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Investor Reliance on ESG Ratings and Stock Price Performance

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Investor Reliance on ESG Ratings
and Stock Price Performance[*]

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Abstract

We exploit a quasi-natural experiment, the recalibration of Sustainalytics' environmental, social, and governance (ESG) rating methodology, to study the implications of investor reliance on ESG ratings on stock returns, absent any change in firms' underlying ESG fundamentals. A one standard deviation decline in the change in ESG rating generates an abnormal monthly return of 1%. This effect is largely due to retail investors' blind reliance on ratings, whose behavior exerts transitory price pressure. We do not find a similar effect on mutual fund investment behavior or investor flows but affected firms repurchase shares in response to the stock price decline.

1 Introduction

The environmental, social, and governance (ESG) activities of firms are of increasing importance to both regulators and investors.[1] The demand for "green" assets has increased investor dependence on rating agencies to distill information on firms' ESG activities. A number of papers note that ESG ratings often have vastly different criteria that often causes them to be incomparable (Berg, Koelbel, and Rigobon, 2019; Billio, Costola, Hristova, Latino, and Pelizzon, 2020; Berg, Fabisik, and Sautner, 2020, among others) making it difficult to isolate any one ESG rating's importance in investor decision-making. Moreover, determining whether ESG ratings affect investor portfolio choices, stock price performance, and the firm's cost of capital is challenging because of the endogenous relationship between ESG ratings and firm fundamentals. Causal identification remains elusive, as a change in ESG ratings often reflects news about a firm's sustainability activities.

In this paper we mitigate these problems by exploiting the reform in Sustainalytics' ESG rating methodology in September 2018 that was subsequently disseminated by Morningstar and Yahoo! Finance a year later in October 2019. Using this shock to ratings, we find that investors respond to the change in ratings in a predictable fashion and their response significantly impacts share prices. Moreover, firms respond by either repurchasing or issuing shares. Our results highlight the power of ESG ratings to impact markets and firm's cost of capital.

Specifically, the change in the Sustainalytics' methodology consists of two components. The first is a reassessment of the unique components of a firm's ESG risk exposure in order to facilitate comparisons across companies that may operate in different sectors. Under the old methodology, firms were rated relative to their industry peers but now are rated relative to all firms.

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[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). Globally, the amount could be as high as \$100 trillion – https://www.unpri.org/news-and-press/principles-for-responsible-investment-releases-new-framework-for-signatories-to-take-action-on-the-sustainable-development-goals/5924.article.

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The second change to the methodology is to make the interpretation of the ESG Risk rating more logical by inverting the scale. Both the new and the old ratings share the same scale from 0 to 100, but under the old method, *higher* ratings indicate lower ESG risk while under the new method *lower* ratings indicate lower ESG risk. For example, a firm that is considered to be the best in terms of ESG risk would have previously been rated closer to 100; under the new methodology, it is rated closer to 0.

We document that investors interpret the decline (increase) in the ESG ratings as a "downgrade" ("upgrade") in Sustainalytics' opinion of a firm's ESG risk exposure. We find that the greater the decline (increase) in the change in the ESG rating, the lower (higher) are subsequent abnormal returns. The effect of a change in ESG rating on stock prices is economically meaningful as a one standard deviation decline in the ESG rating translates into a 1.08% decrease in the monthly four-factor abnormal return. It is clear that investors use the change in the rating to re-evaluate a firm's ESG risk.

But should they? One interpretation is that the widespread decline in ESG ratings means that Sustainalytics grossly underestimated most firms' ESG risk using the old methodology. However, we show that our results are primarily due to the inversion of the rating scale that confuses some investors. We isolate firms who are unlikely to have new information on their ESG activities revealed by ranking each firm according to its ESG rating both before and after the dissemination of the new rating. We assume that if the firm experiences a decline in its ESG rating but the ranking of the firm remains unchanged or is better, then the change in ESG rating is mainly due to the inversion of the scale and not a reassessment of ESG risk.

When we restrict our analysis to this sample of firms, our results remain quantitatively and qualitatively unchanged; investors perceive negative changes in ratings as bad news even when they are most likely not. Thus, investors appear to blindly follow the numerical change in ratings without adequate due diligence, making some investors' interpretation of the ratings change incorrect. If this is true, then we expect that once investors become aware of their erroneous beliefs, prices will eventually reverse.[2] Our empirical findings

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[2]Rashes (2001) notes that investors may confuse one ticker symbol for another, causing comovement

support this conjecture; the effect on abnormal returns is short-lived and returns adjust to their pre-adoption level within five months (by February 2020).

We further examine which type of investor is most likely to blindly rely on the new methodology and thus drive the post-dissemination abnormal returns. We investigate the trading behavior of four different types of investors: retail, institutional, equity mutual funds, and short sellers. We predict that retail investors, who are generally perceived as less sophisticated, uninformed investors, (e.g., Calvet, Campbell, and Sodini, 2007; Barber, Odean, and Zhu, 2006) and who are more likely to rely on public websites such as Morningstar and Yahoo! Finance for ESG information, to reevaluate their portfolio once the new ratings become public. Institutional investors and portfolio managers of equity mutual funds, in contrast, have a wider information set available to them including access to the new Sustainalytics ESG Risk ratings at least one year prior to their public disclosure on Morningstar and Yahoo! Finance in October 2019. In addition, these investors have the resources to conduct due diligence on the firms in their portfolio and therefore, we predict that these should be less likely to respond to the dissemination of the new ratings on public websites.

Our findings are consistent with our predictions. Using Robinhood data, we find that changes in retail investor participation are positively correlated with the direction of the ESG rating change. Their participation declines more in stocks with the largest negative changes in their ESG ratings and increases more for positive changes in their ESG rating. This result holds true even when we restrict the sample to firms whose ratings change is unlikely due to new information about their ESG risk but instead due to the rating scale inversion.

We show that the availability of the new methodology on Morningstar and Yahoo Finance! websites is not accompanied by changes in the holdings of more sophisticated investors such as 13F institutions or mutual funds. These investors do not react either because they subscribe to Sustainalytics directly and thus have been using the new ESG

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among similar firms. The benefit of using investor confusion to examine the effect of their' perceptions of ESG risk on asset prices is that it is independent of firms' fundamentals.

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Risk ratings for a year prior to adoption or because they are savvy enough to understand the specific implications of the change in methodology.

The finding that no portfolio rebalancing takes place for 13F institutions may not be 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 retail investors by shorting the stock. Since the timing of the dissemination of the new methodology is known in advance, we investigate whether short sellers would take advantage of unsophisticated investors' misinterpretation of the ratings change.[3] We document that the size of the change in short interest is positively related to the change in ESG ratings. In other words, when retail investors are buying, short sellers increase their positions in the expectation that returns will undergo a subsequent reversal once investors realize their error. On the other hand, when retail investors are selling, short sellers reduce their positions to take advantage of the price pressure on the stock. We do not find, however, that short selling is able to completely reverse the impact of the ratings change on stock prices.

Inspired by Hartzmark and Sussman (2019), we examine mutual fund flows around the introduction of the new ESG rating methodology. In our sample of U.S.-domiciled mutual funds actively investing in U.S. equities, we show that the change in a fund's ESG rating and/or number of globes has no effect on investor flows. Our results are consistent with recent empirical work by Gantchev, Giannetti, and Li (2020), who show that investors primarily value fund performance over portfolio sustainability after the introduction of the globe ratings.

Finally, we investigate how firms themselves respond to the short-term price pressure stemming from the implementation of the new rating methodology. In line with theoretical models in which capital markets are imperfect but firm managers are able to identify price dislocations (see Baker, Ruback, and Jeffrey, 2007, for a review), we find that downgraded (upgraded) firms repurchase their shares (issue new shares) after the

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

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introduction of new ESG rating methodology by Morningstar and Yahoo! Finance. The change in ESG rating is positively associated with the change in the number of shares outstanding. Affected firms appear to take into account investors misperception of the change in the firm's sustainability and the associated stock price effects when making capital formation decisions.

Our results are robust to a number of alternative tests. We include in the specification the change in the new ESG Risk rating that controls for any ESG event or change in ESG fundamentals that occur over the transition period. In addition, we include the change in the MSCI ESG ratings in the analysis (assuming the firm has one). The inclusion of any of these variables into our analysis does not change the results. Our results remain unchanged if we exclude industries with worse ESG fundamentals such as fossil fuels and oil and gas extraction. Finally, we do not find that our findings are affected by the Dow Jones Sustainability Index reconstitution that occurred around the same period as the dissemination of the new methodology.

Our paper is complementary to a broader literature investigating the impact of ESG-related risk on asset prices. Both theoretical and empirical papers have examined whether sustainability should be included in a modified CAPM (Pedersen, Fitzgibbons, and Pomorski, 2020; Pástor, Stambaugh, and Taylor, 2020), specific ESG-related risk factors (Hong and Kacperczyk, 2009; Hong, Li, and Xu, 2019; Bolton and Kacperczyk, 2021; Hsu, Li, and Tsou, 2020), and drivers of investors' preferences for sustainable investments (Bialkowski and Starks, 2016; Barber, Morse, and Yasuda, 2021; Riedl and Smeets, 2017; Krueger, Sautner, and Starks, 2020; Ilhan, Sautner, and Vilkov, 2021; Engle, Giglio, Kelly, Lee, and Stroebel, 2020).[4] We show that ESG ratings, in and of themselves, play a meaningful role in investors' portfolio allocation decisions, subsequent stock returns, and firms stock issuance.

In addition to highlighting the importance of reliance on ESG ratings for stock price performance, our work adds to recent studies on the effect of retail investor trading

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[4]Giglio, Kelly, and Stroebel (2021) provide a broad literature review on the interaction between climate change, socially responsible investing, and asset prices.

on share prices using Robinhood data (Barber, Huang, Odean, and Schwarz (2021); Welch (2020); Ozik, Sadka, and Shen (2021)). Our results are also consistent with Moss, Naughton, and Wang (2020), who document that retail investors do not respond to ESG press releases. We show that retail investors appear to blindly follow ESG ratings without conducting their own due diligence, activities that would include examining firms' own ESG disclosures.[5]

Overall, we document that ESG ratings are an important input into investors decision-making that can ultimately affect share prices and firms' equity issuance decisions. The insights we glean from our analysis can help regulators better understand how investors use ratings and their potential impact on financial markets. For example, IOSCO notes "that the activities of ESG ratings and data products providers are not generally subject to regulatory oversight at the moment, increasing reliance on these services raises concerns about the potential risks they pose to investor protection..."[6] Our results highlight that investors' blind reliance on these ratings without independent information production might lead investors to make sub-optimal investment choices.

2   Sustainalytics ESG Ratings Reassessment

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.

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[5]Indeed, retail investors appear to be following this recommendation: "Do your research. Particularly if you prefer hand-picking individual stocks via Robinhood or other trading apps. ESG ratings firms such as Sustainalytics and MSCI make their company scores public on their websites." https://qz.com/guide/esg/

[6]https://www.iosco.org/library/pubdocs/pdf/IOSCOPD681.pdf

[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/).

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 their subsequent dissemination by Morningstar and Yahoo! Finance.[10]

The motivation for reassessing the methodology is the following: "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."[11] 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."[12] The old ESG rating was on a scale from 0 to 100 and a firm with a high ESG rating was considered a leader in managing ESG risks within an industry. One drawback of the old ESG rating was the inability of investors to compare companies' ESG scores across industries.

To address the problem of comparability and to update the score to better reflect ESG risk exposure, Sustainalytics introduced a new rating, "ESG Risk," which first identifies the material ESG risks in each industry. For example, "in the integrated oil and gas industry, greenhouse-gas emissions, other emissions, effluents and waste from operations, management of human capital, community relations, and bribery and corruption issues have been identified by Sustainalytics as the key material ESG risks. By contrast, in the enterprise and infrastructure software industry, the most important material ESG risks include data privacy and security issues, management of human capital, and corporate governance."[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.

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[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.

[12]*Ibid.*

[13]*Ibid.*

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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 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 relative to the old rating. After the methodology change, a firm with a low exposure to ESG risk is given a *low* ESG Risk rating, rather than a high ESG rating as under the previous rating regime. Morningstar provides an example of how the methodology changes the interpretation of the ESG risk exposure:[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.
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> 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.
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> That said, the new rating remains sensitive to best-in-class comparisons. For

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[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.

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

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.

Note that both Microsoft and Royal Dutch Shell's experience a negative change in their ESG ratings over the transition period, -61.2 and -41, respectively. The consequence of this recalibration of ESG risk is a substantial decline in the ratings of the vast majority of the firms Sustainalytics rates. Figure 2 shows the distribution of the average old ESG rating in the three months (July-September 2019) before the adoption in Panel A and the average new ESG Risk rating in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance in Panel B. The inversion in the ratings is evident from the two graphs. In Panel A, most firms have an old average ESG rating between 40 and 80; in Panel B, most firms have a new average ESG Risk rating between 10 and 60. In Table 1, Panel A, the average ESG rating is 50.51 before adoption and 30.38 after, translating into an overall average change of -20.17 (Panel B). Further evidence of the impact of the new methodology on numerical ratings is presented in Figure 3, which plots the difference between the two ratings. It is evident that most firms experience a decline in rating after the new methodology is reported on the websites.

One interpretation of this widespread decline in ESG ratings, is that Sustainalytics vastly underestimated the ESG risk of the majority of firms it covers. However, we believe this is unlikely because the ratings recalibration not only reassesses ESG risk but also inverts the scale of the rating. This results in potentially two effects on investor behavior. The first is that investors who follow the ESG ratings of firms on Morningstar and Yahoo! Finance need to update their beliefs about how Sustainalytics views a firm's ESG risk after the new methodology is implemented (Cornaggia, Cornaggia, and Israelsen, 2018). The second is that an investor must also consider the numerical inversion when updating their beliefs. This can be quite complicated as there is no direct mapping from the old ratings to the new making it hard to parse out whether a decline in the rating is due to a worse assessment of a firm's ESG risk or the inversion of the scale. If some investors blindly

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follow ESG ratings, for example by having high information processing costs (Hirshleifer and Teoh, 2003), then we expect that less informed investors may not fully understand the rating change and interpret a reduction in the ESG rating as a "downgrade" or worse score, and an increase as an "upgrade" or better score, even when this may not be the case.

Understanding whether some investors put blind faith in ESG ratings is important to regulators because it can shed light on both the market frictions that exist as well as the cost of potential problems in ESG ratings systems.[17] For example, Andy Howard, global head of sustainable investment at Schroders notes in a Reuters article "One of the challenges here, is a tendency to use ESG ratings without really thinking about precisely what it is you're trying to measure and whether that particular rating system is an appropriate way of measuring that thing, or not."[18]

3   Data and Variable Construction

We collect ESG ratings for all companies trading on the NYSE, NASDAQ, and Amex exchanges between June 2019 and March 2020. We obtain both the old ESG ratings and the new ESG Risk ratings that are disseminated on the Morningstar website from Morningstar Direct and confirm that the same ratings are reported on Yahoo! Finance over the transition period.

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

We define a number of variables that allow us to identify firms that have been hetero-

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[17]Note we are not suggesting that the ratings change we study is an example of the type of situation regulators should be focused on. As we note throughout the paper, Sustainalytics and Morningstar were very transparent about the methodology change.

[18]https://www.reuters.com/business/sustainable-business/regulators-turn-spotlight-company-sustainability-ratings-2021-07-26/

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geneously affected by the change in the ESG rating. 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). $\Delta\overline{\text{ESG}}_i$ 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. Thus, both ΔESG_i and $\Delta\overline{\text{ESG}}_i$ vary only by stock but not time.

We also use two indicator variables. The first is ESG PSEUDO-DOWNGRADE$_i$, which is equal to one if stock i's change in its average ESG rating is in the lowest quartile of the $\Delta\overline{\text{ESG}}_i$ distribution. Firms that have a value of one for ESG PSEUDO-DOWNGRADE$_i$ have the largest negative change in their ESG rating. The second indicator variable is similar to the first but captures whether the firm has been "upgraded." Specifically, 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 any particular quartile since only 6% of the firms in our sample experienced an increase in their ESG ratings.

To show that investors blindly react to the inversion of the scale rather than to new information conveyed by the ratings, we need a mechanism to isolate inversion from information.[19] We do so using two different methods. First, we control for any change in the relative ranking of the firm in terms of ESG scores. As noted in the example in the introduction, Herman Miller was ranked 3 (a lower numerical ranking is better) before the methodology change on Morningstar and Yahoo! Finance and is then ranked 1 after the fact, even though it had the largest decline in its ESG rating of any firm in the sample. In some sense, Herman Miller's decline is mechanistic. Firms with the best ESG scores under the old ratings have scores close to 100. If no significant reassessment about ESG risk is made under the new ratings, these firms will be rated close to 0, resulting in a large "downgrade" in their ratings. To construct this variable, we rank each firm

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[19]As discussed later, we also control for any change in firm fundamentals in our specifications.

from 1 to 2,310 (the total number of firms in our sample), where one is the firm with the *best* ESG rating, that is, the firm with the lowest ESG risk. In the pre-dissemination period, the number one firm would have the highest ESG rating; in the post-adoption period, the number one firm would have the lowest ESG Risk rating. Ties are given the same ranking and the next ranking reflects the number of ties in the previous ranking. We define 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.

Second, we use an alternative measure of a given firm's relative sustainability ranking provided by Morningstar. Specifically, we control for whether the firm experienced a change in its Morningstar ESG Rating Assessment, which is similar to the globe rating used in the Morningstar Sustainability Rating for funds (Hartzmark and Sussman, 2019; hereafter referred to as "Morningstar Classification"). Thus, if a firm experiences a decline in its ESG rating but either does not have an increase in its relative ranking or a worse Morningstar Classification, then we assume that the change in the ESG rating is due to the inversion of the scale rather than new information on the exposure of the firm to material ESG risk. Panel A of Figure 4 presents the distribution of the change in ranking of the firms around the adoption of the new methodology. Most firms show little change in their ranking as the distribution is centered on zero (also confirmed in Panel B of Table 1) but there are firms who move rankings by more than 25% in either direction.

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

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

Panel B of Figure 4 shows the percentage of firms that move up or down a category. The majority of firms remain in their original classification, although some move up or down one or two notches. Furthermore, Panel B of Table 1 shows that the median change in the Morningstar Classification is zero. To capture changes in a firm's Morningstar Classification, we construct CLASSIFICATION UPGRADE$_i$ (CLASSIFICATION DOWNGRADE$_i$), an indicator variable equal to one if the stock has an increase (decrease) in its Morningstar Classification after the adoption of the new methodology.

We also control for the potentially new information about a firm's ESG risk over the transition months. For example, a firm could experience an ESG event or implement new policies in September 2019 that could affect its ESG rating in October irrespective of the methodology change. Although Morningstar and Yahoo! Finance adopted the new ESG Risk rating in October 2019, the ESG Risk ratings are actually available to us from Sustainalytics since September 2018. Therefore, we can see the counterfactual new ESG Risk rating at the same time as the old rating is still being reported on Morningstar's website. Any change in the Sustainalytics new ESG Risk rating over the transition period controls for a possible ESG change in a firm's underlying ESG fundamentals. We define ΔSUSTAINALYTICS RATING$_i$ as the difference in firm i's average ESG Risk rating in the

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three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption.[20]

Panel A of Figure 5 shows the change in firms' Sustainalytics ESG Risk rating before and after adoption. As shown in the figure and Panel B of Table 1, most firms do not experience any meaningful change in their ESG Risk rating during the transition period, as most of the distribution is centered at zero. Indeed, this figure shows that ΔSUSTAINALYTICS RATING$_i$ is almost zero (between -5 and +5) for 98.6% of stocks. In Panel B, we show the relationship between the change in the ESG rating (or main variable of interest) and the change in the ESG Risk rating. There is very little correlation between the two.

Panel C of Table 1 presents the correlation matrix for our variables of interest. Both ΔESG RANK$_i$ and ΔMORNINGSTAR CLASSIFICATION$_i$ are highly correlated. This is not surprising since Morningstar uses the broad categories of the ranking of ESG Risk ratings as input to their classification. Otherwise, the correlations between ΔESG$_i$ and all other variables are generally low.

We note that the change in methodology also affected mutual funds' Historical Portfolio Sustainability Score because this score is calculated as asset-weighted average of each company's ESG scores in the portfolio. Panel A of Figure 6 shows that all mutual fund ESG ratings fell, because as we stated when discussing Figure 3, most individual stocks experienced a decline. The change in ESG ratings of mutual funds, in turn, may also affect the number of globes they receive from Morningstar as evidenced in Panel B. Although over 40% of mutual funds had the same number of globes, roughly another 20% experienced an upgrade (downgrade) of their Morningstar classification.

We are interested in whether investors' perceptions of the new ESG Risk ratings affect their trading behavior. Therefore, we collect daily returns, prices, and shares outstanding from the Center for Research in Security Prices (CRSP). To merge the ESG ratings data with the CRSP stock database, we convert the ISINs of U.S. companies (starting

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[20]Later in the paper, we include the change in the MSCI index as an alternate variable to capture a change in a firm's ESG fundamentals and/or ratings inputs more generally.

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with 'US') from Morningstar into 8-digit CUSIPs. We eliminate small 'penny' stocks by requiring that the stock price at the end of the beginning of the sample period is greater than $1.

To compute abnormal returns, we download information on daily and monthly risk factors for Fama and French (1993) three- and Carhart (1997) four-factor model from Kenneth French's website. We use daily stock excess returns over a 12-month period from July 2018 to June 2019 to estimate risk factor loadings and expected returns for each stock. Then, we compute abnormal returns in the following month by subtracting the firm's expected return from its actual return.[21]

We collect information on the participation or holdings of four different types of investors: retail, institutional, ESG 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.[22] We then average the reported number of retail investors holding the stock over the day and aggregate the daily means into monthly averages.[23]

Robinhood retail investor participation measure captures the number of investors currently holding a stock and *not* the number of shares held by retail investors of a given stock. Thus, there is no direct way to adjust retail investor participation for a firm's importance or size since we do not have information on the total number of investors in the firm. We therefore follow Coval and Stafford (2007) and divide the mean number of Robinhood investors holding a stock i in month t, # $\text{RETAIL}_{i,t}$, by the average dollar trading volume from April to June 2019 (one quarter before the control period).[24] Finally, we merge the Robinhood data with the CRSP dataset using a stock's ticker symbol.

We collect quarterly 13F institutional ownership from Thomson Reuters and aggregate

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

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

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

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

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

We use Morningstar dataset to collect information on U.S.-domiciled mutual funds actively investing in U.S. equities. For each mutual fund, we obtain data on the number of shares a 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 compute the holding of each type of ESG mutual funds by dividing the aggregated position of all funds in a firm at the end of a quarter by the number of shares outstanding.

We collect information from Capital IQ on the month-end short interest for NYSE, Amex, and NASDAQ firms for the six-month period around the introduction of the new methodology. We then average short interest during the three months before the adoption from July 2019 to September 2019 and during the three months after the adoption from October 2019 to December 2019.[25] We construct SHORT INTEREST$_{i,t}$ by dividing the average number of shares sold short during the pre- or post-adoption period by the number of shares outstanding during the same period.

To examine the impact of the change in ESG ratings on mutual funds, we follow prior literature (e.g., Chevalier and Ellison, 1997; Sirri and Tufano, 1998) and compute the

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[25]Although we ignore the short interest reported in the middle of the month, our results are robust to its inclusion in the average short interest.

investment flow to fund f over month t as

$$\text{NET FLOW}_{f,t} = \frac{\text{TNA}_{f,t} - \text{TNA}_{f,t-1} \cdot (1 + \text{RET}_{f,t})}{\text{TNA}_{f,t}}, \tag{1}$$

where $\text{TNA}_{f,t}$ is fund's f total net assets at the end of month t and $\text{RET}_{f,t}$ is the fund's return in month t. Net flows are also measured at the retail and institutional level.

Finally, we examine whether firms respond to the stock price change associated with investors' trading behavior in response to the change in ESG ratings. We compile information on an individual firm's number of shares outstanding from CRSP over the sample period.

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

The mean number of investors on the Robinhood platform holding a stock increases slightly in the periods surrounding the introduction of the new ESG Risk ratings. In the pre-adoption period, there are approximately 2,750 retail investors in a given stock, rising to 2,920 post-adoption. However, the median number of investors is much smaller, approximately a tenth of the size of the mean. 13F institutional and mutual fund holdings remain roughly similar pre- and post-adoption. 13F institutions hold 52% and mutual funds 24% of shares outstanding.

Net flows, including those of retail and institutional investors, are more negative in the post-period. On average net outflows are -0.63% in the pre-period and -1.17% in the post period. Finally, we document that shares outstanding for the average firm do not appear to change during the sample period.

Panel B presents the change in each of our different ESG ratings. Consistent with

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Panel A, the change in ESG rating is roughly 20 points and this is invariant to whether we measure the change as an average in the three months before and after or one month before and after the new methodology is reported by Morningstar and Yahoo@! Finance. The average firm's Sustainalytics ESG Risk rating is the same over the transition period as is its relative rank and Morningstar Classification. Thus, these summary statistics suggest that any effect we document is not driven by a change in the fundamental ESG risk of the firm.

Finally, in Panel C, we present the correlations among our ESG ratings variables. The correlation between the change in ESG ratings and our controls for any fundamental change in ESG risk that occurs during the transition period (ΔSustainalytics Rating$_i$, ΔESG Rank$_i$, and ΔMorningstar Classification$_i$) is quite low. This indicates that these control variables capture different aspects of a firm's ESG activities.

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. Because the dissemination of the new ESG Risk ratings is independent of any change in firm ESG fundamentals, any relationship between returns and the change in ratings is evidence that investors value the information specific to ESG ratings. The motivation is similar to Cornaggia et al. (2018) who use a recalibration of Moody's rating methodology of municipal bonds to overcome the endogeneity problem of determining whether "investors respond directly to credit ratings, or if investors and CRAs [credit rating agencies] merely observe and react to the same information about issuer fundamentals."

4.1   Change in abnormal returns

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

$$\text{ARET}_{i,t} = \gamma_0 + \gamma_1 \text{TREAT}_i \times \text{POST}_t + \text{D}_i + \text{D}_{s,t} + \varepsilon_{i,t}, \qquad (2)$$

where $\text{ARET}_{i,t}$ is stock i's abnormal return in month t computed using either a single-, three-, or four-factor model. TREAT_i captures stock i's exposure to the change in methodology. We use four measures for TREAT_i : (1) ΔESG_i, the difference in the firm's ESG rating between October 2019 and September 2019; (2) $\Delta\overline{\text{ESG}}_i$, the difference in the average firm's ESG ratings in the three months (October-December 2019) after and the three months (July-September 2019) before the adoption; (3) ESG PSEUDO- DOWNGRADE$_i$, an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise; and (4) ESG PSEUDO-UPGRADE$_i$, an indicator variable equal to one if $\Delta\overline{\text{ESG}}_i$ is positive, zero otherwise. D_i and $\text{D}_{s,t}$ represent firm and industry×year-month fixed effects.[26] t-statistics with standard errors clustered at the firm level are shown in parentheses.

Our time series consists of only six months around the methodology adoption and we are unable to extend the time series because of the transitory price pressure due to the confluence of the methodology change and the onset of COVID-19. According to Angrist and Pischke (2008), six clusters are not sufficient for the standard cluster-time adjustment.[27] In order to address concerns that our standard errors are understated due to cross-sectional correlation in the residuals, we perform a wild bootstrap, that allows us to cluster the standard errors at the time dimension, whose results are present in the internet appendix in Table IA.1.[28] In addition, our results are qualitatively similar when the standard errors are clustered at the industry×year-month level.

If our conjecture about the value of ratings to investors is 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, meaning that, 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 (2) in Table

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[26]It is impossible to include stock×year×month fixed effects, because the set of fixed effects would span the entire variation that we use in our regression.

[27]See Chapter 8.2.3 'Fewer than 42 Clusters' of *Mostly Harmless Econometrics* for more details.

[28]See Roodman, Nielsen, MacKinnon, and Webb (2019).

3. Panel A presents the baseline regression. Single-factor abnormal returns are presented in columns (1) to (4), three-factor abnormal returns are presented in columns (5) to (8), and in the last four columns, we show Carhart (1997) four-factor abnormal returns.

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

To further understand the relationship between the change in the ESG rating and abnormal returns, we investigate whether abnormal returns are differentially impacted by firms that experience large ESG rating declines, 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$_i \times \text{Post}_t$, is negative and statistically significant, indicating that returns are lower for firms with very large declines in their ESG ratings compared to all other firms. In economic terms, this translates to a decrease of between 0.66% and 1.56% in monthly abnormal returns depending on the specification.

The significant decline for firms with ESG Pseudo-Downgrade$_i$ also provides preliminary evidence that the inversion of the rating scale may lead some investors to infer a degradation of ESG risk when the change in the rating is actually due to the inversion of the scale. This means that the decline in ESG rating for firms that we classify as ESG Pseudo-Downgraded may not be an indication of worsened ESG exposure. Indeed, we find that most firms in this category, 86%, have the same or better Morningstar Classification after the change.

In columns (4), (8), and (12), we include the ESG Pseudo-Upgrade$_i \times \text{Post}_t$ in

the specification. We find that this interaction term is positive but insignificant. One reason for this may be that too few firms experience an upgrade within an industry 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 7 presents the outcome of this analysis. The orange horizontal dashed line represents the zero change in a firm's abnormal return, while the vertical dashed line represents the mean change in ESG rating. The shaded area represents the 95% confidence interval.

It is evident from the graph that the change in a firm's abnormal returns is associated with a corresponding change in ESG rating relative to the mean. The change in abnormal returns declines as the change in ESG rating becomes more negative and increases as the change in ESG rating becomes more positive. These results suggest that investors who value ESG ratings have an impact on stock returns. Of course, this interpretation assumes no correlation between the change in ratings methodology and firm fundamentals. In the next section, we examine whether this is true.

4.1.1 Effect of a change in firm ESG risk

As mentioned previously, the benefit of our approach is that the recalibration of the ratings methodology is unaccompanied by any actual change in firm ESG risk. To make sure this is true, we control for 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 rat-

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ing. Since we have the contemporaneous Sustainalytics ESG Risk rating over the entire transition period, we can see the counterfactual change in ESG risk, free from the methodology change. 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 Panel B.

In Panel B of Table 3, the coefficient on ΔSustainalytics Rating$_i \times$Post$_t$ is never significant, indicating that a change in the average Sustainalytics ESG Risk rating does not impact returns. In other words, most firms do not experience an ESG event that could affect investors' trading behavior and their impact on stock returns.

As a robustness test, we include the change in the MSCI ESG rating in the specifications.[29] We create a variable, ΔMSCI$_i$, that is measured as the difference in the MSCI ESG rating between the three months after the adoption by Morningstar of the new methodology and the three months before (similar to ΔSustainalytics Rating$_i$). Note that any change in the MSCI ESG rating is unlikely to be related to the reassessment of ESG risk by Sustainalytics. Since not all firms have an MSCI ESG rating, we also include MSCI Available$_i$ in the regression equation – an indicator variable equal to one if the firm has an MSCI ESG rating, zero otherwise. In Panel C of Table 3, 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 ESG ratings interacted with the Post$_t$ dummy are significant and our main results hold. In untabulated results, we drop the ΔESG$_i \times$ Post$_t$ interaction term from the regression equation. We find that neither the coefficient on ΔMSCI$_i \times$ Post$_t$ nor MSCI Available$_i \times$ Post$_t$ are significant indicating that the change in the Sustainalytics' methodology and dissemination is a unique event.

We, therefore, show that investors' value the specific information inherent in ESG ratings. Moreover, their reliance on ratings for ESG information has real economic impacts. In the following section, we examine whether some investors take the change in

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[29]MSCI ESG ratings are available on the MSCI website: https://www.msci.com/esg-ratings/issuer.

ESG ratings at face value without further due diligence. In this case, they blindly assume that a negative change in the ratings signals bad information when, in fact, it may not.

4.1.2 Investor misperception

The prior analysis suggests that investors perceive negative changes as downgrades or bad news and positive changes as good news or upgrades. In some cases, this is likely true. However, it may not be true in all cases since the change in methodology results in a downgrade for 94% of all the firms in the sample. Clearly the decline in the rating for some firms, given the significant number of downgrades, is the result of the inversion of the scale rather than a reevaluation of ESG risk by Sustainalytics. We need an independent metric that can determine whether the change in ratings indicates a reassessment of the ESG risk of the firm or a change in the numerical scale. In Table 4, we use a subsample of firms that experience a decline in their ESG ratings but do not have a worse relative ESG ranking among all other firms (Panel A) or Morningstar classification (Panel B) after the methodology change. Approximately 50% of the firms in our sample meet one or the other of these criteria. In other words, these are firms where the recalibration of the methodology is likely driven by the inversion of the scale and not due to a worsening of Sustainalytics view of their ESG risk. Thus, we reduce the possibility that an informed investor would view these firms as having been correctly downgraded in terms of ESG ratings after the dissemination. Evidence of price pressure in this sample of firms points to a blind reliance on ESG ratings by investors without due diligence.

The results in both panels of Table 4 are remarkably analogous to our findings for the full sample. The coefficients of ΔESG_i and the corresponding R^2 are of similar magnitude to those in Panel A of Table 3. The effect is strongest for firms that are most likely the best before the methodology change and the best after. We find that the coefficient on ESG PSEUDO-DOWNGRADE$_i$ × POST$_t$ is negative and significant. (Note there is no ESG PSEUDO-UPGRADE$_i$ by construction.) We, therefore, conclude that some investors place an over-reliance on the numerical judgment of ESG rating agencies without performing independent information production.

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4.1.3 The dynamics of abnormal returns

The findings of the previous section indicate that investor reliance on ESG ratings impacts stock prices. We predict that if our findings are primarily driven by investors' blind faith in the meaning of the ratings, then the effect of a change in ESG ratings should be short-lived and ultimately reversed as investors recognize their error or market forces correct it. To test whether this is the case, we compare the experience of firms whose ratings are most affected to the experience of all other firms, using a dynamic version of the regression equation (2) 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, which captures the differential effect over time for firms that experience the most severe decline in the value of their ESG rating (treated firms where 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 new ratings are widely disseminated and then reverse as investors better understand the new methodology (or market forces correct their misperception).

Figure 8 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 any 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 the control firms, and this becomes most pronounced in November 2019. The magnitude of the effect is quite large as the abnormal returns of

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the firms with the largest change in their ESG ratings drop by 2.5 percentage points more than the control firms one month after the methodology change. However, this difference in returns is short-lived and persists only until January 2020, when the gap between the abnormal returns of the treated and control firms again begins to converge. By the end of February 2020, five months after the adoption, the abnormal returns between the two types of firms are no longer statistically different. Thus, any investor confusion about the meaning of the change in the ESG rating scale has been either clarified or its effect eliminated a few months after adoption.

4.1.4 Additional robustness tests

In addition to the tests above, we conduct three additional robustness tests whose results are presented in the internet appendix. We re-run the analysis but exclude firms classified as fossil fuels (NAICS=2211) or oil and gas extraction (NAICS=2111), as these firms may be more likely to experience an ESG event during the transition period. Furthermore, the new methodology no longer assigns ratings relative to a firm's peers in the industry. As the quote in Section 2 indicates, these types of firms may be most affected (downgraded) by the new methodology. However, we find in Table IA.3, that our results remain unchanged.

Around the same time as the adoption of the new Sustainalytics methodology by Morningstar, the Dow Jones Sustainability Index was reconstituted. It is possible that a change in a firm's ESG rating coincides with its addition to or removal from the index, thus confounding our results. We control for this possibility by including DOW JONES$_i$, a dummy variable equal to one, if a stock was part of the Dow Jones Sustainability Index before and after reconstitution in the fall of 2019. To capture the effect of the reconstitution on returns, we include 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.4. As with the previous robustness tests, this reconstitution does not change our findings. In addition, it consistent with Berk and van Binsbergen (2021), who examine the inclusion/exclusion of firms from the

Electronic copy available at: https://ssrn.com/abstract=3801703

FTSE USA 4Good index and find no significant effect on returns.[30] Thus, we conclude that our findings are robust to a number of alternative explanations. Next, we examine whose trading behavior may be driving the change in stock prices

4.2 Change in investor participation and ownership

The preceding section documents a positive relationship between changes in ESG ratings and stock returns even in situations where it is unlikely that Sustainalytics revises its view of a firm's ESG risk. If our results are partially driven by a misinterpretation of the meaning of the rating change, then we expect heterogeneity in investor trading based upon how informed they may be.

For example, since blind reliance on ratings is more likely among less informed investors, who may face higher information processing costs, we anticipate that the change in the participation of retail investors will correspond to the direction of the change in ESG ratings. Retail investors will interpret negative changes in the ESG rating as downgrades and sell their holdings. In contrast, these investors will perceive positive changes as good news or upgrades and decide to invest in the stock.

Sophisticated investors, such as institutional investors and ESG-oriented funds, are likely to either understand the implications of the ESG rating change or to have previously 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 dissemination of the new ratings regime on the Morningstar and Yahoo! Finance websites.

Finally, the timing of the dissemination of the ratings was known in advance because Morningstar announced that it would adopt the new ESG Risk rating in July 2019 and disseminate it in October 2019. We conjecture that some investors, such as short sellers,

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[30]Gantchev et al. (2020) argue that funds very close to Morningstar globe thresholds are more likely to try to improve or maintain their globe rating. Thus, one may wonder if our results could be driven by this effect. We follow their methodology to construct a measure of these funds' impact and we confirm that although the trading behavior of these funds affects returns, their inclusion in the specification neither reduces the significance of the coefficients on ΔESG_i nor changes the interpretations of our findings.

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may attempt to take advantage of less sophisticated investors' potential misinterpretation of the change. If this is true, then the change in short sellers' position should be positively correlated with the change in retail participation.

We follow Mian and Sufi (2011) and estimate the generalized difference-in-difference specification of the form:[31]

$$\Delta\text{OWNERSHIP}_i \;\;=\;\; \delta_0 + \delta_1 \Delta\text{TREAT}_i + \eta_{i,t}, \tag{4}$$

where $\Delta\text{OWNERSHIP}_i$ is defined as the difference between the quarter after and the quarter before the adoption in (1) the average number of investors in a firm on the Robinhood platform, (2) the average percentage of shares outstanding held by 13F investors, (3) the average percentage of shares outstanding held by ESG funds, and (4) the average monthly short interest.

We report the regression coefficients in Table 5. In columns (1)-(4), we focus on how retail investor participation responds to the methodology change. Since the data measures the number of retail investors in a particular stock, retail participation changes only when an investor sells her entire holdings or when an investor, who currently does not own the stock, purchases shares. The change in ESG rating is a positive and significant predictor of retail participation. Retail investors purchase (sell) their holdings when a firm experiences a positive (negative) change in the ESG rating. 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 attribute a decline in the rating to bad news. Consequently, they decide to sell all their holdings in the firm. Conversely,

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

an increase in the ratings is interpreted as good ESG news and more retail investors are attracted to the stock. In economic terms, the participation of retail investors increases (decreases) by roughly 10% relative to the mean as a result of an ESG rating upgrade (extreme downgrade) of a stock compared to firms that do not experience such changes.

Next, we shift our focus toward investors that are traditionally perceived as more informed, such as institutional investors. These investors are more likely to understand the implications of the dissemination of the new ratings methodology by Morningstar and Yahoo! Finance. Moreover, they may have access to ratings directly from Sustainalytics and may thus have been aware of and using the new ESG Risk ratings since September 2018. We predict that the portfolios of 13F institutions will either not be affected by the ESG ratings change or rebalanced in the correct direction based on new information.[32]

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

Next, in columns (9)-(12), we examine the portfolio rebalancing of mutual funds in response to the change in ESG rating methodology. As with institutional investors, mutual funds do not appear to 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.[33]

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 (13)-(16), we regress the change in the average percentage of shares sold short pre- and post-

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

[33]We find a similar result if we restrict the sample of mutual funds whose name includes sustainability keywords: esg, sust, impact, rspnb, env, scl, eco (but not "econ"), social, and/or green.

adoption. We find that short sellers positions change in the same direction as the ESG change and retail participation. Short sellers appear to understand that a decline in a firm's ESG rating will be accompanied by lower abnormal returns after adoption, thereby, 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 (16), short interest increases by 10% relative to the mean for firms that experience an increase in their ESG rating after the adoption. Short interest declines by a smaller amount, approximately 4%, for firms that have an extreme decline in their ESG ratings, as shown in columns (15) and (16).

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 or a decrease in their Morningstar classification. 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 simply respond to the change in ratings without assessing their meaning and short sellers take advantage of this phenomenon. On the contrary, there is scant evidence that either 13F institutions or mutual 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. Like Barber et al. (2021), we show that retail investors' behavior can impact asset prices. Less informed investors, such as retail investors, re-balance their portfolio under the mistaken assumption that a decline in the ESG rating signals worsened ESG risk. Short sellers appear to take advantage of this confusion and increase their positions, when retail investors buy and decrease their positions when retail investors sell. Informed investors' portfolios remain generally unchanged during this time.

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4.3   Mutual fund flows

Hartzmark and Sussman (2019) documents that mutual fund flows respond to the introduction of the globe ratings by Morningstar. Funds that have a high globe rating have an increase in investor flows while funds that are identified as having low sustainability have net outflows. More recently, Gantchev et al. (2020) find that mutual funds rebalance their portfolio toward sustainable investments when the globes are introduced. They show, however, that subsequent to the introduction, mutual fund flows become unresponsive to a change in globe ratings.

Since the methodology change we study impacts the ESG rating of fund's holdings and thus its portfolio ESG score and globe rating, we examine whether investors react in the same fashion to a change in ESG rating for mutual funds as they do for individual stocks. In Table 7, we regress all investor flows as well as retail and institutional flows individually. Like our empirical setup for individual firms, we also classify mutual funds relative to the change in their ESG rating. ESG LARGE PSEUDO DOWNGRADE$_f$ is an indicator variable equal to one if $\Delta \overline{\text{ESG}}_f$ is in the lower quartile, and zero otherwise. ESG SMALL PSEUDO DOWNGRADE$_f$ is an indicator variable equal to one if $\Delta \overline{\text{ESG}}_f$ is in the upper quartile, and zero otherwise. Note that none of the mutual fund portfolios' ESG ratings are upgraded. This is why, we are unable to create an upgrade indicator variable as we did with individual firms.

In Panel A, we present a baseline regression that includes only the change in the ESG rating of the mutual fund's portfolio. Irrespective of the mutual fund investor type, the change in the ESG rating does not affect net flows. In addition, we do not find that the funds with the most negative change in ESG rating experience differential flows.

In Panel B, we include the change in the Morningstar globes for the mutual fund. Unlike the introduction of the Morningstar globe ratings that Hartzmark and Sussman (2019) study, we find no evidence that the change in the globe rating of the fund affects flows to a greater or lesser extent after the methodology change. Finally, in Panel C, we include the change in the star ratings as well as the change in the globe ratings. Again,

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the coefficient of the interaction term of the change in star ratings and the indicator variable for the post-period are insignificant.

4.4 Firm response

It is well-known that firms respond to mispricing in the valuation of their stock by either repurchasing shares (Vermaelen (1981); Ikenberry and Vermaelen (1996)) or issuing new stock (Barclay and Litzenberger (1988)). In this section, we examine whether firms who may be most affected by the methodology change, take advantage of investors' misperception of the change in ESG rating to issue or repurchase shares.

Table 8 reports regression estimates of equation (4) where the dependent variable is the percentage change in shares outstanding from December 2019 (three months after the adoption) to September 2019 (the last month before the methodology change). We include the change in the ESG rating as well as whether the firm was highly downgraded or upgraded. As can be seen from the table, firms appear to respond to the mispricing due to the change in the ESG rating. There is a positive coefficient on ΔESG_i and $\Delta\overline{\text{ESG}}_i$ indicating that a positive (negative) change in the ESG rating is associated with firms' issuing (repurchasing shares).

Firms with very large downgrades and hence, more negative stock price reactions to the change in ESG ratings, significantly decrease the number of shares outstanding compared to firms who are less affected. Conversely, firms who experience an upgrade are more likely to issue new shares. Overall, the results of this section indicate that the stock price reaction to the introduction of the new ESG rating and the subsequent investor confusion, leads to real effects.[34]

4.5 Information environment

The results of the previous sections suggest that retail investors are more likely to trade on misinformation about ESG ratings. If this is the case, then we expect that the effect

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[34]We do not examine the behavior of firms' investments or the longer run impact of the introduction of the new methodology because of the impact of COVID-19 just after our sample period ends.

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will be attenuated in firms that have greater institutional ownership. Firms with high institutional ownership are unlikely to have retail investors as the marginal investor and therefore, we expect that their behavior will not move prices to the same degree as firms with more retail investor participation. In addition, information is likely to be more widely available to investors in these firms. Consequently, we expect that firms with higher institutional holdings will not be as affected by the dissemination of the new methodology by Morningstar and Yahoo! Finance as firms with lower institutional holdings.

In Table 9, we examine abnormal returns using a triple difference-in-difference regression where our main independent variable of interest is $\Delta \overline{\text{ESG}}_i \times \text{Post}_t \times \text{High Inst}_i$. 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.

The coefficient on the triple interaction term is negative and significant, indicating that the effect of the change in ratings due to the new methodology on abnormal returns is lower for firms with high institutional ownership. 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 weakening of the effect of the change in ESG ratings on abnormal returns for S&P 500 firms compared to all other firms.

Another way in which the impact of uninformed investors 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.[35] In Table 10, we include an indicator variable, MSCI$_i$, equal to one if stock's ESG rating is available on the MSCI website, zero otherwise. The triple interac-

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

tion term, $\Delta\overline{\mathrm{ESG}}_i \times \mathrm{Post}_t \times \mathrm{MSCI}_i$, measures the marginal effect of having an ESG rating provided by MSCI during the disclosure of the new ESG rating methodology by Morningstar and Yahoo! Finance. As seen in the table, the coefficient on the triple interaction term is negative and significant for all specifications. The availability of alternate ESG ratings reduces the effect of the change in ESG ratings due to adoption of the new methodology.[36] Therefore, we conclude that the availability of information substitutes can act as a disciplining mechanism for potential investor misinterpretation. Our conclusion is similar to Cornaggia et al. (2018) who show that municipal bonds who do not have a credit rating from S&P respond more to an upgrade after the change in Moody's methodology than bonds that do.

5   Conclusion

We provide evidence that investor rely on ESG ratings when making investment decisions by using a quasi-natural experiment of the dissemination of the new Sustainalytics ESG Risk rating in October 2019 by Morningstar and Yahoo! Finance. We find that investors trade in the direction of the ESG ratings change. They purchase firms whose ESG ratings increase and sell firms whose ESG ratings decline and their trading behavior impacts prices.

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.

While the new methodology may correctly change investors' perception of a firm's ESG risk, the inversion of the scale makes inference about its meaning more difficult. Indeed, in some cases, investors appear to blindly implement a trading strategy based on

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[36]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 9.)

the change in ratings without additional due diligence. We show that potentially incorrect assessments of the meaning of the change in ESG ratings shape investors' portfolio allocation decisions and result in temporary price pressure on the affected stocks, even in situations where it is unlikely that new fundamental ESG information is conveyed by the ratings change.

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, equity mutual funds, and short-sellers. Using novel data on investor participation from Robinhood, we find that a shift in individual investors' trading behavior is consistent with the direction of the change in stock prices. Retail investors increase their participation in stocks that they perceive as more sustainable, those with positive changes in their ESG rating, and reduce their participation in firms that appear to undergo a downgrade in their rating, those with negative changes in their ESG rating.

13F institutions and mutual funds, on the other hand, do not rebalance their portfolios in response to the implementation of the new ESG rating methodology. The lack of 13F institutions' response is consistent with our hypothesis that 13F investors are more aware and understand the changes in the rating methodology and/or are using more sophisticated ESG information. Since less informed investor misinterpretation of the ratings, in some cases, creates a profit opportunity, we find that short sellers take the other side of these investors' trades. They increase their short positions for "upgraded" stocks and decrease their short positions for stocks with negative changes in their ESG ratings.

Our work provides a piece of the puzzle identified by Hartzmark and Sussman (2019) who find that after the introduction of Morningstar's sustainability globes in March 2016, highly ESG rated mutual funds attract investors but these fund flows do not affect subsequent performance despite that fact that "experimental evidence suggests that investors have a strong belief that better globe ratings positively predict future returns." Unlike the mutual fund setting, we document a strong relationship between investors reaction to

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the ratings methodology change and future abnormal returns for individual firms. More-over, we confirm the findings of Gantchev et al. (2020) that mutual fund investors do not appear to react to a change in the ESG rating after the initial introduction of the globe rating.

Finally, we document at least one real effect of the ESG rating change. Firms react to the mispricing in the valuation of their stock by repurchasing shares if they are down-graded and issuing shares if they are upgraded. Thus, our findings suggest that ESG ratings are salient to both investors and firms.

As investor interest in sustainability increases, their reliance on ESG ratings will also increase. Our results suggest that some investors use ESG ratings to make an investment decisions without adequate due diligence. Regulators have become keenly interested in an oversight authority of ESG ratings as the demand for information on the sustainability of firms and investment companies increases. In particular, European Securities and Markets Authority (ESMA) states "that increasing demand for assessments that provide insights on an entity's ESG profile should go hand in hand with safeguards that ensure the information referred to is robust and that the assessments are reliable."[37]

While our analysis is agnostic on the merits of the change in Sustainalytics' method-ology, 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. mar-ket capitalization).[38] 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 important to investors' decision-making and can be a determinant of firms' stock prices.

It is important to note that one of the regulatory solutions proposed is to increase the

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

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

transparency underpinning ratings.[39] While opaqueness in methodology is not a desired outcome, increasing transparency through disclosure may not be as useful as regulators envision. In the event we study, both Sustainalytics and Morningstar provided extensive written and video information to the public about the new methodology both at the time of its initial adoption in 2018 and prior to its dissemination in 2019.[40] Yet retail investors appear to have ignored this information as well. This highlights the challenge regulators face ensuring that investors do not mechanistically rely on ESG ratings.

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[39]https://www.iosco.org/library/pubdocs/pdf/IOSCOPD690.pdf
[40]See   https://connect.sustainalytics.com/hubfs/INV%20-%20Reports%20and%20Brochure/
Thought%20Leadership/\SustainalyticsESGRiskRatings_WhitePaperVolumeOne_October%202018.
pdf,
https://www.youtube.com/watch?v=Xg4v0ylvDk8 and (https://www.morningstar.com/insights/
2019/07/01/esg-risk).

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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 adoption of the new methodology – e.g., before the adoption it was an 'Average Performer' and after the adoption it belongs to the 'Low' ESG risk group.
CLASSIFICATION DOWNGRADE$_i$	An indicator variable equal to one if the firm has a decrease in its Morningstar Classification after the adoption of the new methodology – e.g, before the adoption it was an 'Outperformer' and after the adoption it belongs to the 'Medium' ESG risk group.
$\Delta 13F_i$	The quarterly change in holdings by 13F institutions, measured as the difference in number of shares held by 13F institutions between the end of December 2019 and September 2019 divided by the number of shares outstanding.
ΔESG_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.
$\Delta \overline{ESG}_i$	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 difference in number of shares held by ESG Funds between the end of December and September 2019 divided by the number of shares outstanding. Using textual analysis on keywords, we classify any U.S. mutual funds actively investing in U.S. equities in the Morningstar database as an ESG Fund if it has the following strings in its name: esg, sust, impact, rspnb, env, scl, eco (but not "econ"), social, and/or green.
ΔESG RANK$_i$	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.

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 denotes a company that scores well below average relative to its peer group and Leader indicates a company that scores well above average relative to its peer group. After the adoption, Morningstar still consists of five groups. However, the naming of the groups changed to Negligible, Low, Medium, High, and Severe, where Negligible denotes a company with a very low ESG risk rating (between 0 and 10) and Severe indicates a firm with a very high ESG risk rating (above 40). Whereas previously the classification breakpoints were established annually, after the methodology change the breakpoints became fixed.
ΔMSCI$_i$	The difference in MSCI rating from the three months after the adoption by Morningstar of the new methodology to the three months before. Firms that are not available through the MSCI-website are assigned a value of zero.
ΔRETAIL$_i$	The change in retail participation in stock i measured as the difference in the average number of Robinhood investors holding a stock between December 2019 and September 2019 divided by the average dollar trading volume between April 2019 and June 2019.
ΔSHARES OUTSTANDING$_i$	The percentage change in shares outstanding from December 2019 (three months after the adoption) to September 2019 (the last month before the methodology change.
ΔSHORT SELLERS$_i$	The change in short interest in stock i measured as the difference in the average number of shares sold short in the three months (October-December 2019) after the adoption of the new methodology by Morningstar and Yahoo! Finance and the average number of shares sold short in the three months (July-September 2019) before the adoption divided by the number of shares outstanding.
ΔSUSTAINALYTICS RATING$_i$	The difference 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 $\Delta\overline{\mathrm{ESG}}_i$ is in the lower quartile, and zero otherwise.
ESG PSEUDO-UPGRADE$_i$	An indicator variable equal to one if $\Delta\overline{\mathrm{ESG}}_i$ is positive, zero otherwise.
FOUR FACTOR ABNRET$_{i,t}$	Carhart's (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.
INSTITUTIONAL NET-FLOWS$_{f,t}$	Mutual fund f's net flows over month t. We consider share class to be institutional if its name carries on 'Inst' as a suffix.
MSCI AVAILABLE$_i$	An indicator variable equal to one if the stock's ESG ratings are also available through the MSCI ESG rating platform.
NET-FLOWS$_{f,t}$	Mutual fund net flows estimated using all fund f's share classes and defined as $\text{TNA}_{f,t} - \text{TNA}_{f,t-1} \cdot (1 + \text{RET}_{f,t})$ divided by $\text{TNA}_{f,t-1}$ where $\text{TNA}_{f,t}$ is the total net assets of the fund determined at the end of the month t and $\text{RET}_{f,t}$ refers to the net returns of the fund over the month t.
POST$_t$	An indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise.
#RETAIL$_{i,t}$	Retail participation in stock i in month t. This gives a number of retail investors holding a given stock through the Robinhood trading platform.
RETAIL NET-FLOWS$_{f,t}$	Mutual fund f's net-flows from retail share classes over month t. A fund share class is considered retail if its name carries one of the following suffixies: A, B, C, D, S, and T.
SINGLE FACTOR ABNRET$_{i,t}$	A single factor abnormal return for stock i in month t. We estimate the loadings using 12 months of daily return data from July 2018 to June 2019. We compute abnormal returns in a given month by subtracting the firm's expected return from its actual return.
THREE FACTOR ABNRET$_{i,t}$	Fama and French's (1993) three-factor abnormal return for stock i in month t. We estimate the loadings using 12 months of daily return data from July 2018 to June 2019. We compute abnormal returns in a given month by subtracting the firm's expected return from its actual return.

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Figure 1: Timeline of ESG rating dissemination and changes in methodology

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

October 2019
Yahoo! Finance and
Morningstar adopt Sustain-
alytics ESG Risk Ratings

February 2018
Yahoo! Finance makes
Sustainalytics ESG
Rating available for free

March 2016
Morningstar Sustain-
ability Rating launched
(by Sustainalytics)

September 2018
Sustainalytics introduces
new ESG Risk Rating

2016   2017   2018   2019   2020
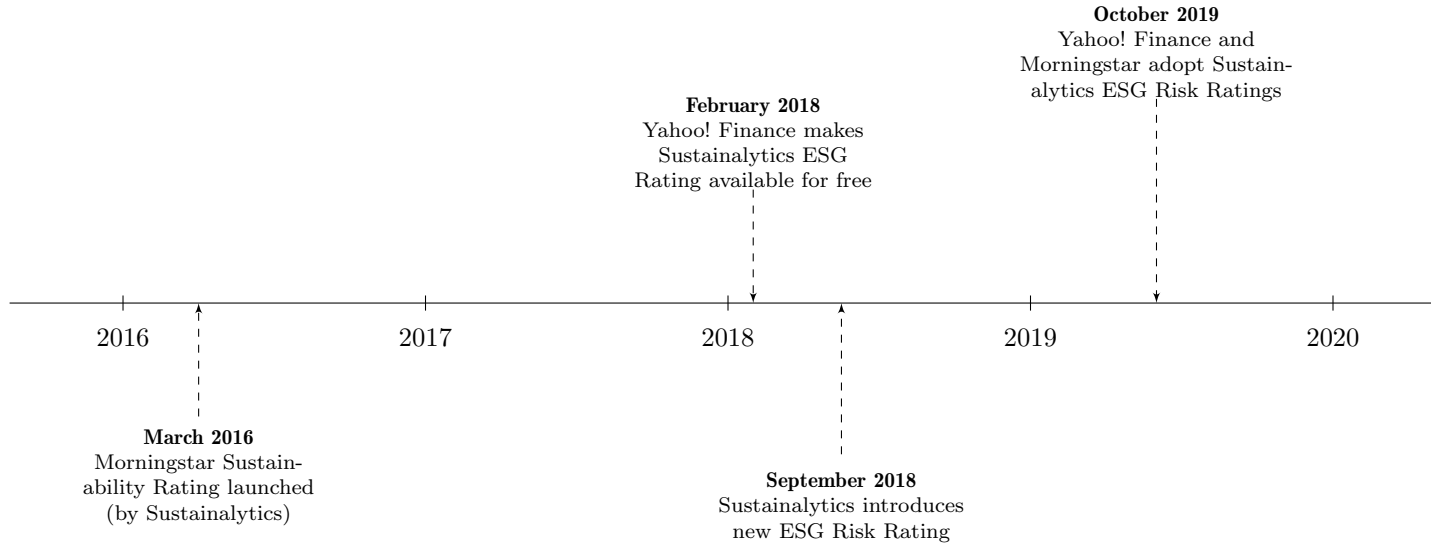
Figure 2: Comparison of Old ESG rating with New ESG Risk rating for individual stocks

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

Panel A

Panel B

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Figure 3: Change in stock ESG ratings for individual stocks

This figure shows the distribution of the change in the stock ESG rating, $\Delta\overline{\mathrm{ESG}}_i$, defined as the difference between the average new ESG Risk rating in the three months (October-December 2019) after the dissemination of the new methodology by Morningstar and Yahoo! Finance and the average old ESG rating in the three months (July-September 2019) before the dissemination.
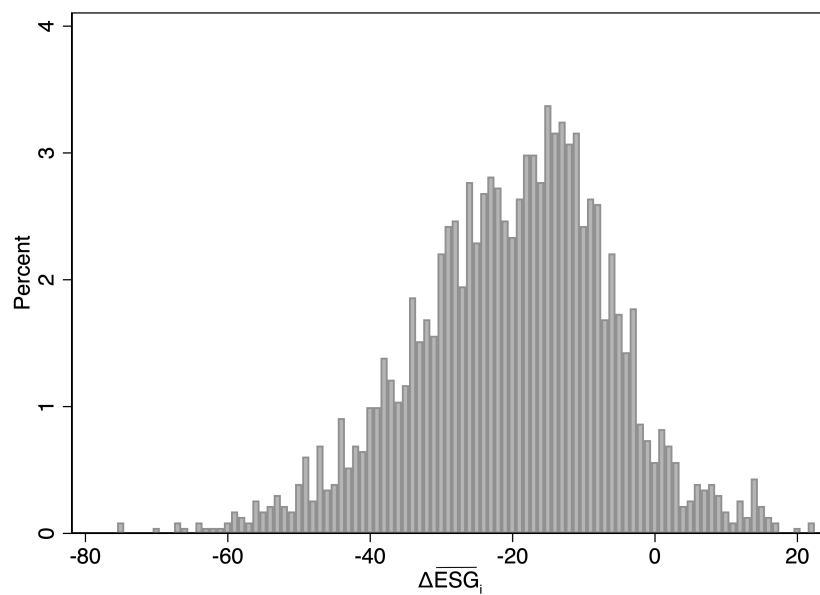
Figure 4: Change in ranking and Morningstar Classification for individual stocks

This figure shows the change in the relative ranking of the firms after the dissemination 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 dissemination and the last month (September) before the dissemination. Panel B shows the change in firms' Morningstar Classification after the dissemination of the new methodology. See Table 2 for the definitions of the classifications before and after dissemination.

Panel A

Panel B

47
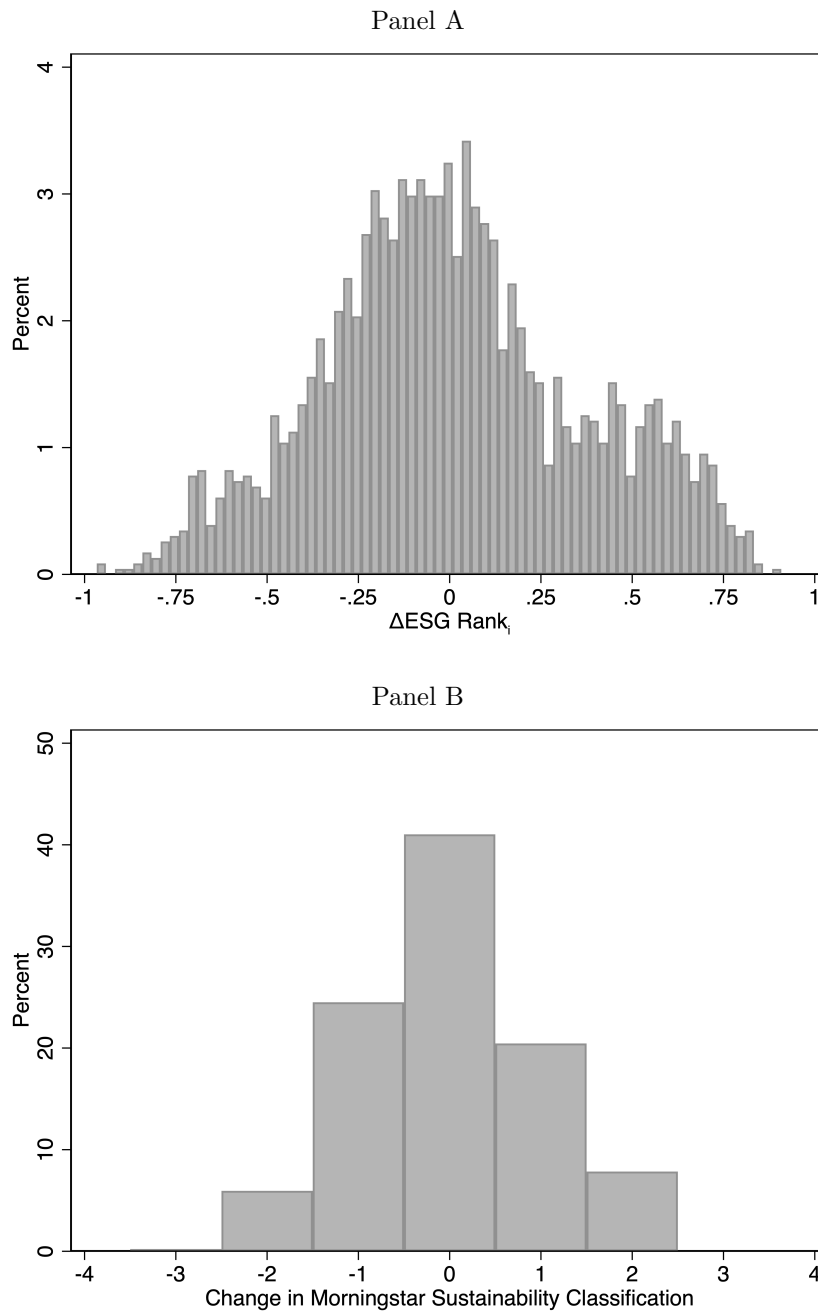
Figure 5: Change in Sustainalytic's ESG Risk ratings around the dissemination of new methodology

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 dissemination of the new methodology by Morningstar and Yahoo! Finance and the average ESG Risk rating in the three months (July-September 2019) before the dissemination. 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 dissemination of the new methodology by Morningstar and Yahoo! Finance and the average old ESG rating in the three months (July-September 2019) before the dissemination.

Panel A

Panel B

48
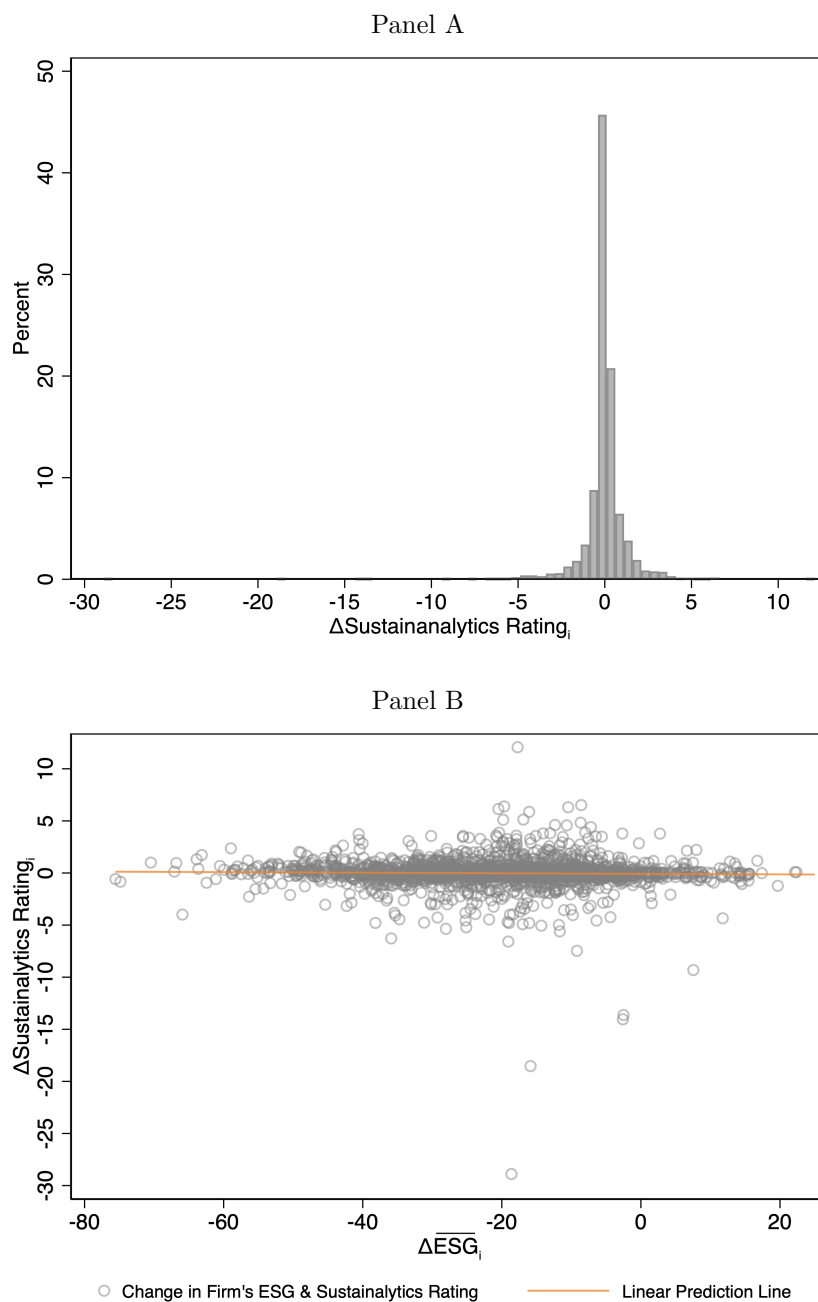
Figure 6: Change in mutual fund ESG ratings and globe category

Panel A shows the distribution of the change in the fund ESG rating, $\Delta\overline{\text{ESG}}_f$, defined as the difference between the average new ESG Risk rating in the three months (October-December 2019) after the dissemination of the new methodology by Morningstar and Yahoo! Finance and the average old ESG rating in the three months (July-September 2019) before the dissemination. Panel B depicts the distribution of the change in fund's sustainability globe rating after the dissemination of the new methodology.

Panel A

Panel B

49
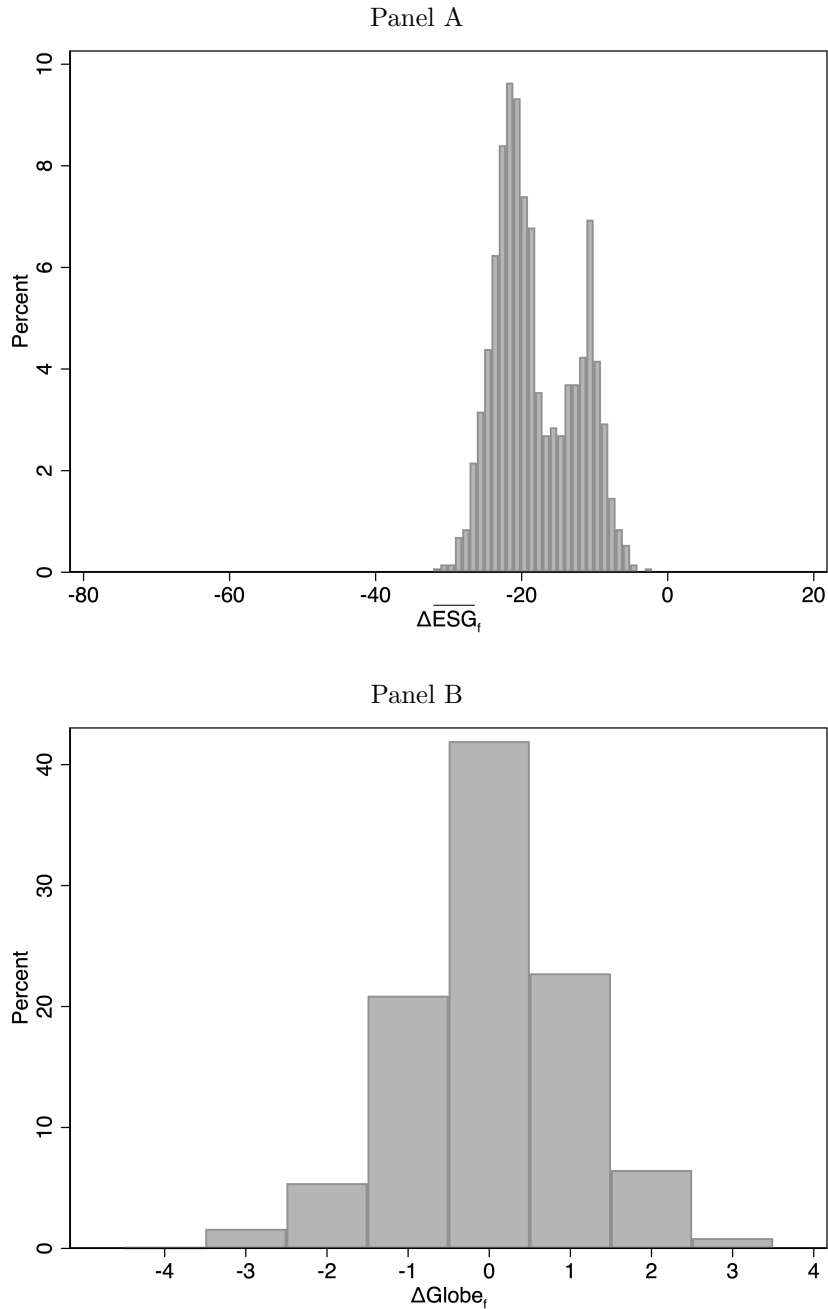
Figure 7: Abnormal return response to the change in ESG rating methodology

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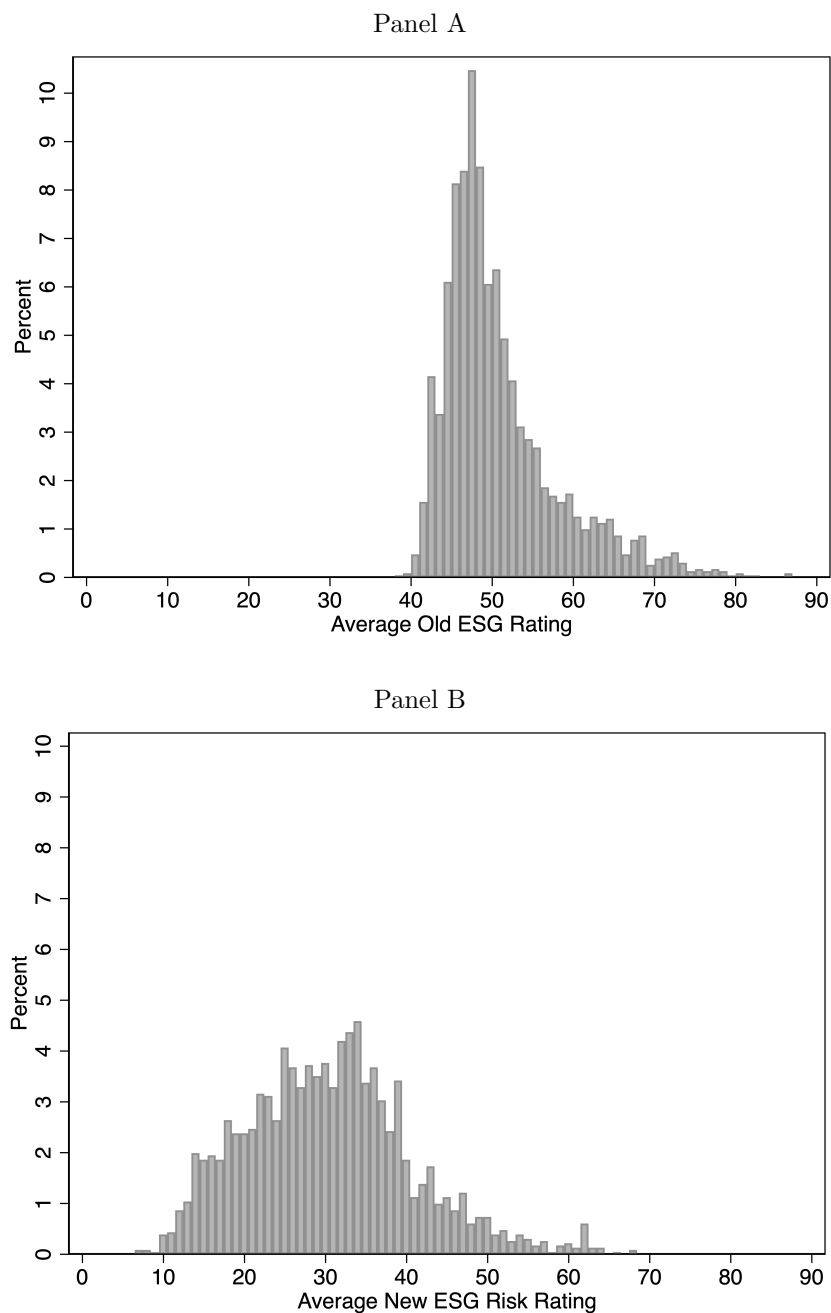rage old ESG rating in the three months (July-September 2019) before the dissemination. The shaded areas represent 95% confidence intervals. The horizontal dashed orange line represents a zero change in firms' abnormal returns. The vertical dashed orange line represents the mean change in the ESG ratings.

50
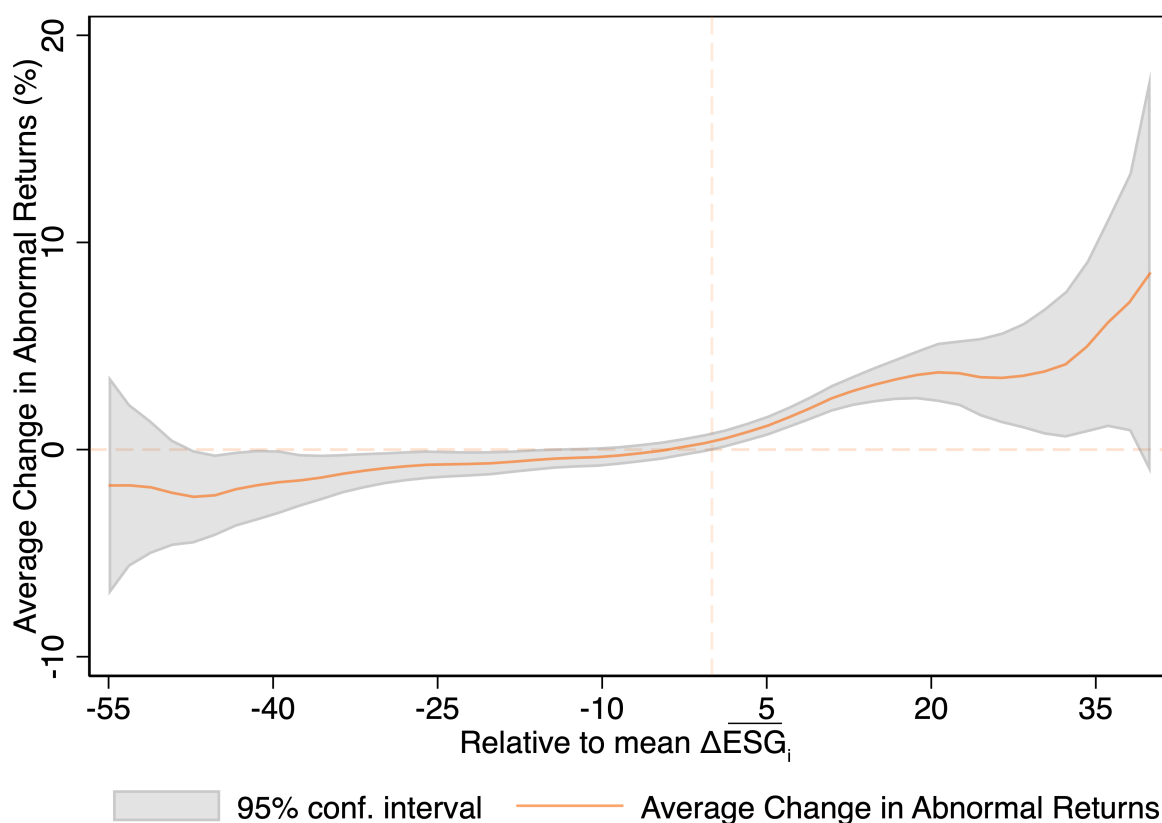
Figure 8: Change in ESG rating methodology and abnormal returns using dynamic difference-in-difference analysis

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:

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

$\mathrm{ARET}_{i,t}$ is a four-factor abnormal return estimated using market beta from 12-month rolling-window regression. ESG PSEUDO DOWNGRADE$_i$ is an indicator variable equal to one if $\Delta\overline{\mathrm{ESG}}_i$ 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 dashed line is the 95% confidence interval with standard errors clustered at the stock level.
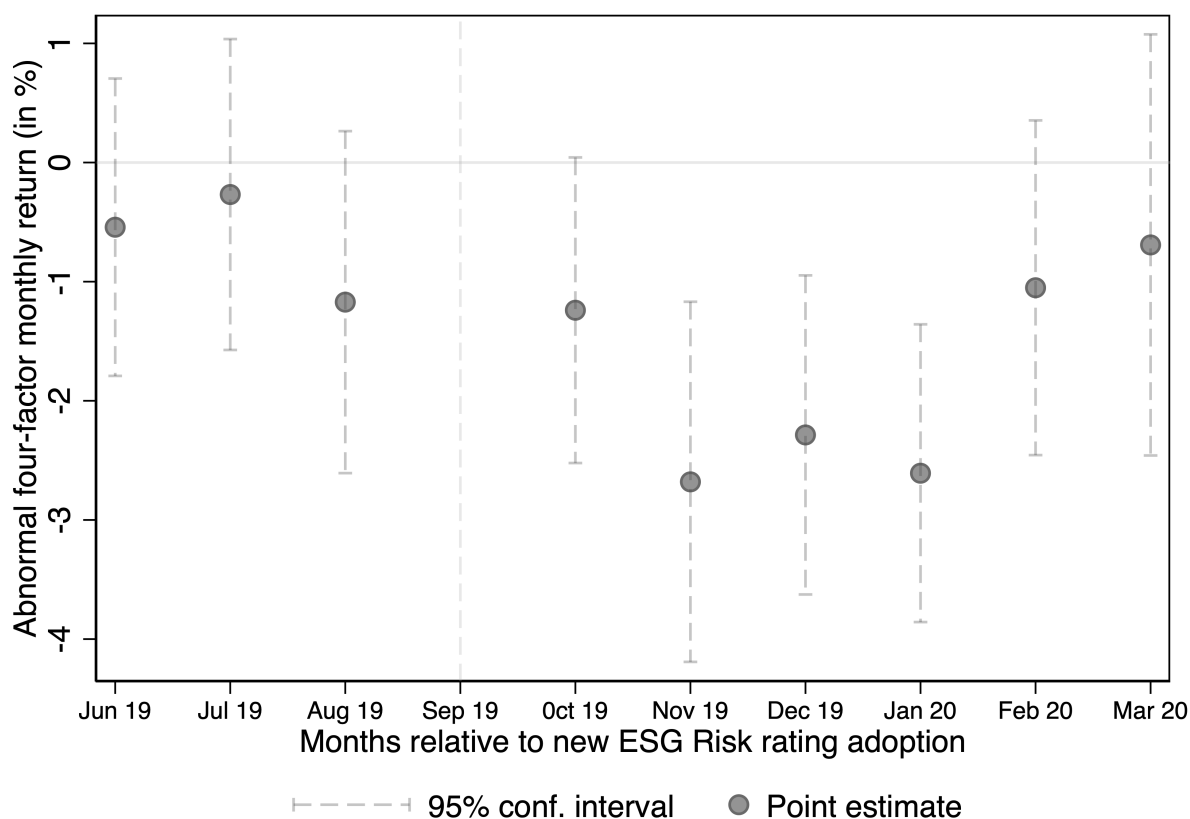
Table 1: Summary statistics

This table reports summary statistics for the main variables used in this paper. We report the variables in levels (Panel A) and in changes (Panel B). In Panel C, we report pairwise correlations between the main variables. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology). For the period before the adoption, ESG denotes the old ESG rating; for the period after the adoption, ESG denotes the new ESG Risk rating. Both ratings have values between 0 and 100. Single Factor AbnRet, Three Factor AbnRet, Four Factor AbnRet are stock i's abnormal return in month t using single-factor, three-factor, and Carhart four-factor models, respectively. # Retail is the number of retail investors holding a given stock through the Robinhood trading platform. % 13F Own is the percentage of shares outstanding held by 13F institutions. Mutual Funds (%) is the percentage of shares outstanding held by U.S. equity ESG funds domiciled in the U.S. , expressed in percentages. Net Flows denote mutual fund estimated using all fund's share classes. Retail Net Flows denote mutual fund Net Flows from retail share classes. A fund share class is considered retail if its name carries one of the following suffixes: A, B, C, D, S, and T. Institutional Net Flows represent Net Flows from institutional share classes. We consider share class to be institutional if its name carries on 'Inst' as a suffix. All Net Flows measures are expressed in percentages. Shares Outstanding is the number of share outstanding expressed in millions. 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. $\Delta\text{ESG Rank}_i$ is the difference in the firm's relative ranking in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption. $\Delta\text{Morningstar Classification}_i$ is the difference in Morningstar Sustainability Classification in the first month (October 2019) after the adoption and in the last month (September 2019) before the adoption. $\Delta\text{Sustainalytics Rating}_i$ is the difference in firm i's 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
Mutual Funds (%)	23.86	24.27	10.78	5.96	41.32	23.78	23.93	10.72	5.84	41.36
Net Flows (%)	-0.63	-0.69	4.39	-4.22	2.79	-1.17	-0.98	5.22	-5.66	3.09
Retail Net Flows (%)	-0.90	-0.91	5.44	-4.19	2.28	-1.26	-1.15	4.82	-4.65	2.24
Institutional Net Flows (%)	-0.28	-0.49	8.15	-6.20	5.67	-0.86	-0.75	8.47	-7.68	5.75
Shares Outstanding (in millions)	171.06	54.41	525.44	10.13	573.53	171.22	54.63	522.16	10.25	574.13

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Table 1: Summary statistics (continued)

Panel B: Changes	Post minus Pre				
	Mean	P50	SD	P5	P95
$\Delta\mathrm{ESG}_i$	-20.17	-19.13	14.20	-45.81	1.53
$\Delta\overline{\mathrm{ESG}}_i$	-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

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Panel C: Correlations	$\Delta\mathrm{ESG}_i$	$\Delta\overline{\mathrm{ESG}}_i$	ΔSustainalytics Rating$_i$	ΔESG Rank$_i$	ΔMorningstar Classification$_i$
$\Delta\mathrm{ESG}_i$	1.0000				
$\Delta\overline{\mathrm{ESG}}_i$	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 Classification	New Morningstar 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**

Panel C: Globes definitions	
5 globes	(highest 10%)
4 globes	(next 22.5%)
3 globes	(next 35%)
2 globes	(next 22.5%)
1 globe	(lowest 10%)

Panel D: Transition matrix – Mutual Funds					
	New Globe Classification				
Old Number of Globes	One	Two	Three	Four	Five
One	**54**	44	30	3	1
Two	36	**104**	112	37	7
Three	23	103	**233**	100	17
Four	9	23	83	**109**	39
Five	1	12	24	49	**44**

Table 3: ESG rating methodology change and abnormal returns

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

Panel A:	SINGLE FACTOR ABNRET				THREE FACTOR ABNRET				CARHART ABNRET			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta \text{ESG}_i \times \text{POST}_t$	0.0839***				0.0501***				0.0579***			
	(5.82)				(3.47)				(3.97)			
$\Delta \overline{\text{ESG}}_i \times \text{POST}_t$		0.0854***				0.0513***				0.0591***		
		(5.80)				(3.47)				(3.97)		
ESG PSEUDO DOWNGRADE$_i \times \text{POST}_t$			-1.6822***	-1.5290***			-0.7616*	-0.6243			-1.0396***	-0.9027**
			(-4.32)	(-3.91)			(-1.94)	(-1.59)			(-2.60)	(-2.25)
ESG PSEUDO UPGRADE$_i \times \text{POST}_t$				2.3967				2.1476				2.1421
				(1.59)				(1.43)				(1.43)
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	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308
R^2	0.191	0.191	0.190	0.190	0.178	0.178	0.178	0.178	0.176	0.176	0.175	0.176

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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)
$\Delta\text{ESG}_i \times \text{POST}_t$	0.0850*** (5.86)				0.0510*** (3.50)				0.0587*** (4.00)			
$\Delta\overline{\text{ESG}}_i \times \text{POST}_t$		0.0854*** (5.80)				0.0513*** (3.47)				0.0591*** (3.97)		
ESG PSEUDO DOWNGRADE$_i \times \text{POST}_t$			-1.6836*** (-4.32)	-1.5312*** (-3.91)			-0.7628* (-1.94)	-0.6262 (-1.59)			-1.0406*** (-2.61)	-0.9041** (-2.26)
ESG PSEUDO UPGRADE$_i \times \text{POST}_t$				2.3803 (1.58)				2.1340 (1.42)				2.1313 (1.42)
ΔSUSTAINALYTICS RATING$_i \times \text{POST}_t$	0.1387 (0.99)	0.0772 (0.55)	0.0799 (0.55)	0.0669 (0.47)	0.1032 (0.76)	0.0664 (0.49)	0.0676 (0.49)	0.0560 (0.41)	0.0962 (0.71)	0.0537 (0.40)	0.0555 (0.40)	0.0438 (0.32)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industr×Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308
R^2	0.191	0.191	0.190	0.190	0.178	0.178	0.178	0.178	0.176	0.176	0.175	0.176

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

Panel C:	Single Factor AbnRet				Three Factor AbnRet				Carhart AbnRet			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta\text{ESG}_i \times \text{Post}_t$	0.0769*** (4.61)				0.0590*** (3.52)				0.0689*** (4.08)			
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.0785*** (4.60)				0.0603*** (3.52)				0.0703*** (4.07)		
ESG Pseudo Downgrade$_i \times \text{Post}_t$			-1.2436*** (-2.84)	-1.1347*** (-2.59)			-0.8054* (-1.82)	-0.7011 (-1.59)			-1.1436** (-2.55)	-1.0387** (-2.32)
ESG Pseudo Upgrade$_i \times \text{Post}_t$				2.2690 (1.51)				2.1721 (1.44)				2.1851 (1.46)
$\Delta\text{MSCI}_i \times \text{Post}_t$	0.2677 (0.37)	0.2233 (0.31)	0.1847 (0.27)	0.2132 (0.30)	0.3219 (0.47)	0.2882 (0.42)	0.2337 (0.35)	0.2610 (0.38)	0.6948 (1.03)	0.6552 (0.96)	0.6254 (0.94)	0.6528 (0.97)
MSCI Available$_i \times \text{Post}_t$	-0.5242 (-1.30)	-0.5167 (-1.27)	-1.1440*** (-2.99)	-1.0531*** (-2.74)	0.6313 (1.56)	0.6392 (1.57)	0.0959 (0.25)	0.1830 (0.48)	0.7654* (1.89)	0.7728* (1.91)	0.2226 (0.58)	0.3102 (0.81)
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	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308
R^2	0.191	0.191	0.190	0.190	0.178	0.178	0.178	0.178	0.176	0.176	0.175	0.176

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Table 4: Change in abnormal returns for firms that have a decline in their ESG ratings and either no change or improvement in ranking (Panel A) or Morningstar classification (Panel B)

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The sample in Panel A is restricted to only those firms that have a decline in their ESG ratings and either no change or improvement in ranking. The sample in Panel B is restricted to only those firms that have a decline in their ESG ratings and either no change or improvement in Morningstar classification. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology). 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 $\Delta\overline{\text{ESG}}_i$ 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. ΔSustainalytics Rating$_i$ is the difference 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. Standard errors are clustered at the firm level and t-statistics are reported in parentheses below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Panel A: Ranking	Single Factor AbnRet			Three Factor AbnRet			Carhart AbnRet		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta\text{ESG}_i \times \text{Post}_t$	0.1572***			0.1226***			0.1252***		
	(5.21)			(4.05)			(4.01)		
$\Delta\overline{\text{ESG}}_i \times \text{Post}_t$		0.1613***			0.1264***			0.1295***	
		(5.28)			(4.12)			(4.10)	
ESG Pseudo Downgrade$_i \times \text{Post}_t$			-2.1697***			-1.5519**			-1.7889**
			(-3.01)			(-2.16)			(-2.42)
ΔSustainalytics Rating$_i \times \text{Post}_t$	0.1964	0.0926	0.1131	0.1261	0.0450	0.0634	0.1229	0.0399	0.0555
	(0.82)	(0.39)	(0.48)	(0.52)	(0.19)	(0.26)	(0.51)	(0.17)	(0.23)
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	6768	6768	6768	6768	6768	6768	6768	6768	6768
R^2	0.201	0.201	0.199	0.191	0.191	0.189	0.188	0.188	0.187

Table 4: Change in abnormal returns for firms that have a decline in their ESG ratings and either no change or improvement in ranking (Panel A) or Morningstar classification (Panel B) (continued)

Panel B: Morningstar Classification	SINGLE FACTOR ABNRET			THREE FACTOR ABNRET			CARHART ABNRET		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta\text{ESG}_i \times \text{POST}_t$	0.0918***			0.0536***			0.0634***		
	(4.94)			(2.87)			(3.36)		
$\Delta\overline{\text{ESG}}_i \times \text{POST}_t$		0.0937***			0.0552***			0.0653***	
		(4.98)			(2.91)			(3.41)	
ESG PSEUDO DOWNGRADE$_i \times \text{POST}_t$			-1.5596***			-0.7005			-1.0230**
			(-3.29)			(-1.47)			(-2.10)
$\Delta\text{SUSTAINALYTICS RATING}_i \times \text{POST}_t$	0.1534	0.0889	0.0891	0.1142	0.0764	0.0780	0.1154	0.0708	0.0714
	(0.88)	(0.51)	(0.51)	(0.66)	(0.44)	(0.45)	(0.67)	(0.41)	(0.42)
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	9345	9345	9345	9345	9345	9345	9345	9345	9345
R^2	0.194	0.194	0.192	0.185	0.185	0.184	0.183	0.183	0.182

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 are as follows: in columns (1)-(4), the change in retail participation measured as the change in the average number of Robinhood investors holding a stock divided by the average dollar trading volume between April and June 2019; in columns (5)-(8), the quarterly change in holdings by 13F institutions; in columns (9)-(12), the change in the holdings of U.S.-domiciled mutual funds investing in U.S.-equities; and in columns (13)-(16), the change in short interest. 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 $\Delta\overline{\text{ESG}}_i$ 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 1%, 5%, and 10%, respectively.

	Retail				13F				Mutual Funds				Short Sellers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
ΔESG_i	0.0029***				-0.0037				0.0008				0.0119***			
	(5.32)				(-0.16)				(0.30)				(4.38)			
$\Delta\overline{\text{ESG}}_i$		0.0029***				-0.0029				0.0010				0.0123***		
		(5.33)				(-0.12)				(0.39)				(4.43)		
ESG Pseudo Downgrade$_i$			-0.0550***	-0.0489***			-0.0158	-0.0932			-0.0408	-0.0418			-0.2132**	-0.1707*
			(-3.90)	(-3.40)			(-0.02)	(-0.11)			(-0.41)	(-0.42)			(-2.14)	(-1.70)
ESG Pseudo Upgrade$_i$				0.0785***				-0.9966				-0.0132				0.5469***
				(3.11)				(-0.54)				(-0.08)				(2.87)
Observations	2310	2310	2310	2310	2310	2310	2310	2310	2310	2310	2310	2310	2310	2310	2310	2310
R^2	0.015	0.015	0.005	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.007	0.002	0.006

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

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 in Panel A is restricted to only those firms that have a decline in their ESG ratings and either no change or improvement in ranking. The sample in Panel B is restricted to only those firms that have a decline in their ESG ratings and either no change or improvement in Morningstar classification. 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 are as follows: in columns (1)-(4), the change in retail participation measured as the change in the average number of Robinhood investors holding a stock divided by the average dollar trading volume between April and June 2019; in columns (5)-(8), the quarterly change in holdings by 13F institutions; in columns (9)-(12), the change in the holdings of U.S.-domiciled mutual funds investing in U.S. equities; and in columns (13)-(16), the change in short interest. 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 $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. Standard errors are clustered at the firm level and t-statistics are reported in parentheses below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Panel B:	RETAIL			13F			MUTUAL FUNDS			SHORT SELLERS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ΔESG_i	0.0054***			0.0831*			0.0011			0.0175***		
	(3.55)			(1.84)			(0.20)			(3.02)		
$\Delta\overline{\text{ESG}}_i$		0.0055***			0.0830*			0.0011			0.0178***	
		(3.54)			(1.81)			(0.19)			(3.01)	
ESG PSEUDO DOWNGRADE$_i$			-0.0776***			-1.9046			-0.0418			-0.3122*
			(-2.87)			(-1.36)			(-0.25)			(-1.74)
ΔSUSTAINALYTICS RATING$_i$	-0.0079	-0.0115	-0.0118	-0.0698	-0.1243	-0.1364	0.1667**	0.1659**	0.1656**	0.0920	0.0805	0.0789
	(-1.11)	(-1.52)	(-1.53)	(-0.18)	(-0.33)	(-0.36)	(2.55)	(2.52)	(2.52)	(1.57)	(1.37)	(1.33)
Observations	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190
R^2	0.020	0.020	0.006	0.002	0.002	0.002	0.005	0.005	0.005	0.008	0.008	0.004

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

Panel A:	Retail			13F			Mutual Fund			Short Sellers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ΔESG_i	0.0029*** (3.68)			-0.0111 (-0.38)			0.0029 (0.81)			0.0101*** (2.81)		
$\Delta\overline{\text{ESG}}_i$		0.0029*** (3.68)			-0.0130 (-0.44)			0.0029 (0.79)			0.0104*** (2.82)	
ESG Pseudo Downgrade$_i$			-0.0494*** (-3.01)			0.3419 (0.37)			-0.0181 (-0.16)			-0.1571 (-1.35)
ΔSustainalytics Rating$_i$	-0.0033 (-0.73)	-0.0054 (-1.12)	-0.0052 (-1.08)	0.1647 (0.58)	0.1730 (0.60)	0.1737 (0.61)	0.0970** (2.34)	0.0950** (2.29)	0.0955** (2.31)	0.0775** (2.13)	0.0703* (1.93)	0.0712* (1.94)
Observations	1625	1625	1625	1625	1625	1625	1625	1625	1625	1625	1625	1625
R^2	0.012	0.012	0.005	0.000	0.000	0.000	0.003	0.003	0.003	0.005	0.005	0.003

Table 7: ESG rating methodology change and mutual fund flows

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on mutual fund net flows. The dependent variables are as follows: in columns (1)-(4), mutual fund net flows estimated using all fund's share classes; in columns (5)-(8), retail investor flows; and in columns (9)-(12), net flows from institutional share classes. Our sample includes U.S.-domicile mutual funds investing in U.S.-equities 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_f is defined as the difference in fund f'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. $\Delta \overline{\text{ESG}}_f$ 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. ESG LARGE PSEUDO DOWNGRADE$_f$ is an indicator variable equal to one if $\Delta \overline{\text{ESG}}_f$ is in the lower quartile, and zero otherwise. ESG SMALL PSEUDO DOWNGRADE$_f$ is an indicator variable equal to one if $\Delta \overline{\text{ESG}}_f$ is in the upper quartile, and zero otherwise. POST$_t$ is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise. ΔGLOBE_f is the difference in fund f's average sustainability globe 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. ΔSTARS_f denotes the difference in Morningstar Star rating from the three months after the adoption by Morningstar of the new methodology to the three months before. We include fund and style×year-month fixed effects. Standard errors are clustered at the fund level and t-statistics are reported in parentheses below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Panel A:	All Flows				Retail Flows				Institutional Flows			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta \text{ESG}_f \times \text{POST}_t$	0.05				-0.04				0.05			
	(1.17)				(-0.73)				(0.64)			
$\Delta \overline{\text{ESG}}_f \times \text{POST}_t$		0.05				-0.03				0.06		
		(1.20)				(-0.60)				(0.85)		
ESG LARGE PSEUDO DOWNGRADE × POST$_t$			-0.29	-0.29			0.26	0.26			-0.27	-0.26
			(-0.88)	(-0.87)			(0.64)	(0.64)			(-0.38)	(-0.37)
ESG SMALL PSEUDO DOWNGRADE × POST$_t$				0.19				0.32				0.68
				(0.43)				(0.56)				(0.91)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Style FE×Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.42	0.42	0.42	0.42	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Observations	5386	5386	5386	5386	3667	3667	3667	3667	5052	5052	5052	5052

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Table 7: ESG rating methodology change and mutual fund flows (continued)

Panel B:	All Flows				Retail Flows				Institutional Flows			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta\text{ESG}_f \times \text{POST}_t$	0.05				-0.04				0.05			
	(1.18)				(-0.73)				(0.65)			
$\Delta\overline{\text{ESG}}_f \times \text{POST}_t$		0.06				-0.03				0.07		
		(1.20)				(-0.60)				(0.86)		
ESG LARGE PSEUDO DOWNGRADE $\times$ POST$_t$			-0.28	-0.28			0.26	0.26			-0.25	-0.24
			(-0.85)	(-0.84)			(0.63)	(0.64)			(-0.36)	(-0.34)
ESG SMALL PSEUDO DOWNGRADE $\times$ POST$_t$				0.22				0.33				0.73
				(0.50)				(0.58)				(0.99)
$\Delta\text{GLOBE}_f \times \text{POST}_t$	-0.08	-0.08	-0.08	-0.08	-0.01	-0.02	-0.02	-0.02	-0.14	-0.14	-0.13	-0.14
	(-0.76)	(-0.76)	(-0.71)	(-0.75)	(-0.10)	(-0.11)	(-0.13)	(-0.18)	(-0.62)	(-0.62)	(-0.60)	(-0.66)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Style FE×Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.42	0.42	0.42	0.42	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Observations	5386	5386	5386	5386	3667	3667	3667	3667	5052	5052	5052	5052

Table 7: ESG rating methodology change and mutual fund flows (continued)

Panel C:	All Flows				Retail Flows				Institutional Flows			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta\text{ESG}_f \times \text{Post}_t$	0.05 (1.17)				-0.04 (-0.72)				0.05 (0.64)			
$\Delta\overline{\text{ESG}}_f \times \text{Post}_t$		0.05 (1.19)				-0.03 (-0.59)				0.06 (0.86)		
ESG Large Pseudo Downgrade $\times \text{Post}_t$			-0.27 (-0.82)	-0.27 (-0.82)			0.26 (0.65)	0.26 (0.65)			-0.24 (-0.34)	-0.23 (-0.32)
ESG Small Pseudo Downgrade $\times \text{Post}_t$				0.22 (0.50)				0.33 (0.58)				0.73 (0.99)
$\Delta\text{Globe}_f \times \text{Post}_t$	-0.08 (-0.75)	-0.08 (-0.74)	-0.08 (-0.70)	-0.08 (-0.74)	-0.01 (-0.05)	-0.01 (-0.05)	-0.01 (-0.07)	-0.02 (-0.12)	-0.13 (-0.61)	-0.13 (-0.61)	-0.13 (-0.59)	-0.14 (-0.65)
$\Delta\text{Stars}_f \times \text{Post}_t$	0.32 (0.87)	0.32 (0.86)	0.32 (0.85)	0.32 (0.85)	0.36 (0.46)	0.36 (0.46)	0.37 (0.47)	0.37 (0.47)	0.43 (0.53)	0.43 (0.52)	0.43 (0.52)	0.43 (0.52)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Style FE×Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.42	0.42	0.42	0.42	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Observations	5386	5386	5386	5386	3667	3667	3667	3667	5052	5052	5052	5052

Table 8: ESG rating methodology change and number of shares outstanding

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on the number of shares outstanding. The dependent variable is the percentage change in shares outstanding from December 2019 (three months after the adoption) to September 2019 (the last month before the methodology change) from Compustat. 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 stock 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. $\Delta\overline{\text{ESG}}_i$ 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 $\Delta\overline{\text{ESG}}_i$ is in the lower quartile, and zero otherwise. ESG PSEUDO UPGRADE$_i$ is an indicator variable equal to one if $\Delta\overline{\text{ESG}}_f$ is positive, and zero otherwise. POST$_t$ is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise. Standard errors are adjusted for heteroscedasticity and t-statistics are reported in parentheses below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	ΔSHARES OUTSTANDING$_i$			
	(1)	(2)	(3)	(4)
ΔESG_i	0.0642***			
	(6.87)			
$\Delta\overline{\text{ESG}}_i$		0.0648***		
		(6.88)		
ESG PSEUDO DOWNGRADE$_i$			-1.4068***	-1.2878***
			(-7.49)	(-6.88)
ESG PSEUDO UPGRADE$_i$				1.5319**
				(2.00)
Observations	2310	2310	2310	2310
R^2	0.027	0.027	0.012	0.016

Table 9: 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, and zero otherwise. The dependent variables are as follows: in columns (1)-(2), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (3)-(4), three-factor abnormal returns, and in columns (5)-(6), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar and Yahoo! Finance of the new methodology). 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 was introduced in October 2019, zero otherwise. ΔSUSTAINALYTICS RATING$_i$ is the difference in firm i's Sustainanalytics average ESG Risk rating between the three months (October-December 2019) after the adoption and the three months (July-September 2019) before the adoption of the new methodology by Morningstar and Yahoo! Finance. We include firm and industry×year-month fixed effects. Standard errors are clustered at the firm level. t-statistics are reported in parentheses below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	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$_i$	-0.0591**	-0.0590**	-0.0579**	-0.0578**	-0.0746**	-0.0745**
	(-2.13)	(-2.12)	(-2.11)	(-2.10)	(-2.04)	(-2.03)
$\Delta\overline{\text{ESG}}_i \times$ POST$_t$	0.0948***	0.0948***	0.0622***	0.0622***	0.0874***	0.0874***
	(5.48)	(5.48)	(3.58)	(3.58)	(4.28)	(4.28)
ΔPOST$_t \times$ HIGH INST$_i$	-2.0331***	-2.0225***	-1.6447**	-1.6353**	-2.0271*	-2.0207*
	(-2.63)	(-2.61)	(-2.17)	(-2.15)	(-1.95)	(-1.94)
ΔSUSTAINALYTICS RATING$_i \times$ POST$_t$		0.0689		0.0612		0.0420
		(0.49)		(0.45)		(0.30)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13308	13308	13308	13308	13308	13308
R^2	0.191	0.191	0.178	0.178	0.170	0.170

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Table 10: ESG rating methodology change and the availability of MSCI sustainability ratings

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

	Single Factor AbnRet		Three Factor AbnRet		Carhart AbnRet	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \overline{ESG}_i \times POST_t \times MSCI_i$	-0.0877***	-0.0872***	-0.0932***	-0.0928***	-0.1011***	-0.1008***
	(-2.98)	(-2.96)	(-3.21)	(-3.20)	(-3.16)	(-3.15)
$\Delta \overline{ESG}_i \times POST_t$	0.1006***	0.1004***	0.0838***	0.0836***	0.1097***	0.1096***
	(4.69)	(4.69)	(3.88)	(3.88)	(4.25)	(4.24)
$POST_t \times MSCI_i$	-3.0158***	-3.0012***	-2.0150**	-2.0033**	-2.0708**	-2.0633**
	(-3.32)	(-3.30)	(-2.27)	(-2.26)	(-2.21)	(-2.20)
$\Delta SUSTAINALYTICS\ RATING_i \times POST_t$		0.0681		0.0548		0.0353
		(0.49)		(0.41)		(0.26)
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13308	13308	13308	13308	13308	13308
R^2	0.191	0.192	0.179	0.179	0.170	0.170

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

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology). 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 $\Delta \overline{\text{ESG}}_i$ 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 was introduced in October 2019, zero otherwise. We include stock and industry×year-month fixed effects. In the square brackets, we report t-statistics calculated with standard errors clustered at the year×month level from a wild bootstrap (Roodman et al., 2019). In the round brackets, we report t-statistics calculated with standard errors clustered at the stock level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	SINGLE FACTOR ABNRET				THREE FACTOR ABNRET				CARHART ABNRET			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta \text{ESG}_i \times \text{POST}_t$	0.0819*** (5.60) [2.97]				0.0482*** (3.29) [1.87]				0.0556*** (3.76) [2.26]			
$\Delta \overline{\text{ESG}}_i \times \text{POST}_t$		0.0832*** (5.58) [2.97]				0.0492*** (3.28) [1.86]				0.0566*** (3.76) [2.23]		
ESG PSEUDO DOWNGRADE$_i \times \text{POST}_t$			-1.7262*** (-4.35) [-3.36]	-1.5670*** (-3.94) [-2.8]			-0.8041** (-2.01) [-2.11]	-0.6617* (-1.65) [-1.63]			-1.0765*** (-2.64) [-3.43]	-0.9353** (-2.29) [-2.5]
ESG PSEUDO UPGRADE$_i \times \text{POST}_t$				2.3902 (1.58) [0.88]				2.1378 (1.41) [0.81]				2.1196 (1.40) [0.81]
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

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

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from 12-month rolling-window regression; in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology). 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 $\text{Pseudo-Downgrade}_i$ is an indicator variable equal to one if $\Delta \overline{\text{ESG}}_i$ 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 was introduced in October 2019, zero otherwise. We include stock and year-month fixed effects. Standard errors are clustered at the firm level and t-statistics are reported in parentheses below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	Single Factor AbnRet				Three Factor AbnRet				Carhart AbnRet			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta \text{ESG}_i \times \text{Post}_t$	0.1062***				0.0763***				0.0798***			
	(7.40)				(5.30)				(5.54)			
$\Delta \overline{\text{ESG}}_i \times \text{Post}_t$		0.1073***				0.0771***				0.0809***		
		(7.33)				(5.25)				(5.50)		
ESG Pseudo Downgrade$_i \times \text{Post}_t$			-2.0083***	-1.6815***			-1.1907***	-0.8846**			-1.4779***	-1.2074***
			(-5.46)	(-4.63)			(-3.22)	(-2.42)			(-3.94)	(-3.25)
ESG Pseudo Upgrade$_i \times \text{Post}_t$				4.4268***				4.1479***				3.6647***
				(3.19)				(2.99)				(2.65)
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	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308
R^2	0.147	0.147	0.144	0.146	0.138	0.138	0.137	0.138	0.137	0.137	0.136	0.137

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

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology), but excludes firms with NAICS 2211 and 2111. 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. $\Delta \overline{ESG}_i$ 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 $\Delta \overline{ESG}_i$ is in the lower quartile, and zero otherwise. ESG PSEUDO-UPGRADE$_i$ is an indicator variable equal to one if $\Delta \overline{ESG}_i$ is positive, zero otherwise. POST$_t$ is an indicator variable equal to one in the time period after the new ESG rating methodology was introduced in October 2019, zero otherwise. We include stock and year-month fixed effects. Standard errors are clustered at the firm level and t-statistics are reported in parentheses below the coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

	SINGLE FACTOR ABNRET				THREE FACTOR ABNRET				CARHART ABNRET			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\Delta ESG_i \times$ POST$_t$	0.0811*** (5.45)				0.0464*** (3.11)				0.0540*** (3.59)			
$\Delta \overline{ESG}_i \times$ POST$_t$		0.0826*** (5.44)				0.0475*** (3.12)				0.0553*** (3.60)		
ESG PSEUDO DOWNGRADE$_i \times$ POST$_t$			-1.6943*** (-4.21)	-1.5821*** (-3.92)			-0.7640* (-1.88)	-0.6663 (-1.64)			-1.0426** (-2.52)	-0.9459** (-2.29)
ESG PSEUDO UPGRADE$_i \times$ POST$_t$				1.8861 (1.11)				1.6429 (0.96)				1.6252 (0.96)
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	12774	12774	12774	12774	12774	12774	12774	12774	12774	12774	12774	12774
R^2	0.179	0.179	0.177	0.178	0.171	0.171	0.170	0.170	0.168	0.168	0.168	0.168

Table IA.4: ESG rating methodology change and abnormal returns – Dow Jones Sustainability Index reconstitution

This table reports difference-in-difference regressions of the adoption of the new ESG Risk rating methodology by Morningstar on abnormal returns. The dependent variables are as follows: in columns (1)-(4), a single-factor abnormal return estimated using market beta from daily return regression over 12 months preceding the control period (July 2018 – June 2019); in columns (5)-(8), three-factor abnormal returns; and in columns (9)-(12), Carhart four-factor abnormal returns. Our sample includes U.S. common stocks during two sub-periods: from July 2019 to September 2019 (three months before the adoption) and October 2019 to December 2019 (three months after the adoption by Morningstar of the new methodology). 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 $\Delta \overline{\text{ESG}}_i$ 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 was introduced in October 2019, zero otherwise. DOW JONES$_i$ is a dummy variable equal to one, if a stock was part of the Dow Jones Sustainability Index before and after reconstitution in the fall of 2019. 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 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)
$\Delta \text{ESG}_i \times \text{POST}_t$	0.0871***				0.0589***				0.0670***			
	(5.32)				(3.58)				(4.04)			
$\Delta \overline{\text{ESG}}_i \times \text{POST}_t$		0.0887***				0.0601***				0.0684***		
		(5.31)				(3.58)				(4.04)		
ESG PSEUDO DOWNGRADE$_i \times \text{POST}_t$			-1.5767***	-1.4300***			-0.8514**	-0.7193*			-1.1419***	-1.0101**
			(-3.71)	(-3.36)			(-1.99)	(-1.68)			(-2.62)	(-2.32)
ESG PSEUDO UPGRADE$_i \times \text{POST}_t$				2.3826				2.1447				2.1399
				(1.58)				(1.43)				(1.43)
DOW JONES$_i \times \text{POST}_t$	0.7643	0.7722	-0.2809	-0.2610	1.5789**	1.5892**	0.7195	0.7374	1.6516**	1.6614**	0.7969	0.8148
	(1.09)	(1.10)	(-0.44)	(-0.41)	(2.30)	(2.31)	(1.14)	(1.17)	(2.39)	(2.40)	(1.26)	(1.29)
ADD DOW JONES$_i \times \text{POST}_t$	-1.0434	-1.0626	-2.3005	-2.1704	-0.5168	-0.5247	-1.5001	-1.3830	-0.3499	-0.3608	-1.3611	-1.2443
	(-0.59)	(-0.61)	(-1.33)	(-1.27)	(-0.31)	(-0.31)	(-0.92)	(-0.86)	(-0.23)	(-0.24)	(-0.93)	(-0.86)
DELETE DOW JONES$_i \times \text{POST}_t$	-1.0580	-1.1065	-2.0743	-2.0309	0.0526	0.0242	-0.7628	-0.7237	-0.0978	-0.1318	-0.9221	-0.8831
	(-0.76)	(-0.79)	(-1.60)	(-1.57)	(0.04)	(0.02)	(-0.54)	(-0.51)	(-0.06)	(-0.08)	(-0.62)	(-0.60)
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	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308	13308
R^2	0.191	0.191	0.190	0.190	0.178	0.178	0.178	0.178	0.176	0.176	0.175	0.176

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