Thus, some investors rely on ESG ratings when making an investment decisions without adequate due diligence.

In order 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 in 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 have a downgrade in their rating, those with negative changes in their ESG rating. We find also that mutual funds that do not specialize in sustainability are also confused by the change in the rating methodology and behave like (uninformed)

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 aware and understand the changes in the rating methodology.

Since uninformed investor confusion creates a profit opportunity, we find that short-sellers take the other side of uninformed 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. 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, 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."[28] 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).[29] 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.

[28]ESMA letter to EC on ESG Ratings on January 28, 2021.

[29]Our sample is limited to U.S. firms and therefore, 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., Kumar, N., Wermers, R., 2020. Do fund managers misestimate climatic disaster risk. The Review of Financial Studies 33, 1146–1183.

Angrist, J. D., Pischke, J.-S., 2008. Mostly harmless econometrics: An empiricist's companion. Princeton university press.

Barber, B. M., Morse, A., Yasuda, A., 2021. Impact investing. Journal of Financial Economics 139, 162–185.

Barber, B. M., Odean, T., Zhu, N., 2006. Do Noise Traders Move Markets? Haas School of Business Working paper pp. 1–47.

Berg, F., Fabisik, K., Sautner, Z., 2020. Rewriting history ii: The (un) predictable past of esg ratings. European Corporate Governance Institute–Finance Working Paper 708.

Berg, F., Koelbel, J., Rigobon, R., 2019. Aggregate confusion: The divergence of ESG ratings. Working Paper pp. 1–43.

Berk, J., van Binsbergen, J., 2021. The impact of impact investing. Working Paper pp. 1–34.

Bialkowski, J., Starks, L. T., 2016. Sri funds: Investor demand, exogenous shocks and esg profiles .

Billio, M., Costola, M., Hristova, I., Latino, C., Pelizzon, L., 2020. Inside the ESG Ratings: (Dis)agreement and performance. Corporate Social Responsibility and Environmental Management Journal Forthcoming.

Boehmer, E., Huszar, Z. R., Jordan, B. D., 2010. The good news in short interest. Journal of Financial Economics 96, 80–97.

Boehmer, E., Jones, C. M., Zhang, X., 2008. Unshackling short sellers: The repeal of the uptick rule. Columbia Business School, unpublished manuscript, December .

Bolton, P., Kacperczyk, M., 2021. Do investors care about carbon risk? Journal of Financial Economics .

Calvet, L. E., Campbell, J. Y., Sodini, P., 2007. Down or out: Assessing the welfare costs of household investment mistakes. Journal of Political Economy 115, 707–747.

Carhart, M. M., 1997. On persistence in mutual fund performance. Journal of Finance 52, 57–82.

Célerier, C., Matray, A., 2019. Bank-branch supply, financial inclusion, and wealth accumulation. The Review of Financial Studies 32, 4767–4809.

Chatterji, A. K., Durand, R., Levine, D. I., Touboul, S., 2016. Do ratings of firms converge? Implications for managers, investors and strategy researchers. Strategic Management Journal 37, 1597–1614.

Chatterji, A. K., Levine, D. I., Toffel, M. W., 2009. How well do social ratings actually measure corporate social responsibility? Journal of Economics and Management Strategy 18, 125–169.

Cohen, L., Diether, K. B., Malloy, C. J., 2007. Supply and demand shifts in the shorting market. The Journal of Finance 62, 2061–2096.

Coval, J., Stafford, E., 2007. Asset fire sales (and purchases) in equity markets. Journal of Financial Economics 86, 479–512.

Delmas, M., Blass, V. D., 2010. Measuring corporate environmental performance: the trade-offs of sustainability ratings. Business Strategy and the Environment 19, 245–260.

Diether, K. B., Lee, K.-H., Werner, I. M., 2009. It's SHO time! Short-sale price tests and market quality. The Journal of Finance 64, 37–73.

Dorfleitner, G., Halbritter, G., Nguyen, M., 2015. Measuring the level and risk of corporate responsibility - An empirical comparison of different ESG rating approaches. Journal of Asset Management 16, 450–466.

Engelberg, J. E., Reed, A. V., Ringgenberg, M. C., 2012. How are shorts informed? Short sellers, news, and information processing. Journal of Financial Economics 105, 260–278.

Fama, E. F., French, K. R., 1993. Common risk factors in the returns on stocks and bonds. Journal of Financial Economics 33, 3–56.

Fama, E. F., French, K. R., 2007. Disagreement, tastes, and asset prices. Journal of Financial Economics 83, 667–689.

Gantchev, N., Giannetti, M., Li, R., 2020. Sustainability or performance? ratings and fund managers' incentives. Ratings and Fund Managers' Incentives (November 15, 2020) .

Goldstein, I., Jiang, H., Ng, D. T., 2017. Investor flows and fragility in corporate bond funds. Journal of Financial Economics 126, 592–613.

Goldstein, I., Kopytov, A., Shen, L., Xiang, H., 2021. On esg investing: Heterogeneous preferences, information, and asset prices. Information, and Asset Prices (April 9, 2021) .

Hartzmark, S. M., Sussman, A. B., 2019. Do investors value sustainability? A natural experiment examining ranking and fund flows. Journal of Finance 74, 2789–2837.

Hong, H., Kacperczyk, M., 2009. The price of sin: The effects of social norms on markets. Journal of financial economics 93, 15–36.

Hong, H., Li, F. W., Xu, J., 2019. Climate risks and market efficiency. Journal of econometrics 208, 265–281.

Hsu, P.-H., Li, K., Tsou, C.-Y., 2020. The pollution premium. Available at SSRN 3578215 .

Ilhan, E., Sautner, Z., Vilkov, G., 2021. Carbon tail risk. The Review of Financial Studies 34, 1540–1571.

Kirchler, M., Huber, J., Stöckl, T., 2012. Thar she bursts: Reducing confusion reduces bubbles. American Economic Review 102, 865–83.

Krueger, P., Sautner, Z., Starks, L. T., 2020. The importance of climate risks for institutional investors. The Review of Financial Studies 33, 1067–1111.

Merton, R. C., 1987. A simple model of capital market equilibrium with incomplete information. Journal of Finance 42, 483–510.

Mian, A., Sufi, A., 2011. House prices, home equity-based borrowing, and the US household leverage crisis. American Economic Review 101, 2132–2156.

Moss, A., Naughton, J. P., Wang, C., 2020. The irrelevance of esg disclosure to retail investors: Evidence from robinhood. Available at SSRN 3604847 .

Pástor, L., Stambaugh, R. F., Taylor, L. A., 2020. Sustainable investing in equilibrium. Journal of Financial Economics forthcoming.

Pedersen, L. H., Fitzgibbons, S., Pomorski, L., 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). The Journal of Finance 56, 1911–1927.

Riedl, A., Smeets, P., 2017. Why do investors hold socially responsible mutual funds? The Journal of Finance 72, 2505–2550.

Semenova, N., Hassel, L. G., 2015. On the validity of environmental performance metrics. Journal of Business Ethics 132, 249–258.

Wardlaw, M., 2020. Measuring mutual fund flow pressure as shock to stock returns. The Journal of Finance 75, 3221–3243.

Table A.1: List of Variable Names

Variable Name	Definition
Classification Upgrade$_i$	An indicator variable equal to one if the firm experienced an increase in its Morningstar ESG Rating Assessment classification after the adoption of the new methodology – e.g., before the adoption it was an 'Average Performer' and after the adoption it belongs to 'Low' ESG risk group.
Classification Downgrade$_i$	An indicator variable equal to one if the firm has a decrease in its Morningstar ESG Rating Assessment classification after the adoption of the new methodology – e.g, before the adoption it was and 'Outperformer' and after the adoption it belongs to 'Medium' ESG risk group.
Δ13F$_i$	The quarterly change in holdings by 13F institutions measured as the change in number of shares held by 13F institutions between the end of December and September 2019 divided by the number of shares outstanding.
ΔESG$_i$	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.
$\Delta\overline{\text{ESG}}_i$	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 change 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 key words, 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$_i$	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$_i$	The abnormal trading in stock i between December 2019 and September 2019 by funds, whose globe rating improved during this period. We follow Gantchev et al. (2020) and define $\Delta\text{GGL Funds}_i = \sum_{f=1}^{F} \frac{\text{Shares}^U_{f,i,\text{Dec 2019}} - \text{Shares}^U_{f,i,\text{Sep 2019}}}{\text{Shares Outstanding}_{i,\text{ Sep 2019}}}$ – the average change between December 2019 and September 2019 in the holdings of stock i by all other funds in our sample, where $\text{Shares}^U_{f,i,\text{Sep 2019}}$ is a number of shares of stock i held at the end of September 2019 by fund f, which experienced globe rating upgrade (U) between December 2019 and September 2019.

ΔGGL Pressure$_{i,t}$	Aggregate abnormal ESG trading experienced by stock i in month t proposed by Gantchev et al. (2020) and defined as ΔGGL Pressure$_{i,t} = \sum_{f=1}^{F}$ Trading$^{U}_{f,i,t}-$ the average change between $t-1$ and t in the holdings of stock i by all other funds in our sample, where Trading$^{U}_{f,i,t}$ is the change in the number of shares held in stock i as a fraction of the stock's shares outstanding by fund f that improves its globe rating between months $t-1$ and t.
ΔMorningstar Classification$_i$	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 equals a company that scores well below average relative to its peer group and Leader equals 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, Severe, where Negligible equals a company with very low ESG risk rating (between 0 and 10) and Severe equals to a firm with very high ESG risk rating (above 40). While previously the classification breakpoints were established annually, after the methodology change the breakpoints became fixed.
ΔOther Fund$_i$	The change in the shares of stock i held by mutual funds domiciled in US and actively investing in US equities, which are neither classified as ESG Funds nor GGL Funds – i.e., funds that experienced globe rating improvement. We define ΔOther Funds$_i$ as the change in number of shares held by non-ESG and non-GGL Funds between the end of December and September 2019 divided by the number of shares outstanding.
ΔRetail$_i$	The change in retail participation in stock i 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.
ΔShort Sellers$_i$	The change in short interest in stock i measured as the change 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.
ΔSustainalytics Rating$_i$	The change in firm i's Sustainanalytics 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$_i$	An indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise.
ESG Pseudo-Upgrade$_i$	An indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise.

Four Factor AbnRet$_{i,t}$	Carhart (1997) four-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.
High Inst$_i$	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$_i$	An indicator variable equal to one if the stock's ESG ratings are also available through the MSCI ESG rating platform.
Post$_t$	An indicator variable equal to one in the time period after the new ESG rating methodology is introduced in October 2019, zero otherwise.
#Retail$_{i,t}$	Retail participation in stock i in month t. It is 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 (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 key words, 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 Sustainanlytics ESG and ESG Risk ratings and their subsequent adoption by both Morningstar and Yahoo! Finance.

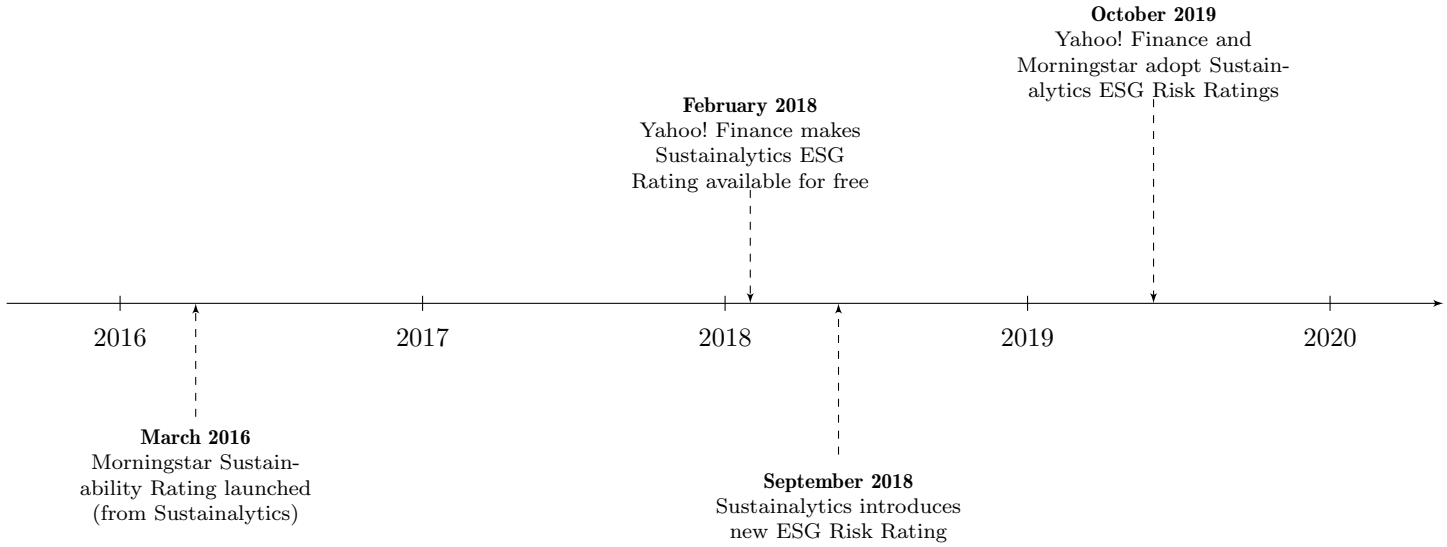
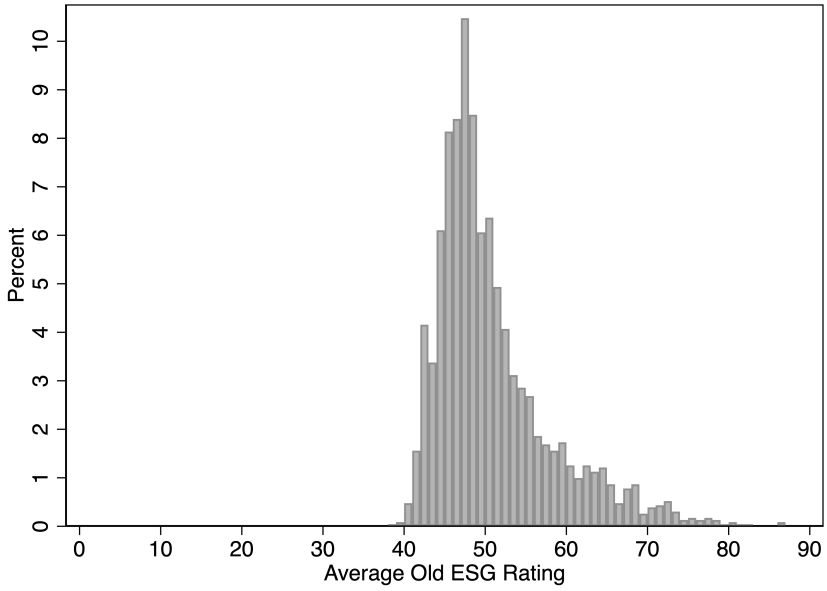


Figure 2: Comparison of Old ESG rating with New ESG Risk rating

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.

Panel A



Panel B

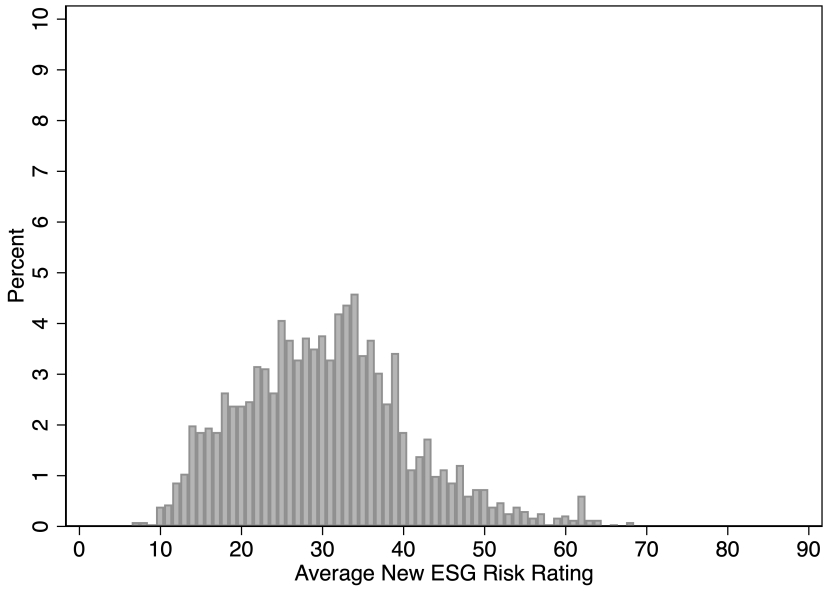


Figure 3: Change in ESG ratings

This figure shows the distribution of the change in the ESG rating, $\Delta\overline{\text{ESG}}_i$, 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.

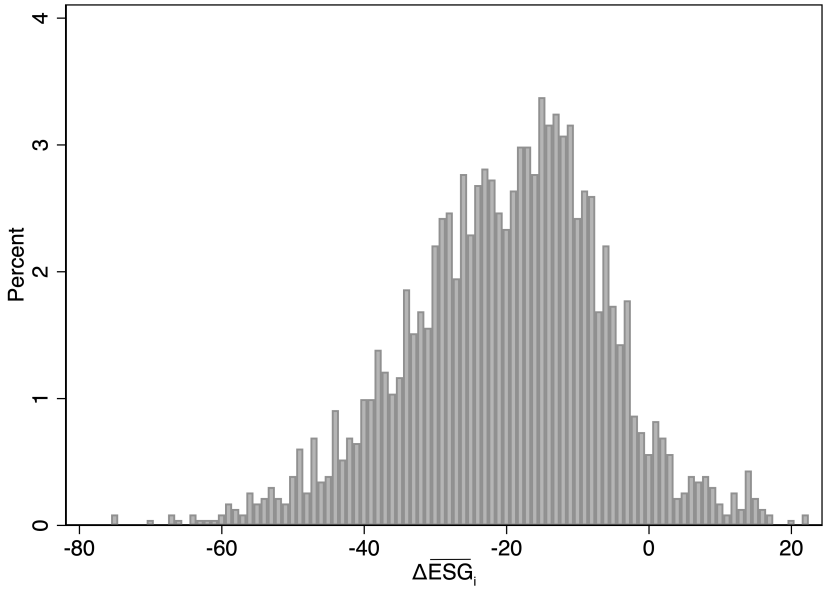
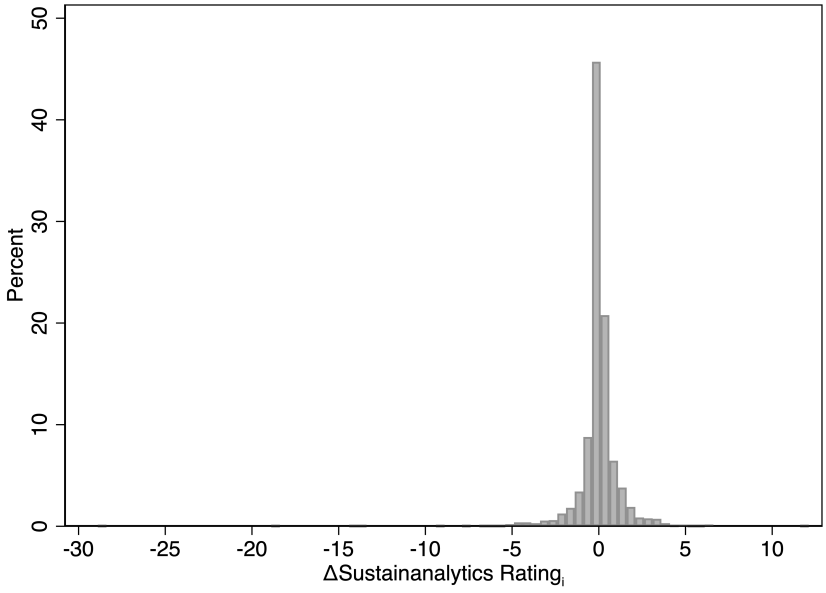


Figure 4: Change in Sustainability ESG Risk ratings around adoption of new methodology

This figure shows the distribution of the change in the Sustainanalytics ESG Risk rating, ΔSustainalytics 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 ΔSustainalytics 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.

Panel A



Panel B

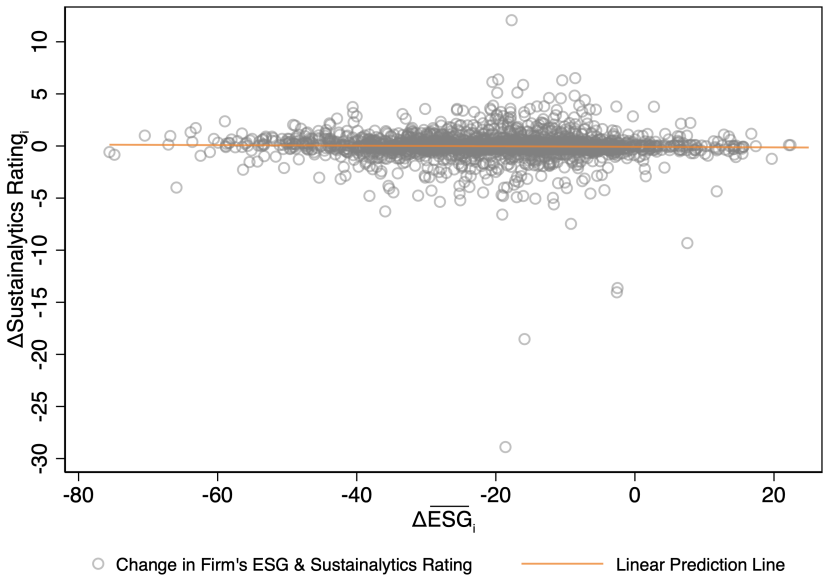
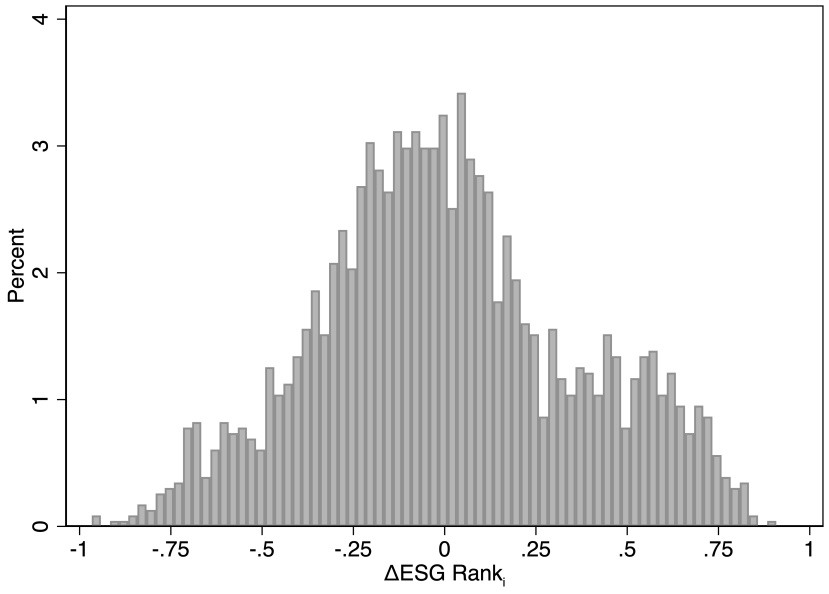


Figure 5: Change in ranking and Morningstar Classification

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, ΔESG 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.

Panel A



Panel B

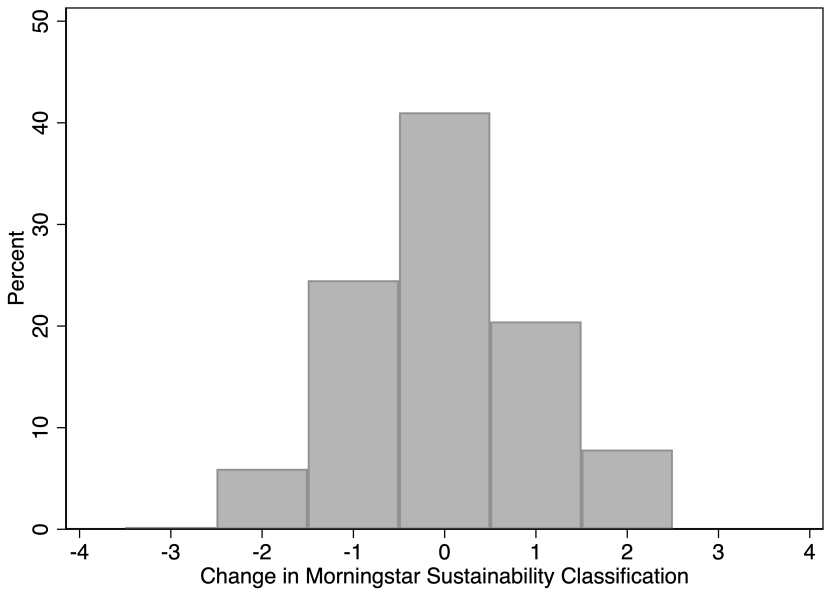


Figure 6: Abnormal return response to the change in ESG rating methodology

This figure depicts the relation 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 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. The change in the ESG rating, $\Delta\overline{\text{ESG}}_i$, is the difference between the average new ESG Risk rating in the three months (October-December 2019) after the adoption 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 firm's abnormal returns. The vertical dashed orange line represents the mean change in the ESG ratings.

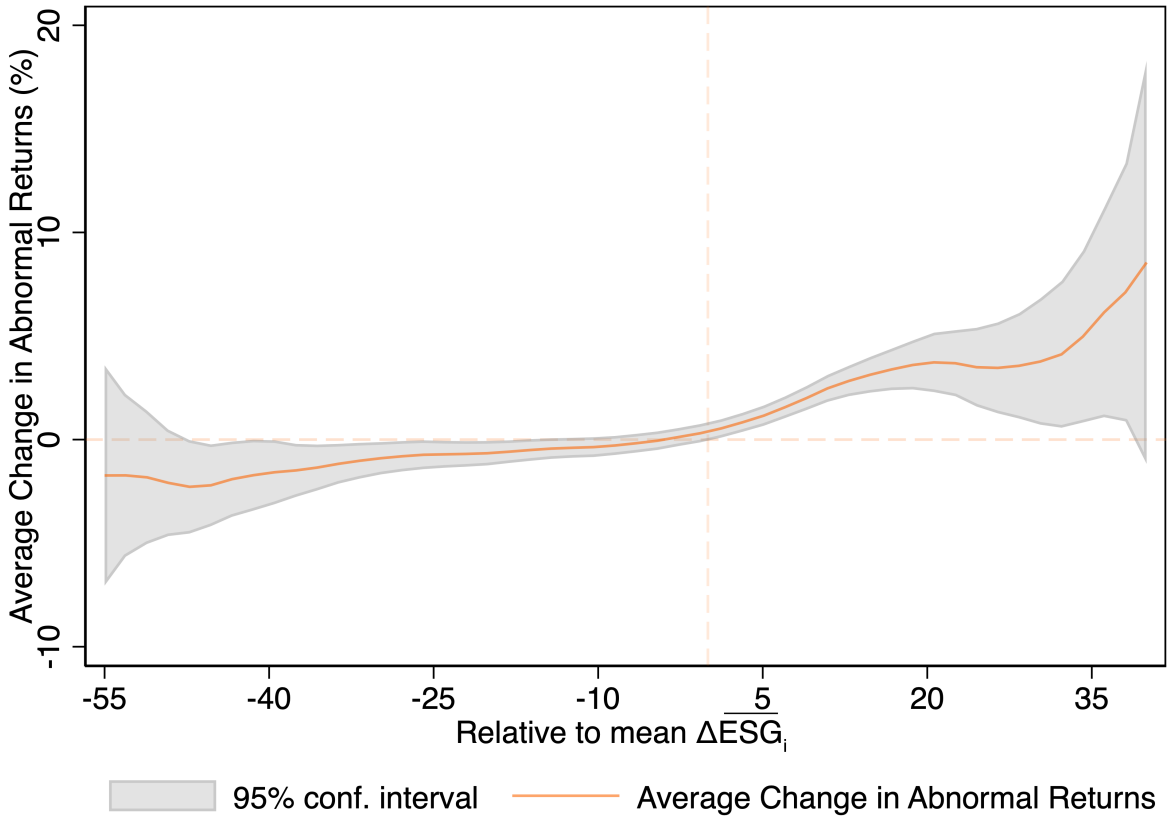


Figure 7: Change in ESG rating methodology and abnormal returns using dynamic difference-in-difference analysis

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 γ_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 by using market beta from 12-month rolling-window regression. ESG PSEUDO DOWNGRADE$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. We use October 2019 as month 0. D_i and D_t denote stock and year-month fixed effects. The grey circles represent point estimates and the dash line is the 95% confidence interval with standard errors clustered at the stock level.

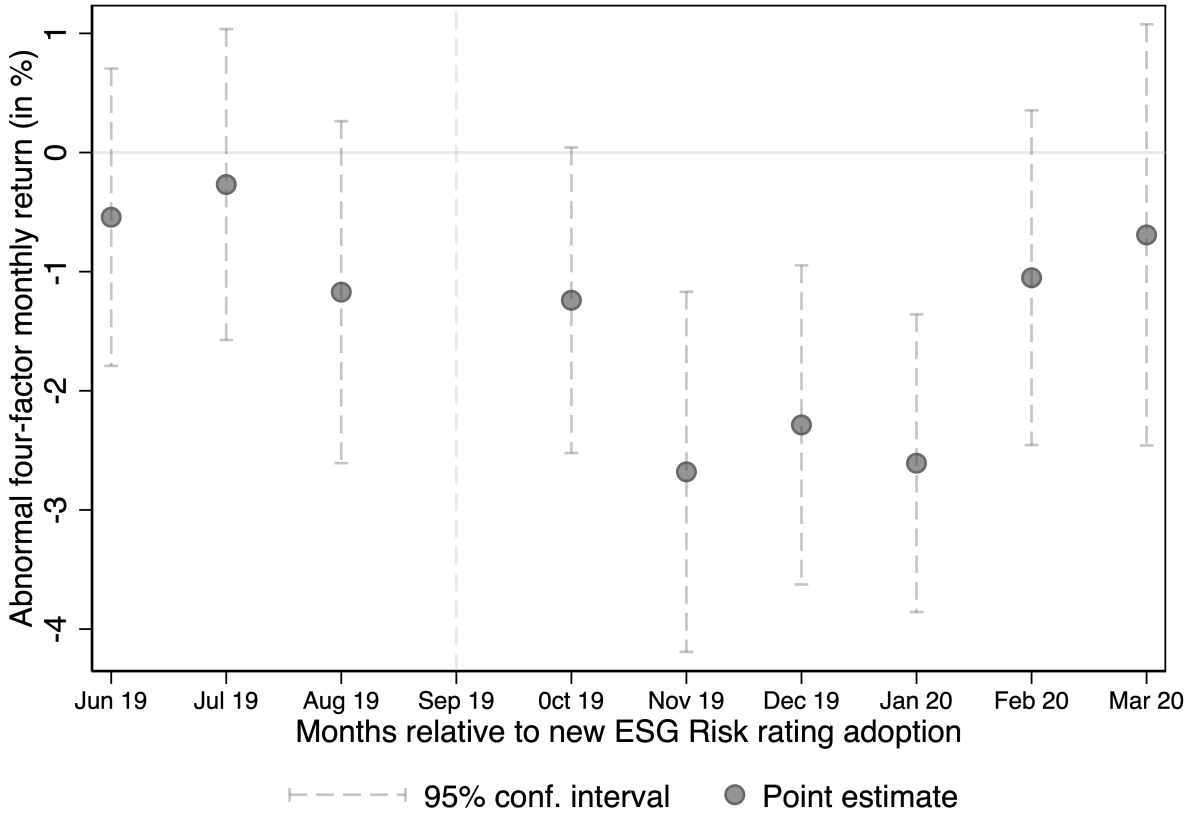


Table 1: Summary statistics

This table reports summary statistics of 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 and 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 model, respectively. # Retail is a 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 U.S. We follow Gantchev et al. (2020) 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 – Decembe 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. ΔESG_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. ΔESG 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. ΔMorningstar Classification$_i$ is a change in Morningstar Sustainability Classification in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption. ΔSustainalytics Rating$_i$ is the change in firm i's Sustainanalytics 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.

	Pre (Jul 2019 – Sep 2019)					Post (Oct 2019 – Dec 2020)				
Panel A: Levels	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	Post minus Pre Mean	P50	SD	P5	P95
ΔESG$_i$	-20.17	-19.13	14.20	-45.81	1.53
$\Delta\overline{\text{ESG}}_i$	-20.13	-18.97	14.02	-44.54	1.19
ΔSustainalytics Rating$_i$	-0.02	-0.01	1.41	-1.66	1.62
ΔESG Rank$_i$	-0.00	-0.02	0.36	-0.60	0.64
ΔMorningstar Classification$_i$	-0.01	0.00	1.01	-2.00	2.00

Panel C: Correlations	ΔESG$_i$	$\Delta\overline{\text{ESG}}_i$	ΔSustainalytics Rating$_i$	ΔESG Rank$_i$	ΔMorningstar Classification$_i$
ΔESG$_i$	1.0000				
$\Delta\overline{\text{ESG}}_i$	0.9956	1.0000			
ΔSustainalytics Rating$_i$	-0.0968	-0.0254	1.0000		
ΔESG Rank$_i$	0.1812	0.1843	-0.0146	1.0000	
ΔMorningstar 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 (Score relative to industry peers)		New Morningstar Classification (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	New Morningstar Classification				
Classification	Negligible	Low	Medium	High	Severe
Industry Leader	**1**	9	5	1	0
Outperformer	3	**29**	23	5	0
Average Performer	5	265	**538**	320	167
Underperformer	0	66	124	**295**	112
Industry Laggard	0	5	64	164	**68**

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 include in columns (1)-(4), a single-factor abnormal return estimated by 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. 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. ΔSustainalytics Rating$_i$ is the change in firm i's Sustainanalytics 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. ΔESG 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. Classification Upgrade$_i$ (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×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 the 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***				0.0482***				0.0556***			
	(5.60)				(3.29)				(3.76)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.0832***				0.0492***				0.0566***		
		(5.58)				(3.28)				(3.76)		
ESG Pseudo Downgrade$_i \times$ Post$_t$			-1.7262***	-1.5670***			-0.8041**	-0.6617*			-1.0765***	-0.9353**
			(-4.35)	(-3.94)			(-2.01)	(-1.65)			(-2.64)	(-2.29)
ESG Pseudo Upgrade$_i \times$ Post$_t$				2.3902				2.1378				2.1196
				(1.58)				(1.41)				(1.40)
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^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***				0.0501***				0.0579***			
	(5.88)				(3.39)				(3.90)			
$\Delta \overline{\text{ESG}}_i \times \text{Post}_t$		0.0869***				0.0504***				0.0584***		
		(5.83)				(3.36)				(3.87)		
ESG Pseudo Downgrade$_i \times$ Post$_t$			-1.7660***	-1.6019***			-0.8155**	-0.6737*			-1.0939***	-0.9519**
			(-4.44)	(-4.02)			(-2.03)	(-1.68)			(-2.68)	(-2.32)
ESG Pseudo Upgrade$_i \times$ Post$_t$				2.5181*				2.1756				2.1794
				(1.67)				(1.44)				(1.45)
ΔESG Rank$_i \times$ Post$_t$	-1.6324**	-1.6349**	-1.3451*	-1.4726**	-0.5588	-0.5604	-0.3805	-0.4906	-0.7856	-0.7880	-0.5880	-0.6984
	(-2.38)	(-2.38)	(-1.95)	(-2.15)	(-0.82)	(-0.82)	(-0.55)	(-0.72)	(-1.14)	(-1.14)	(-0.85)	(-1.01)
ΔSustainalytics Rating$_i \times$ Post$_t$	0.1402	0.0775	0.0801	0.0677	0.0878	0.0515	0.0528	0.0421	0.0866	0.0446	0.0463	0.0355
	(0.98)	(0.54)	(0.54)	(0.47)	(0.63)	(0.37)	(0.37)	(0.30)	(0.62)	(0.32)	(0.33)	(0.26)
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^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)
$\Delta ESG_i \times Post_t$	0.0810***				0.0439***				0.0514***			
	(5.59)				(3.03)				(3.54)			
$\Delta \overline{ESG}_i \times Post_t$		0.0814***				0.0441***				0.0518***		
		(5.53)				(3.00)				(3.51)		
ESG Pseudo Downgrade$_i \times Post_t$			-1.5834***	-1.4692***			-0.5845	-0.4869			-0.8584**	-0.7616*
			(-3.94)	(-3.62)			(-1.45)	(-1.19)			(-2.09)	(-1.83)
ESG Pseudo Upgrade$_i \times Post_t$				2.2756				1.9460				1.9301
				(1.51)				(1.29)				(1.29)
ΔSustainalytics Rating$_i \times Post_t$	0.1225	0.0637	0.0733	0.0587	0.0871	0.0552	0.0613	0.0488	0.0833	0.0459	0.0525	0.0401
	(0.86)	(0.44)	(0.50)	(0.41)	(0.63)	(0.40)	(0.44)	(0.36)	(0.60)	(0.33)	(0.37)	(0.29)
Classification Upgrade$_i \times Post_t$	-0.3289	-0.3303	-0.3041	-0.2310	-0.5636	-0.5643	-0.5782	-0.5156	-0.6384	-0.6391	-0.6378	-0.5757
	(-0.80)	(-0.80)	(-0.73)	(-0.56)	(-1.37)	(-1.37)	(-1.40)	(-1.24)	(-1.52)	(-1.52)	(-1.51)	(-1.36)
Classification Donwgrade$_i \times Post_t$	0.0232	0.0162	0.3911	0.2831	0.2585	0.2546	0.5078	0.4154	0.1910	0.1853	0.4514	0.3598
	(0.04)	(0.03)	(0.68)	(0.50)	(0.46)	(0.46)	(0.90)	(0.75)	(0.34)	(0.33)	(0.79)	(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^2	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 include in columns (1)-(4), a single-factor abnormal return estimated by 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. 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 the 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***			0.1140***			0.1153***		
	(4.96)			(3.78)			(3.72)		
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.1541***			0.1186***			0.1205***	
		(5.08)			(3.89)			(3.85)	
ESG Pseudo Downgrade$_i \times$ Post$_t$			-2.2416***			-1.6211**			-1.8214**
			(-3.07)			(-2.23)			(-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 include 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 include in columns (1)-(4), the change in the holdings of funds identified as ESG-oriented funds, in columns (5)-(8), Gantchev et al.'s (2020) 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ 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 the 1%, 5%, and 10%, respectively.

Panel A:	Δ#Retail				Δ13F				ΔShort Sellers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ΔESG_i	0.0041***				0.0026				0.0120***			
	(4.80)				(0.27)				(4.42)			
$\Delta\overline{\text{ESG}}_i$		0.0041***				0.0026				0.0124***		
		(4.79)				(0.27)				(4.47)		
ESG Pseudo Downgrade$_i$			-0.0807***	-0.0743***			-0.0079	-0.0089			-0.2164**	-0.1739*
			(-4.33)	(-3.80)			(-0.02)	(-0.03)			(-2.19)	(-1.74)
ESG Pseudo Upgrade$_i$				0.0829**				-0.0131				0.5472***
				(1.99)				(-0.02)				(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:	ΔESG Funds				ΔGGL Funds				ΔOther Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ΔESG_i	-0.0001				-0.0003				0.0134***			
	(-0.58)				(-0.72)				(4.50)			
$\Delta\overline{ESG}_i$		-0.0001				-0.0003				0.0137***		
		(-0.54)				(-0.73)				(4.56)		
ESG Pseudo Downgrade$_i$			0.0050	0.0058			-0.0002	-0.0019			-0.3399***	-0.3073***
			(1.28)	(1.47)			(-0.02)	(-0.12)			(-3.56)	(-3.21)
ESG Pseudo Upgrade$_i$				0.0101**				-0.0207				0.4199*
				(2.05)				(-1.10)				(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 include 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 include in columns (1)-(4), the change in the holdings of funds identified as ESG-oriented funds, in columns (5)-(8), Gantchev et al.'s (2020) 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ 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 the 1%, 5%, and 10%, respectively.

Panel A:	Δ#Retail			Δ13F			ΔShort Sellers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ΔESG_i	0.0085***			0.0344*			0.0175***		
	(3.32)			(1.90)			(3.00)		
$\Delta\overline{\text{ESG}}_i$		0.0084***			0.0347*			0.0182***	
		(3.29)			(1.89)			(3.06)	
ESG Pseudo Downgrade$_i$			-0.1132***			-0.7114			-0.3234*
			(-3.26)			(-1.22)			(-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:	ΔESG Funds			ΔGGL Funds			ΔOther Funds		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ΔESG_i	-0.0001			-0.0006			0.0172***		
	(-0.50)			(-0.76)			(2.88)		
$\Delta \overline{ESG}_i$		-0.0001			-0.0006			0.0177***	
		(-0.50)			(-0.73)			(2.96)	
ESG Pseudo Downgrade$_i$			0.0044			-0.0079			-0.3979**
			(0.63)			(-0.30)			(-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. 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, zero otherwise. The dependent variables include in columns (1)-(2), a single-factor abnormal return estimated by 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). ΔESG$_i$ 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. 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. ΔESG 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. ΔSUSTAINALYTICS RATING$_i$ is the change in firm i's Sustainanalytics average ESG Risk rating the three months (October-December 2019) after the adoption and in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance. We include firm and industry×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 the 1%, 5%, and 10%, respectively.

Panel A:	SINGLE FACTOR ABNRET		THREE FACTOR ABNRET		CARHART ABNRET	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\overline{\text{ESG}}_i \times$ POST$_t \times$ HIGH INST$_i$	-0.0569**	-0.0571**	-0.0560**	-0.0561**	-0.0726*	-0.0727**
	(-2.03)	(-2.03)	(-2.02)	(-2.02)	(-1.96)	(-1.96)
$\Delta\overline{\text{ESG}}_i \times$ POST$_t$	0.0919***	0.0958***	0.0594***	0.0607***	0.0846***	0.0873***
	(5.24)	(5.49)	(3.37)	(3.45)	(4.08)	(4.18)
ΔPOST$_t \times$ HIGH INST$_i$	-2.0413***	-1.9853**	-1.6776**	-1.6550**	-2.0506*	-2.0147*
	(-2.62)	(-2.55)	(-2.19)	(-2.16)	(-1.95)	(-1.92)
ΔESG RANK$_i \times$ POST$_t$		-1.5885**		-0.5365		-1.0673
		(-2.33)		(-0.79)		(-1.39)
ΔSUSTAINALYTICS RATING$_i \times$ POST$_t$		0.0683		0.0453		0.0352
		(0.47)		(0.32)		(0.25)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry×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 that only evaluated by Sustainalytics MSCI_i is an indicator variable equal to one if the stock's ESG ratings are also available through MSCI ESG Rating website, zero otherwise. The dependent variables include in columns (1)-(2), a single-factor abnormal return estimated by 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). ΔESG_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. 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. ΔESG 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. ΔSustainalytics Rating_i is the change in firm i's Sustainanalytics average ESG Risk rating the three months (October-December 2019) after the adoption and in the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance. We include firm and industry×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 the 1%, 5%, and 10%, respectively.

Panel B:	Single Factor AbnRet		Three Factor AbnRet		Carhart AbnRet	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t \times \text{MSCI}_i$	-0.0880***	-0.0997***	-0.0921***	-0.0981***	-0.1009***	-0.1110***
	(-2.95)	(-3.31)	(-3.13)	(-3.30)	(-3.11)	(-3.35)
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$	0.1004***	0.1107***	0.0839***	0.0892***	0.1097***	0.1186***
	(4.63)	(5.01)	(3.83)	(4.00)	(4.18)	(4.39)
$\text{Post}_t \times \text{MSCI}_i$	-2.8714***	-2.9731***	-1.8049**	-1.8565**	-1.9080**	-1.9990**
	(-3.10)	(-3.23)	(-2.01)	(-2.07)	(-2.00)	(-2.09)
ΔESG $\text{Rank}_i \times \text{Post}_t$		-1.8203***		-0.9473		-1.5457**
		(-2.61)		(-1.36)		(-1.97)
$\Delta\text{Sustainalytics Rating}_i \times \text{Post}_t$		0.0700		0.0441		0.0335
		(0.49)		(0.32)		(0.24)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry×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 include in columns (1)-(4), a single-factor abnormal return estimated by 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. 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. 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 the 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***				0.0763**				0.0796**			
	(3.00)				(2.47)				(2.61)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.1076***				0.0770**				0.0805**		
		(2.97)				(2.44)				(2.60)		
ESG Pseudo Downgrade$_i \times$ Post$_t$			-2.1050***	-1.7678**			-1.2724*	-0.9572			-1.5663**	-1.2885**
			(-2.80)	(-2.54)			(-1.81)	(-1.44)			(-2.33)	(-2.05)
ESG Pseudo Upgrade$_i \times$ Post$_t$				4.4424				4.1523*				3.6587
				(1.65)				(1.66)				(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 industry×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 include in columns (1)-(4), a single-factor abnormal return estimated by 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. 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. 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 the 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***				0.0763***				0.0796***			
	(7.30)				(5.21)				(5.43)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.1076***				0.0770***				0.0805***		
		(7.22)				(5.15)				(5.38)		
ESG Pseudo Downgrade$_i \times$ Post$_t$			-2.1050***	-1.7678***			-1.2724***	-0.9572**			-1.5663***	-1.2885***
			(-5.62)	(-4.79)			(-3.38)	(-2.58)			(-4.08)	(-3.40)
ESG Pseudo Upgrade$_i \times$ Post$_t$				4.4424***				4.1523***				3.6587***
				(3.18)				(2.97)				(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 include in columns (1)-(4), a single-factor abnormal return estimated by 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 exclude firms with NAICS 2211 and 2111. ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. 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. 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 the 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***				0.0442***				0.0514***			
	(5.23)				(2.92)				(3.37)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.0802***				0.0451***				0.0525***		
		(5.21)				(2.92)				(3.37)		
ESG Pseudo Downgrade$_i \times \text{Post}_t$			-1.7412***	-1.6246***			-0.8089*	-0.7077*			-1.0812**	-0.9821**
			(-4.24)	(-3.95)			(-1.96)	(-1.71)			(-2.56)	(-2.32)
ESG Pseudo Upgrade$_i \times \text{Post}_t$				1.8773				1.6290				1.5955
				(1.09)				(0.95)				(0.93)
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	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 include in columns (1)-(4), a single-factor abnormal return estimated by using market betafrom 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. 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. ΔMSCI_i denotes a change 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 MSCI-website are assigned a value of zero for ΔMSCI_i. MSCI Available$_i$ is an indicator variable that takes value one if a stock's ESG ratings are available through MSCI online platform, otherwise zero. We include stock and industry×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 the 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***				0.0596***				0.0688***			
	(4.53)				(3.50)				(4.01)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.0783***				0.0607***				0.0700***		
		(4.52)				(3.49)				(4.00)		
ESG Pseudo Downgrade$_i \times$ Post$_t$			-1.3475***	-1.2334***			-0.9314**	-0.8222*			-1.2581***	-1.1490**
			(-3.01)	(-2.75)			(-2.06)	(-1.82)			(-2.74)	(-2.50)
ESG Pseudo Upgrade$_i \times$ Post$_t$				2.2867				2.1874				2.1852
				(1.51)				(1.44)				(1.44)
$\Delta\text{MSCI}_i \times \text{Post}_t$	0.1094	0.0626	0.0441	0.0713	0.1462	0.1101	0.0779	0.1039	0.5280	0.4862	0.4779	0.5039
	(0.15)	(0.09)	(0.06)	(0.10)	(0.21)	(0.16)	(0.11)	(0.15)	(0.77)	(0.70)	(0.71)	(0.73)
MSCI Available$_i \times$ Post$_t$	-0.3647	-0.3597	-0.9544**	-0.8604**	0.8179**	0.8223**	0.3142	0.4041	0.9281**	0.9325**	0.4223	0.5121
	(-0.89)	(-0.87)	(-2.45)	(-2.20)	(2.00)	(2.01)	(0.81)	(1.04)	(2.26)	(2.27)	(1.09)	(1.31)
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^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 include in columns (1)-(4), a single-factor abnormal return estimated by 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. 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. Dow Jones$_i$ is a dummy variable equal one, if a stock was part of Dow Jones Sustainability Index before and after reconstitution in the Fall of 2019. Add Dow Jones$_i$ (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×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 the 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***				0.0568***				0.0647***			
	(5.13)				(3.41)				(3.86)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.0865***				0.0578***				0.0659***		
		(5.11)				(3.40)				(3.85)		
ESG Pseudo Downgrade$_i \times$ Post$_t$			-1.6379***	-1.4851***			-0.9120**	-0.7747*			-1.2021***	-1.0658**
			(-3.78)	(-3.43)			(-2.09)	(-1.78)			(-2.70)	(-2.39)
ESG Pseudo Upgrade$_i \times$ Post$_t$				2.3774				2.1356				2.1183
				(1.57)				(1.41)				(1.40)
Dow Jones$_i \times$ Post$_t$	0.7717	0.7713	-0.1749	-0.1561	1.5778**	1.5798**	0.8148	0.8316	1.6770**	1.6790**	0.9247	0.9414
	(1.09)	(1.09)	(-0.27)	(-0.24)	(2.27)	(2.27)	(1.27)	(1.31)	(2.40)	(2.40)	(1.44)	(1.47)
Add Dow Jones$_i \times$ Post$_t$	-1.0468	-1.0713	-2.2149	-2.0879	-0.5033	-0.5174	-1.3985	-1.2844	-0.3504	-0.3667	-1.2674	-1.1542
	(-0.58)	(-0.60)	(-1.26)	(-1.20)	(-0.30)	(-0.30)	(-0.84)	(-0.78)	(-0.23)	(-0.24)	(-0.85)	(-0.78)
Delete Dow Jones$_i \times$ Post$_t$	-1.0425	-1.0954	-1.9804	-1.9374	0.0715	0.0381	-0.6647	-0.6260	-0.1020	-0.1403	-0.8426	-0.8042
	(-0.75)	(-0.78)	(-1.53)	(-1.50)	(0.05)	(0.03)	(-0.47)	(-0.44)	(-0.07)	(-0.09)	(-0.57)	(-0.55)
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^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 include in columns (1)-(4), a single-factor abnormal return estimated by using market beta from 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). ΔESG_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. ESG Pseudo-Downgrade$_i$ is an indicator variable equal to one if the change in $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG Pseudo-Upgrade$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. 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. GGL Pressure$_{i,t}$ denotes Gantchev et al.'s (2020) ESG abnormal trading pressure measure of stock i in month t. We control for stock and industry×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 the 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***				0.0486***				0.0559***			
	(5.61)				(3.29)				(3.76)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.0830***				0.0489***				0.0564***		
		(5.56)				(3.26)				(3.73)		
ESG Pseudo Downgrade$_i \times$ Post$_t$			-1.7079***	-1.5484***			-0.7840*	-0.6409			-1.0558***	-0.9137**
			(-4.30)	(-3.89)			(-1.96)	(-1.60)			(-2.59)	(-2.24)
ESG Pseudo Upgrade$_i \times$ Post$_t$				2.3929				2.1457				2.1301
				(1.58)				(1.42)				(1.41)
ΔSustainalytics Rating$_i \times$ Post$_t$	0.1194	0.0594	0.0650	0.0519	0.0805	0.0452	0.0484	0.0367	0.0764	0.0358	0.0396	0.0279
	(0.84)	(0.41)	(0.44)	(0.36)	(0.58)	(0.33)	(0.34)	(0.27)	(0.55)	(0.26)	(0.28)	(0.20)
ΔGGL Pressure$_{i,t}$	-1.9307**	-1.9311**	-1.9163**	-1.9256**	-2.1069***	-2.1071***	-2.1022***	-2.1105***	-2.1660***	-2.1663***	-2.1580***	-2.1662***
	(-2.51)	(-2.51)	(-2.49)	(-2.51)	(-3.07)	(-3.07)	(-3.06)	(-3.08)	(-3.21)	(-3.21)	(-3.19)	(-3.21)
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^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