Do Firms Care About ESG Ratings?
Evidence from Refinitiv's Scoring Adjustment[*]

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Abstract

This paper examines the impact of Refinitiv's revised ESG scoring methodology in 2020, which penalizes firms neglecting sustainability reporting, on corporate ESG practices. Firms with large negative ESG score revisions show significant improvements in their scores post-adjustment, reflected in sub-scores and scores from other providers. They achieve this by professionalizing ESG disclosures and processes, including introducing sustainability reports, establishing CSR committees, and participating in ESG surveys. There are, however, signs that these trends started already prior to Refinitiv's scoring adjustment. Firms with positive ESG score revisions, in contrast, have established ESG disclosures but tend to have higher carbon emissions, even though they improve their carbon intensity subsequently.

Keywords: ESG ratings, ESG methodology, ESG disclosure, ESG initiatives, Sustainable Finance

JEL Classification: C8, D83, G00, G10

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1 Introduction

Environmental, social, and governance (ESG) issues have become an important aspect of the corporate landscape, relevant for financial investors, companies, and their managers. Having relatively better ESG scores (or ratings) than peers can be a competitive advantage that affects a firm's strategy in ways beyond finance. Several studies show that many institutional but also retail investors expect firms to engage in ESG (e.g., Krüger et al., 2020; Kräussl et al., 2024; Riedl and Smeets, 2017; Bauer et al., 2021) and that institutional investors monitor the firm's ESG performance (Dyck et al., 2019). ESG scores have emerged as a critical tool in evaluating and comparing the ESG performance of firms operating within the same industry or sector.

While extensive evidence indicates that investors value a firm's ESG performance for investment decisions (e.g., Avramov et al., 2022; Rzeźnik et al., 2022), there is limited insight into what drives ESG scores and how firms react to score changes.[1] One reason for this gap might be the complexity of ESG scores (Delmas et al., 2013), which attempt to consolidate multi-dimensional goals into a single metric; prior research highlights the low agreement among providers (e.g., Berg et al., 2022; Billio et al., 2021; Christensen et al., 2022; Serafeim and Yoon, 2023). Furthermore, most scores are relative, depending not only on a firm's own actions but also on the ESG performance of its industry peers (Benuzzi et al., 2024). Another challenge is that ESG providers often rely exclusively on publicly disclosed information without direct interaction with the rated firms. Therefore, it is crucial to distinguish between a firm's ESG disclosure and ESG performance: ESG disclosure pertains to the quantity and quality of information firms provide about their ESG practices, while ESG performance reflects the actual impact of these practices.

In this paper, we employ a quasi-natural experiment and investigate whether firms increase their ESG initiatives, such as reporting, and ESG actions following a sudden revision

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[1]A notable exception is Cornaggia and Cornaggia (2023) who investigate firms' feedback effects of monthly changes in ESG ratings criteria.

to their current ESG scores. We therefore leverage changes in firms' ESG scores resulting from a revision in Refinitiv's ESG scoring methodology. According to Berg et al. (2021), Refinitiv, a leading provider of ESG scores, revised its methodology in 2020.[2] This revision impacted not only new scores but also existing and historical ones. The change primarily addressed unreported data and reshuffled firms based on their reporting standards: under the old methodology, non-disclosed data was still assigned half of the maximum score, whereas the revised methodology no longer awarded points for missing information. As a result, firms experienced substantial changes in their ESG scores, with 86% firms receiving negative revisions of their scores.[3]

By downloading Refinitiv ESG data for the same set of firm-years in both February 2020 and September 2020 – capturing periods before and after Refinitiv's methodology change released in April 2020 – we can identify a (sudden) revision in a firm's overall ESG score. The methodology change was publicly announced by Refinitiv via a press release on April 15, 2020, and affected all firms in a similar vein.[4] We leverage the changes in Refinitiv's overall ESG scores and the timing of the announcement to examine whether firms with negative ESG score revisions improved in the subsequent years. The methodology change resulted in score fluctuations of up to 25 points, with an average decrease of –7.8 on a 0 to 100 scale. Nevertheless, not all firms were negatively affected; some improved their ESG scores, with the top performers increasing their scores by up to 10 points.

If firms actively targeted ESG scores, we would expect to see improvements in the ESG scores following negative revisions resulting from Refinitiv's rating adjustment. Contrary, if a firm neglects its ESG score, we should observe further declines in the ESG score post-adjustment, given Refinitiv's relative score design, and the immediate impact of the firm's

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[2]Refinitiv was renamed to LSEG in 2023 following its acquisition by the London Stock Exchange. Originally, ESG scores were provided by ASSET4 before Refinitiv acquired the company. This paper retains the name Refinitiv to reflect the name at the time of the methodology change.

[3]This number is consistent with the percentage reported by Berg et al. (2021).

[4]Refinitiv also conducted changes in the materiality matrix and its company size bias, but these modifications do not explain systematic downgrades for most firms.

peer improvements. Our Refinitiv sample includes ESG scores from 6,149 international firms, covering data from 2018 to 2023. Our main research question is whether and how firms responded to the adjustment of Refinitiv's scoring methodology.

Our results are as follows: We first find evidence that firms experiencing larger negative revisions to their ESG scores resulting from Refinitiv's 2020 methodology adjustment show greater improvements in their ESG scores in subsequent years. The effect of the improved scoring in the subsequent years is primarily driven by firms that experienced larger negative revisions, as we do not observe similar improvements in firms that received positive revisions of their ESG scores. Additionally, our results indicate that firms negatively affected by the methodology adjustment not only enhance their overall Refinitiv ESG score but also improve across the different dimensions of the score (environmental, social, and governance).

Next, we examine the external evidence of our findings. Berg et al. (2022) and Christensen et al. (2022), among others, show that the correlation between ESG scores of different ESG data providers is low. Therefore, we examine the effect of Refinitiv's methodology change on the ESG scores of a different provider, namely S&P Global. Our results show a similar effect, as firms which received negative revisions resulting from Refinitiv's scoring adjustment also improve their ESG scores as provided by S&P Global. Our results again suggest that firms improve not only the overall score but also the sub-scores that are provided by S&P Global.

ESG scores are typically built on a bottom-up approach. Refinitiv's formula uses up to 186 relevant data points of various kinds.[5] Some of them relate to ESG disclosure or internal processes, whereas others aim to capture actual ESG performance, such as carbon emissions. If firms actively manage ESG scores, there are two potential ways how to improve them: either through extended ESG disclosure initiatives and/or enhanced ESG

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[5]LSEG's general ESG scoring methodology is explained on its website: https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores.

performance. Since negative revisions are often triggered by issues related to ESG reporting, we expect the effects of improved disclosure to be more prominent. These adjustments are likely more cost-effective because enhancing ESG reporting primarily involves administrative and procedural changes, which are generally less costly and quicker to implement (Clementino and Perkins, 2021). In contrast, improving ESG performance requires substantial operational changes, often involving higher costs and long-term investments. Among all data points collected by Refinitiv, a couple of variables are of particular interest in this context: providing separate sustainability reports/sections, having a sustainability committee, and becoming a signatory of United Nations Global Compact initiative. Additionally, we investigate whether firms respond to ESG surveys from rating providers.

We begin by examining firms' ESG initiatives following the revised scoring. According to Refinitiv, the methodology adjustment was introduced to motivate firms to disclose more ESG-related information. Consequently, firms with weak ESG reporting and missing data points received negative scoring revisions, while those with robust reporting saw their scores improve. Notably, only 40% of firms that lost more than 10 points due to the ESG scoring adjustment had published corporate social responsibility (CSR) or sustainability reports. Yet, two years after the update, this number rose to over 80%. A similar trend is observed with sustainability committees: fewer than 40% of firms had a sustainability committee before Refinitiv's adjustment, but by 2022, 60% of firms had established one. We, however, do not find a corresponding increase in firms becoming signatories of the UN Global Compact. While Refinitiv relies solely on publicly disclosed information, S&P Global employs a mixed approach that includes firm surveys. Analyzing S&P Global's data, we find that firms experiencing larger negative revisions to their ESG score are more likely to respond to these surveys. In an additional test, we use all underlying data items and calculate the ratio of variables with a value of one to the total number of items and find that this ratio increases significantly more for firms with larger negative revisions.

Our results suggest that this increased engagement in ESG reporting following Refini-

tiv's scoring adjustment helps firms to mitigate the negative consequence of the firm's initial ESG score revision. This effect remains the same for both Refinitiv and S&P Global ESG scores. However, due to existing pre-trends in our disclosure variables, we cannot interpret this finding as causal evidence resulting from Refinitiv's methodology adjustment. Yet, firms that actively extend ESG reporting initiatives are able to reverse the effect of the methodology change by quickly recovering lost ground in their ESG scores.

To contrast ESG reporting from ESG performance, we provide one final test. We examine how firms' carbon emissions relate to our findings. Carbon emissions are also incorporated in ESG scores but improvements are usually much harder to achieve than improvements in ESG disclosures. We rely on firm-level data provided by S&P Trucost and analyze all three scopes of emissions. The results are in sharp contrast to the ones reported for ESG disclosure. We find that firms with high carbon emissions see their ESG scores improve due to Refinitiv's methodology adjustment. Furthermore, high-intensity firms tend to improve their ESG scores demonstrating significant reductions in carbon intensity measures and Scope 3 emissions.

One potential explanation is that high-emission firms already emphasize ESG reporting and focus on their carbon footprint. Firms with negative scoring revisions just begin to establish ESG reporting and sustainability initiatives, which may delay the impact on carbon emissions. According to Bolton and Kacperczyk (2023), institutional investors focus on emission intensity because it standardizes comparisons across different firm sizes, supporting our results on why firms with high carbon intensity aim to reduce it, though results for absolute carbon levels lack significance.

Our paper contributes to the better understanding of ESG scores. While there is growing evidence how investors respond to changes in ESG scores (e.g., Fabisik et al., 2023; Choi et al., 2024; Berg et al., 2024; Gantchev et al., 2024), we focus on the firms' behavior. We provide evidence that during our sample period more and more firms try to proactively manage their ESG scores. To what extent Refinitiv's scoring adjustment incentivized firms

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to do so remains an open question. The paper most related to ours is Cornaggia and Cornaggia (2023), which examines monthly changes in Sustainalytics' ESG risk ratings criteria between 2011–2019. They show that while firms generally respond to these changes, firms undertake only smaller efforts which do not affect operations. Our research design focuses on one large methodology change, leading to severe effects in a firm's current ESG score. Our results indicate that firms with large negative revisions improve ESG scores again by establishing ESG initiatives. However, we also show that the sorting effects due to the methodology adjustment are not random. Firms with low ESG reporting received the largest decline in ESG scores, leading to overlapping effects. We also build on the findings of Christensen et al. (2022), who show that disclosures exacerbate disagreements in ESG scores. In contrast, our results indicate that establishing ESG initiatives leads to improved ESG scores across different rating providers. Our study further highlights the role of ESG rating providers in motivating firms to enhance their ESG initiatives and provides evidence of a feedback effect in response to scoring adjustments. Consequently, our research offers some policy implications regarding the influence of ESG rating providers and the importance of ESG rating methodologies.

The rest of this study proceeds as follows. In Section 2, we discuss the related literature. Section 3 presents the sample and our methodology. Section 4 examines the impact of the ESG score revisions on subsequent ESG scores. Section 5 provides additional analyses and potential channels for the observed effect. Finally Section 6 concludes.

2   Motivation and Related Literature

Our study is motivated by a dual perspective. On the one hand, it is influenced by the growing evidence that ESG can be a competitive advantage for firms.[6] For instance, Cheng

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[6]Note that there is a large debate questioning whether sustainability is linked to financial performance. While this debate is important, our study does not focus on the relationship between ESG performance and financial performance. For an overview of the debate, see Atz et al. (2023). Instead, we focus on ESG scores and how firms respond to changes in them.

et al. (2014) find that ESG disclosure is related to lower capital constraints, while Dhaliwal et al. (2012) find ESG disclosure leads to lower analyst forecast errors, and Hoepner et al. (2024) show that ESG-related engagement by shareholders can reduce firms' downside risks. Moreover, ESG scores serve as an important decision-making tool for investment choices, helping investors identify which firms align with ESG principles (Avramov et al., 2022). More recent evidence suggests that institutional investors follow ESG scores in their investment decisions and that investors value sustainability (Hartzmark and Sussman, 2019). Berg et al. (2024) report that ESG rating downgrades by MSCI lead to a subsequent reduction of ownership by U.S. funds with an ESG mandate. Rzeźnik et al. (2022) examine the impact of ESG scores for retail investors. They empirically show by using Robinhood data that ESG rating downgrades resulting from a methodology change of Sustainalytics' ESG ratings led to abnormal stock declines of 1.08% within one month. Finally, Gantchev et al. (2024) analyze the introduction of Morningstar's sustainability ratings and find evidence that mutual funds increased their holdings of sustainable stocks to attract flows.

On the other hand, our research is driven by the increasing body of literature indicating the influence of credit ratings on managerial choices, and the objective of managers to achieve favorable credit ratings. Kisgen (2009) shows that managers target credit ratings in making capital structure decisions as higher credit rating levels provide several benefits to a firm. We examine whether similar effects exist for changes in ESG scores. In a more recent study conducted by Wang and Xie (2022), it was demonstrated that companies constrained by the sovereign ceiling experience an increase in information production. Additionally, Almeida et al. (2017) and Bongaerts and Schlingemann (2024) present further evidence suggesting that credit ratings significantly influence firm investment decisions and corporate restructurings, respectively, thus supporting the notion that credit ratings have substantial effects on corporate choices.

ESG scores and credit ratings substantially differ in their interpretation as well as in their methodology. ESG scores measure the relative performance of one firm to the general

ESG performance of its peer group, e.g., an industry or sector. Benuzzi et al. (2024) show that on average less than 45% of Refinitiv's total pillar score variation results from the firm's actual ESG performance. Choi et al. (2024) take advantage of this peer effect. They rely on Refinitiv's expanded coverage of U.S. firms, which includes Russell 3000 companies rather than just Russell 1000 firms. This broader inclusion caused mechanical updates in the ESG scores of initially covered companies, as the influx of new firms with lower ESG scores affected the overall ratings. Their findings indicate that firms receiving positive ESG score revisions are more likely to be chosen by ESG funds, provided they were not already in the funds' portfolios.

Another issue with ESG scores is that different industries and sectors have different dimensions or weights, as industries have distinct ESG characteristics and challenges. For example, an energy company may be more evaluated based on its carbon emissions and renewable energy initiatives, while a consumer goods company may be assessed more on its supply chain practices and labor rights. The expectations and standards for ESG performance can differ across sectors due to varying regulatory frameworks, stakeholder expectations, and industry-specific risks. In addition, Berg et al. (2022) examine ESG scores from six different providers. They demonstrate that ESG scores for a given firm can vary significantly depending on the provider. Consequently, the correlation between ESG scores is notably lower compared to credit ratings. Christensen et al. (2022) provide evidence that divergence between ESG scores can be attributed to greater ESG disclosure by firms and the significant variations in outcome metrics used by different providers. Serafeim and Yoon (2023) also note ESG rater disagreement but find that consensus ESG ratings predict future ESG news and stock returns.

A similar setting to ours has been used by Tang (2009) and Kisgen (2019) for credit ratings. Tang (2009) analyzes the impact of Moody's credit rating refinement in 1982. He shows that firms receiving refinement upgrades have a further decrease in borrowing costs, higher levels of capital investments, lower cash accumulation, and faster asset growth

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compared to those receiving downgrades. Kisgen (2019) demonstrates that modifications made by Moody's to the methodologies for determining credit ratings have a significant impact on a firm's capital structure and investment decisions in the subsequent year. Unlike credit rating analysts who have direct relationships with rated firms, ESG rating providers predominantly rely on publicly disclosed information. Consequently, a firm's willingness to disclose ESG-related information already influences its score. ESG criteria often adopt binary responses such as 'Yes' or 'No', with analysts from ESG providers, e.g., Refinitiv, gathering this data.[7] Therefore, the information provided by firms across industries is crucial for measuring changes in a firm's ESG score, as overall industry data is considered in this score.

Given the circumstances in the interpretation of the ESG score, we employ a quasi-natural experiment by analyzing revisions to ESG scores resulting from a methodology change made by one of the leading ESG information providers, Refinitiv. Berg et al. (2021) find that Refinitiv's ESG scores for the same firm-years can vary significantly between two versions of the data. They show that these changes in Refinitiv's scores are systematic and can be partly explained by time-varying firm characteristics and past stock returns. Fabisik et al. (2023) are among the first leveraging these changes in a firm's ESG score and show that loan spreads of firms affected by this scoring adjustment increase by about 10% compared to firms with unchanged ESG scores. This suggests that debt investors take changes in a firm's ESG score into account.

While there is large evidence that credit ratings alter firm behaviour, not many studies focused on ESG scores yet. Chatterji and Toffel (2010) are among the first to examine the response of firms when they are initially ESG rated. They show that firms with poor initial ratings improve their ESG performance more than those with good initial ratings. More recently, Clementino and Perkins (2021) conduct interviews with 18 Italian firms

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[7]For instance, the answer to 'Does the company have a water efficiency policy?' can be 'Yes' (which is equal to a value of one) if this is indeed the case, or 'No' if the company in question does not have such a policy (which is equivalent to a value of zero).

concluding that firms are mainly improving their ESG disclosures rather than measures to improve their ESG performance. Slager and Gond (2022) conduct interviews covering 60 international firms and show that firms exhibit ambivalent reactions, often engaging in symbolic actions to enhance their ESG ratings without making substantial changes to their practices. The findings suggest that companies' responses to ESG ratings are influenced by a combination of external pressures, including stakeholder expectations and strategic considerations, leading to strategic ambivalence and limited substantive changes in ESG practices. Dupire and M'Zali (2018) and Ding et al. (2022) focus on the peer pressure of ESG scores and the industry benchmark. Dupire and M'Zali (2018) argue that ESG can serve as a strategic tool for positioning within the market, revealing that companies employ distinct ESG activities in response to varying competitive pressures. Likewise, Ding et al. (2022) find that more competitive environments force firms to invest more in ESG.

One recent study on the management of ESG scores is related to ours. Cornaggia and Cornaggia (2023) investigate ESG scores from Sustainalytics spanning 2011 to 2019, focusing on the relative emphasis given to the three ESG pillars. Their research indicates that firms improve their performance in areas where Sustainalytics places more importance on specific criteria. Although this results in greater reporting on these criteria, they find no evidence that such changes lead to actual improvements in firms' ESG behaviors. Instead, the enhancements seem superficial, aimed at satisfying investors and consumers rather than indicating substantial ESG progress.

We extend this strand of research to a global dataset of several thousand companies using large overnight revisions of ESG scores resulting from a methodology change. By measuring the subsequent ESG scores after Refinitiv's scoring adjustment, we contribute to the discussion on the relevance of ESG scores (Berg et al., 2024) and how firms respond to (sudden) changes in their ESG scores (Clementino and Perkins, 2021; Dupire and M'Zali, 2018; Ding et al., 2022; Cornaggia and Cornaggia, 2023). We want to continue this research by examining what drives these ESG score adjustments. We distinguish between two

options for managers: First, managers could adjust their ESG disclosures by simply ticking more boxes in the ESG providers' questionnaire. This would be a comparatively cheap and fast option as it only affects disclosure but without any meaningful improvement in the firms' ESG performance. The second option would be to implement ESG measures to actively improve the ESG or sustainability performance, such as actions to lower carbon emissions.

3   Sample and Methodology

The central object of our analysis are Refinitiv's ESG scores. The scores measure firms' disclosure and sustainability performances relative to industry peers. Refinitiv screens annual reports, CSR/sustainability reports, and other publicly available documents for hundreds of characteristics that are deemed relevant. Based on this database, a relative score for each firm's fiscal year is compiled ranging between 0 (worst) and 100 (best). Refinitiv has a broad coverage and the scores are popular among academics and institutional investors alike: Ehlers et al. (2024) note that Refinitiv scores have been mentioned in more than 2,500 academic studies. Moreover, Refinitiv ESG data is used by BlackRock and other prominent asset managers, as well as by the European Commission or the OECD (Fabisik et al., 2023).

On April 15, 2020, Refinitiv released an adjustment to its ESG methodology resulting in measurable revisions in ESG scores for a large number of companies overnight. The same adjustment in the methodology has been a key finding of prior research by Berg et al. (2021), and we refer to their paper for more details. The methodology change was pre-announced to investors who subscribe to Refinitiv's data services a couple of weeks earlier. Yet, we suspect that companies that do not very actively engage with their ESG scores were hit by surprise. The reform entailed three important components[8]: Firstly, Refinitiv

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[8]See the original press release: https://www.refinitiv.com/en/media-center/press-releases/2020/april/refinitiv-enhances-esg-scoring-methodology-to-reflect-sustainable-industry-

enhanced ESG scores by developing a materiality matrix that adjusts metric importance based on industry-specific relevance and evolving corporate disclosures. Secondly, Refinitiv introduced a market cap factor in controversies scores, which allocates more weight to smaller companies to counterbalance the impact of larger companies' media presence. Thirdly, to foster greater ESG disclosure, the transparency and investment grade scores were revised to assign a score of zero to unreported qualitative/Boolean data items, which previously received a score of 0.5. The original assignment of half of the maximum score was motivated by the fact that Refinitiv relies solely on publicly available information, and if firms did not report on some metrics, Refinitiv gave them the 'benefit of the doubt'.

Refinitiv's adjustment in its methodology, as stated in their press release, emerged from collaborative discussions with sustainable finance experts over a four-year period. This change was made in response to shifts in the market and the developments of the sustainable investing industry. While the revision of the materiality matrix may cause firms to be ranked differently within their sectors or industries based on their strengths in various categories, it does not result in a systematic downgrade for the vast majority of firms. Similarly, adjustments for company size in controversies scores do not account for systematic downgrades in other scores. Therefore, we have reasons to assume that the primary reason for systematic downgrades must be the shift in transparency, where Refinitiv's revised approach now penalizes firms that do not report on metrics, abandoning its previous 'benefit of the doubt' approach.

Our methodology exploits the differences in ESG scores caused by the adjustment of the scoring methodology. These differences are based on Refinitiv's main ESG score (*ESG score*), and we define $\Delta ESG\ Score$ as the difference between an initial download of a firm's ESG score from February 2020 and an updated download from September 2020 for the same firm and year. Both scores refer to the latest fiscal year available at the time, in some instances 2019, but mostly 2018. Figure 1 shows the distribution of $\Delta ESG\ Score$.

developments-and-market-changes.

Panel A of Figure 1 plots the initial against the revised distribution of ESG scores. Initial scores have a fairly symmetric distribution around 50. The revised scores, in comparison, have a much heavier skew towards scores below 50. The difference is our variable of interest and plotted in Panel B of Figure 1. Most firms were negatively affected by the methodology change and their ESG scores worsen on average by almost 8 points. The best firms received revisions up to 10 points on a scale between 0 and 100, while most firms received negative revisions of their ESG score up to 25 points.

It is important to note that the construction of $\Delta ESG\ Score$ sets limitations for our sample. We can only include companies that were already covered by Refinitiv prior to our first download.[9] This leaves us with an unbalanced panel of 6,149 international firms.

The dependent variables are ESG scores and other ESG-related characteristics. To avoid a mechanical link with our variable of interest in panel regressions, we exclude all firm observations prior to the base year for which we calculate $\Delta ESG\ Score$. This way we are able to capture predictive effects how ESG scores evolved subsequently with respect to changes in ESG scores. Our final sample covers the period from 2018 to 2023 and contains 29,580 firm-year observations.

Due to the time lag between fiscal year ends and the release of Refinitiv's ESG scores, the timeline of our model requires some explanation. We attempt to illustrate this in more detail in Figure 2. The graph plots monthly frequencies of when firms' fiscal years end in our sample. The black bars indicate the observations used to calculate $\Delta ESG\ Score$ as they were the latest observations available in our download from February 2020. The bulk is from December 2018, but there are also observations from early 2018 or 2019. The light grey bars were not available to investors in 2020, but they refer to a period prior to Refinitiv's scoring adjustment. Thus, firms were not able to adjust their ESG disclosures

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[9]Refinitiv did not continue to calculate ESG scores under the old methodology. Therefore, firms that are added later to the database must be dropped even though their data may be backfilled and available in later downloads.

anymore, which is why we attribute these observations to the pre-adjustment period. Since we are interested in annual changes and not looking at stock prices, the exact cutoff point is not that important for our identification, but to give firms some time to react to the scoring adjustment we picked end of May 2020. Finally, the dark grey bars indicate observations we treat as post-adjustment.

[Insert Figure 2 around here]

To measure the changes in our dependent variables, we run panel regressions with firm and year fixed effects. The coefficient of interest is for an interaction term between ΔESG $Score$ and a $Post$ dummy that takes the value one after the implementation of Refinitiv's scoring adjustment (cutoff May 2020). The level of ΔESG $Score$ is subsumed in firm fixed effects. The $Post$ dummy remains in our specification because the sample split does not perfectly coincide with calendar years. Our baseline regression takes the following form:

$$y_{i,t} = \alpha_i + \delta_t + \beta \cdot \Delta ESG\ Score \times Post_t + \gamma Post_t \times X_{i,t-1} + \epsilon_{i,t} \tag{1}$$

where $y_{i,t}$ is in our main model the firm's ESG score, the combined score, and the different dimensions of the score (environmental, social, and governance). The coefficient of interest in our model is the interaction term $\Delta ESG\ Score \times Post$, which captures the differential sensitivity of the dependent variable in post-adjustment years with respect to the baseline years. Additional control variables are obtained from the current literature (e.g., Avramov et al., 2022; Berg et al., 2021; Christensen et al., 2022), including the size of the firm, proxied by the natural logarithm of total assets, leverage, return on assets (ROA), and the firm's tangibility, proxied by property, plant and equipment (PPE) divided by total assets.[10] Table 1 summarizes the dependent and independent variables used throughout the paper, whereas Table A-1 in the appendix provides a detailed definition for each variable. Our control variables are in line with the ones reported in Berg et al. (2021).

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[10]Control variables are lagged by one year; however, our results remain consistent when using control variables from the respective year. The results also hold true when no control variables are applied.

[Insert Table 1 around here]

4 ESG Scoring Adjustments and subsequent Changes in Refinitiv's ESG Scores

In this section, we analyze how firms' ESG scores change following Refinitiv's scoring adjustment. The main results are reported in Table 2 in which we use the revised ESG score as a predictor for subsequent ESG scores. The coefficient of the interaction term ΔESG $Score \times Post$ captures the differential sensitivity during the post-adjustment period relative to the pre-adjustment period (as outlined in Figure 2). Using a baseline specification with only firm and year fixed effects in Column (1), we estimate a coefficient of –0.264, which is also statistically significant.

[Insert Table 2 around here]

Assessing the economic magnitude of the effect, we find that a one standard deviation change in $\Delta ESG\ Score$ (7.511) is associated with a 2-point change in ESG scores. This change may seem small given that these scores theoretically range between 0 and 100. Comparing the magnitude to within firm ESG score changes, which are on average only 2.33, such a change is more meaningful. Adding time-varying firm characteristics, such as size, profitability, etc., to our model, does not change the result.

Table 2 also shows the results of two additional robustness tests. First, we exclude observations of fiscal years used to calculate $\Delta ESG\ Score$ (the black observations in Figure 2). The sensitivity in Column (3) is marginally smaller at –0.198, but the coefficient remains statistically significant. Second, we estimate the model in a cross-sectional regression, following the approach of Tang (2009) and Kisgen (2019). Here, the dependent variable is the difference between the latest ESG score available and the one used to calculate ΔESG $Score$. We find in Column (4) again a negative coefficient (–0.382) that is statistically significant. However, this setting does not capture general time trends of the underlying ESG disclosure and the improved ESG reporting over years.

In Columns (5) to (8), we estimate the complete panel model for additional types of ESG scores: Refinitiv's combined score (*Combined*) that integrates ESG controversies into the ESG score, the environmental sub-score (*E score*), the social sub-score (*S score*), and the governance sub-score (*G score*). The results are largely comparable and statistically significant. We estimate the strongest effect for the environmental sub-score with a coefficient of –0.272, somewhat larger than for the other pillars. Potentially an indication for the strong pressure on environmental issues we see at the moment.

There are several plausible explanations for our findings: Refinitiv's ESG scores are calculated based on a large set of firm-specific characteristics, which are measured with noise. Looking at negative changes in ESG scores for a given year could lead to mean reversion over the following years. Alternatively, the timing of Refinitiv's methodology change may be a response to current market developments. Therefore, $\Delta ESG\ Score$ could pick up pre-existing trends in ESG scores. Finally, there could be also a causal effect where firms that are surprised by much lower ESG scores due to Refinitiv's adjustment try to go to the bottom of the source of revision and, if not too costly, take steps to improve their ESG initiatives.

To investigate these issues, we evaluate time trends surrounding the methodology change. Therefore, we create separate interaction terms of $\Delta ESG\ Score$ with each calendar year in our sample. The estimated coefficients are plotted in Figure 3. The figure shows that the coefficient of 2019, whose underlying data points actually predate the methodology adjustment, is already statistically significant. This suggests that there are pre-trends in our data, and we cannot interpret the entire estimate in Table 2 in a causal sense.

[Insert Figure 3 around here]

Looking at the trend in 2020, we also do not detect a steepening of the trend line. It rather looks like the continuation of a linear trend. Only towards the end of our sample period in 2023, the incremental effect becomes smaller.[11] Given the extended observation

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[11]This may also be a sample selection effect as ESG scores for the year 2023 are not fully released by

period for the emergence of the effect, reversion to noise is an unlikely explanation for our findings. We conclude that it is most plausible that firms most affected by the negative revisions to their scores had already begun to improve their ESG disclosures prior to the methodology change. Possibly there is also a causal effect, but we are not able to isolate it from the existing trend. The same graph also shows the trends for the environment, social and governance pillars with very similar results.

One prediction that follows from the proposed causal effect is that positive and negative revisions to ESG scores do not need to have symmetric effects. If a firm is surprised by a lower ESG score, it may face pressure to revise its ESG policies and disclosures. The reverse is not true for firms that are suddenly better than anticipated. We investigate this asymmetry by extending our baseline model. Therefore, we introduce the triple interaction term $\Delta ESG\ Score \times Post \times Neg$ to the model specification that captures the differential sensitivity of firms with negative ESG score revisions in comparison to firms with positive ones.

Table 3 reports the results of the asymmetric effects. Firms with positive revisions to their ESG scores still exhibit a negative sensitivity with respect to $\Delta ESG\ Score$. Yet, the coefficient is –0.062 and statistically insignificant. Firms receiving negative revisions, however, exhibit an incremental sensitivity that is –0.191, three times as large and statistically significant. This suggests that the effect is largely driven by negative revisions to ESG scores, which is in line with an attention mechanism exposing relatively inferior ESG disclosures.

[Insert Table 3 around here]

Refinitiv at the time of our lastest download.

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5 Additional Analyses and Potential Channels

5.1 S&P Global ESG Scores and Sub-scores

We now investigate whether similar effects are observable with scores from other ESG rating providers, specifically S&P Global. This test aims to alleviate concerns that the observed effect is unique to Refinitiv scores. Thus, we utilize S&P Global ESG scores to examine whether firms that received a negative revision to their Refinitiv ESG scores resulting from the 2020 methodology change subsequently show also improvements in their S&P Global ESG scores.

Unlike credit ratings, the correlation between different ESG information providers is relatively low (Berg et al., 2022; Chatterji et al., 2016; Gibson Brandon et al., 2021; Christensen et al., 2022). Berg et al. (2022) report that the correlation between Refinitiv and S&P Global ESG scores is only 0.62, a discrepancy attributed to differences in scope, measurement, and weighting criteria employed by each scoring provider. Additionally, there are several key distinctions between the two ESG rating providers. Firstly, S&P Global provides scores as reported on the original release date and does not systematically revise historical scores. Secondly, S&P Global has a significantly larger market share compared to Refinitiv. Thirdly, while Refinitiv relies solely on publicly disclosed information, S&P Global also collects data through surveys sent to firms. Similar to Refinitiv scores, the S&P Global's ESG score is a relative measure of a company's ESG performance compared to its industry peers, with scores ranging between 0 and 100. The firm coverage of the two providers largely overlaps; out of the 6,149 firms in our Refinitiv sample, 5,311 are also covered by S&P Global.

We keep the same empirical setting as we previously used for Refinitiv scores. Table 4 reports the results on Refinitiv's 2020 scoring adjustment on S&P Global ESG scores. Using the same baseline specification with firm and year fixed effects, we estimate a coefficient of –0.119 for S&P Global ESG scores in Column (1). In Columns (2) and (3), where

we add control variables and additionally exclude observations from fiscal years used to calculate revised scores, respectively, there is no significant change of this finding, neither in the economic nor in the statistical significance. While this coefficient is smaller than that of Refinitiv, it remains statistically significant and meaningful. This indicates that firms undergoing a downward revision in their Refinitiv ESG scores experience improvements in their S&P Global ESG scores in subsequent years.

[Insert Table 4 around here]

For the analysis of time trends and the impact of Refinitiv's revised scores resulting from Refinitiv's adjusted methodology on S&P Global scores, we plot in Figure 4 the estimated coefficients for each year. We find a notable difference to the plot of Refinitiv scores as 2019 now lacks significance and the coefficients for this year are close to zero. From 2020 onwards, we observe a continuing decline in the coefficients, indicating larger improvements of the S&P Global ESG scores for firms with negative revisions to their ESG score over time. In line with our regression results, the strongest changes can be observed for the environmental score and the smallest in the governance score.

[Insert Figure 4 around here]

When using S&P Global scores instead of Refinitiv's own scores, we still find strong evidence that firms receiving a negative revision to their Refinitiv ESG scores improve their ESG scores. Despite the relatively low correlation between ESG scores from different providers, these ESG rating providers compile their scores using predominantly publicly available information. When firms do not publicly disclose ESG-related information, it often results in lower ESG scores across providers.

One plausible explanation for observing improvements in firms' S&P Global ESG scores could be that firms have begun to enhance their ESG reporting or initiate more ESG-related activities. Refinitiv's scoring adjustment may have motivated firms to enhance their engagement in ESG practices, subsequently leading to improvements in both Refinitiv and S&P Global scores. We explore the potential impact of ESG initiatives on improved ESG

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scores in the next section.

5.2 ESG Scoring Adjustments and ESG Initiatives

We aim to go deeper into explaining where the changes in ESG scores are coming from. Since both our ESG providers generate relative scores (as the majority of EGS rating providers), a firm can improve its own scoring if it intensifies its sustainability efforts in comparison to industry peers. Enhancing sustainability disclosures is a very efficient way to do so. One variable of particular interest in this context is whether a firm publishes a CSR and/or sustainability report or features a separate sustainability section in the annual report. Refinitiv collects this data and it is one of the underlying Boolean characteristics that feeds into the governance pillar calculation of the overall ESG score. At the same time, it provides a platform for firms to share more information on sustainability issues and makes this information more visible to the public. If a firm decides to actively manage and improve its ESG score, this would be a good starting point.

We consider several additional indicators that reflect similar concepts, categorizing them as a firm's ESG initiatives. Firstly, does the company's board have a dedicated sustainability committee? Such committees, as highlighted by Eccles et al. (2014) and Burke et al. (2019), are crucial for making high-level strategic decisions on ESG issues, ensuring alignment with primary business objectives. They serve as a forum where sustainability policies can be discussed and implemented in a manner that integrates them with the company's overall strategic direction. Secondly, is the company a signatory of the United Nations Global Compact? This initiative promotes non-binding principles related to sustainability across human rights, labor, environment, and anti-corruption. Being a signatory signals a commitment to upholding these principles and integrating them into corporate practices, which can enhance the company's reputation and stakeholder trust (Cetindamar, 2007; Brown et al., 2018). Lastly, does the company participate in S&P Global ESG surveys? These surveys, alongside public disclosures, are used by S&P Global to evaluate companies

on their ESG performance. Responding to these surveys does not only provide valuable feedback to investors and stakeholders but also demonstrates a proactive approach to transparency and accountability in sustainability reporting. These indicators share the common characteristics of directly influencing ESG scores, being relatively straightforward and cost-effective to implement, and supporting broader sustainability efforts and disclosures. By addressing these aspects, firms can enhance their ESG profiles and positively contribute to their long-term sustainability goals.

Figure 5 plots time-series averages of these variables from 2018 to 2023. We report the time trends separately for firm with positive revisions (a score change larger than 0 points), moderate negative revisions (a score change between 0 and –10 points), and large negative revisions to ESG scores (more than 10 points). We find that most firms with positive revisions already have sustainability reports in 2018 (more than 80%). In contrast, only slightly more than 40% of firms with large negative revisions have sustainability reports in 2018. We see, however, that during our sample period of six years this percentage is strongly increasing. By 2023, the fraction of these firms with sustainability reports almost doubles, thereby closing the gap with respect to firms with positive ESG score revisions.

[Insert Figure 5 around here]

We observe the same pattern for sustainability committees. More than 70% of firms with positive ESG score revisions have sustainability committees in 2018, compared to only 30% of firms with large negative revisions. During our sample period more and more firms are introducing sustainability committees, and the gap between the different groups is diminishing. A similar group ranking follows for S&P Global survey respondents and Global Compact signatories in 2018. Here, however, a possible catch-up effect is less visible. Starting in 2020, there is an increase in the percentage of firms responding to S&P Global's survey, but this holds for all groups.

The clear picture emerging from this graph is that there are strong trends of firms intensifying ESG disclosures in our sample. To some extant these trends also seem correlated

with the reshuffling of ESG scores resulting from Refinitiv's scoring adjustment. To test this correlation more formally, we go back to our panel regression model. Interaction terms of ΔESG *Score* with calendar years capture the catch-up effect of firms with large negative ESG score revisions, which are less likely to comply with the disclosure tools. The results are reported in Table 5.

[Insert Table 5 around here]

We find statistically significant trends for sustainability reports, sustainability committees, and S&P survey respondents. After 2020, the coefficients of ΔESG *Score* are statistically significant for all years. In the case of sustainability reporting, there are also significant pre-trends reflected in the 2019 coefficient. In the other cases the pre-trends are not statistically significant but a tendency is also visible beforehand.

5.3 Do Enhanced ESG Initiatives Improve Subsequent ESG Ratings?

Given the strong trends showing that firms with negative revisions to their ESG scores increase their ESG initiatives, including ESG reporting, which was also the primary intention of Refinitiv's scoring adjustment, we examine in this section the moderating effect of these sustainability-linked communication channels on our initial findings. The idea is that they not only have a direct impact on ESG scores, but also provide a platform to enhance ESG disclosures and initiatives more broadly, making them focal elements of ESG assessments.

To estimate the moderating effect, we introduce the triple interaction term $X \times \Delta ESG$ *Score* $\times$ *Post* to our baseline model. The new variable X refers to a binary variable for a given firm-year that indicates if a firm provides a given feature. We use the four characteristics discussed in the previous section: CSR/sustainability reporting, sustainability committee, S&P Global survey respondent, and Global Compact signatory. Using Refinitiv's ESG scores as dependent variables, the results of this triple interaction effect are provided in Table 6.

[Insert Table 6 around here]

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We first focus on the effect of CSR/sustainability reporting in Columns (1) and (2). Most importantly, the coefficient of the triple interaction term is –0.137 and statistically significant. In comparison, the old interaction term $\Delta ESG\ Score \times Post$, which now captures the sensitivity of firms without sustainability reports, remains statistically significant with a coefficient of –0.127. This suggests that firms with negative revisions to their ESG scores improve future ESG scores more than twice as much if they start publishing CSR/sustainability reports. The level effect of sustainability reports in our sample is also significant. After introducing sustainability reports, firms have ESG scores that are on average almost 10 points higher than before. In the post-adjustment period that effect has become even more pronounced. This indicates that firms actively managing their ESG practices by establishing ESG reporting can considerably improve their ESG scores.

Similar conclusions can be drawn from the results of having sustainability committees, reported in Columns (3) and (4). The relative effect of the triple interaction term is smaller, but it remains statistically significant. The introduction of sustainability committees is also associated with a significant increase in ESG scores of around 7 points on average. Interestingly, the response to S&P Global surveys does not turn out to be significant. One could have thought that this variable might be able to capture some general willingness to engage with ESG issues. Yet, as Refinitiv has no access to the information shared by firms with S&P Global, there is no direct influence. A general willingness to engage with ESG issues is finally captured if firms are Global Compact signatories. This effect is reported in Columns (7) and (8) and it is again statistically significant, even though its economic magnitude is less important.

We repeat the same analysis for S&P Global ESG scores. The results are reported in Table 7 and support the moderating effect resulting from establishing ESG initiatives. If anything, the coefficient of the triple interaction is even stronger than the ones reported for Refinitiv's ESG scores. Looking at the regressions with sustainability reports and sustainability committees, we do not find a significant coefficient for $\Delta ESG\ Score \times Post$

post-adjustment. The effect is entirely driven by firms introducing these ESG initiatives. Contrary to our prior findings, we now find a very strong result when firms respond to S&P Global's survey. Looking at the level effect of the S&P Global survey, we estimate that firms increase their ESG score by almost 10 points after responding to the survey. We conclude from this that S&P Global relies actually quite heavily on these surveys. Finally, there are still strong results for firms that are willing to engage with ESG issues as measured by Global Compact signatories.

[Insert Table 7 around here]

5.4 Examining All Underlying Data Points

Next, we integrate in our analysis also the remaining ESG data points collected by Refinitiv to determine the ESG scores. In 2020, Refinitiv used 178 data points for their scoring methodology.[12] Refinitiv categorizes these data points as either Boolean or numeric and as having positive or negative polarity. Polarity indicates whether a higher value is beneficial or detrimental to the score. Before the methodology change, firms either had missing values or strategically omitted certain values without penalty. Afterward, firms were penalized for not reporting. This section focuses on the increase in reporting items around the time of Refinitiv's methodology change. Our variable of interest is the ratio of Boolean variables with positive polarity that have a value of one, divided by the total number of available items.[13] We hypothesize that firms with negative revisions to their ESG scores began to implement more measures, resulting in more covered items and better raw data. This is particularly relevant because these items generally address the broad ESG aspects a firm faces, rather than measuring relative performance or quality.

Figure 6 shows the availability of Boolean data points used to construct Refinitiv's

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[12]This number increased to 186 as new data points were added and others removed. We focus on the data points used before this change. Note that Berg et al. (2021) show that raw data items were not affected by the methodology adjustment, as changes in the raw data occurred in only 6% of firm-years.

[13]We also calculated the ratio of missing variables to total items. The results are provided in Figure A-1 and show a similar trend, as firms with negative revisions having more missing observations.

ESG score and its three underlying scores. The trends observed are similar to those for our ESG initiative variables. For all binary variables that improve a firm's ESG score, only 25% of data items were filled for firms with significant negative revisions, whereas firms with score improvements had already achieved 50% of all potential points. While the trends are consistently positive, firms with large negative revisions have shown more significant improvements since 2020. The environmental pillar exhibits the lowest coverage, with only 24.3% of the items assigned a 'Yes' by Refinitiv's analysts. In 2018, firms with large negative revisions had a coverage ratio of less than 15%, whereas firms with positive revisions started with a 35% coverage. The governance pillar, however, shows the highest coverage ratio and has experienced strong increases for firms with large negative revisions.

[Insert Figure 6 around here]

We also test this relationship in our panel regression setting, using the item ratios as our dependent variable. The results are reported in Table 9 and support the sharper increase for firms with larger negative revisions to their ESG scores. The coefficient of $\Delta ESG\ Score \times Post$ is highly significant in all models, indicating that firms improved generally in the underlying ESG data items of Refinitiv. Comparing the magnitude to within changes of firms' general increase of underlying ESG items, which are on average only 3.5%, our coefficient indicates that firms with negative revisions resulting from Refinitiv's methodology change considerably improved their ESG efforts.

[Insert Table 9 around here]

The analysis of the underlying items Refinitiv uses to calculate its ESG score supports our previous findings that firms which received negative revisions to their ESG score are the ones with less ESG activities prior to the methodology change. We observe that these firms catching up as ESG analysts find now more ESG measures publicly disclosed.

5.5 ESG Scoring Adjustments and Greenhouse Gas Emissions

The previous section indicated a positive relationship between Refinitiv's scoring adjustments and ESG initiatives, suggesting that firms with negative revisions to their ESG scores improved their ESG initiatives. In this section, we focus on the firm's carbon emissions, as a proxy for a firm's actual ESG action. Different to our Boolean ESG initiative measures, carbon emissions are a good numerical proxy for a firm's actual sustainability effort. We measure several dimensions of carbon emissions in the subsequence of Refinitiv's 2020 scoring adjustment.

Our carbon emissions data is obtained from S&P Trucost and is widely used for measuring carbon emissions (see e.g., Bolton and Kacperczyk, 2021, 2023). To determine potential impacts, we categorize carbon emissions into all direct external environmental impacts of a company (GHG)[14], direct emissions from production under the firm's control (*Scope 1*), indirect emissions from the consumption of purchased electricity, heat, or steam (*Scope 2*), and other indirect upstream emissions from activities such as the production of purchased materials, product use, waste disposal, and outsourced activities (*Scope 3*). We report results on both absolute carbon emissions in CO2e and carbon intensity, which scales greenhouse gas emissions by the firm's revenues. While total emissions are more relevant to social impact, emissions intensity is better suited for assessing a firm's individual carbon performance, as it avoids a mechanical correlation with firm size (Aswani et al., 2024; Bolton and Kacperczyk, 2023, 2024).

The results on the firm's carbon emissions response following Refinitiv's scoring adjustment is presented in Table 8. The first four columns, Colums (1) to (4), report the results on total emissions, while the last four columns, Colums (5) to (8), report carbon intensity. Our results do not indicate that firms reduce their direct external environmental impact, as both total GHG and Scope 1 lack significance. We also find that emissions from the

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[14]Trucost assigns a monetary value to GHG emissions quantities, representing the global average damage of each environmental impact.

consumption of purchased electricity, heat, or steam, summed together in a firm's Scope 2 emissions, are not significantly associated with the firm's ESG score revision. However, we observe a strong impact on carbon intensity measures and absolute level of Scope 3 emissions, capturing indirect emissions. In contrast to initial expectation, the association is not positive, as the coefficient of $\Delta ESG\ Score \times Post$ is consistently negative and statistically significant. The results therefore suggest that firms with positive revisions to their ESG scores are the ones lowering their carbon intensity as well as their Scope 3 emissions.

[Insert Table 8 around here]

As the regression results indicate that firms with negative revisions to their ESG score perform considerably worse than their peers in terms of carbon intensity, we plot the mean carbon intensity in Figure 7, split between firms with positive revisions, moderate negative revisions (a score change between 0 and –10 points), and large negative revisions to their ESG scores. The graphs support the regression results, as firms with positive revisions to their ESG scores show the largest declines in carbon intensity. However, we note that these firms start generally on higher levels than their peers. For example, while the average Scope 1 emission intensity is 1.5 for firms with both moderate and large negative revisions, firms with positive revisions have an average Scope 1 emission intensity of 2.5 in 2018. In 2022, firms with positive ESG score revisions show still higher emissions than their peers in 2018. Similar patterns can be found for all other carbon intensity measures.

[Insert Figure 7 around here]

The results of the regression analysis might therefore be misleading, as it captures only relative improvements, but not the initial levels (at the beginning of our sample period in 2018) which are subsumed in the firm fixed effects. One potential explanation could be that firms for which carbon emissions are crucial, such as those in the oil industry, are the ones that had already implemented good ESG reporting but are now aiming to reduce their carbon emissions as well. As our previous results indicate that firms which were negatively affected by Refinitiv's methodology change rather begin with ESG reporting

and installing CSR/sustainability boards and teams, it might take more time to see an impact on carbon emissions, as these initiatives take more time to implement. Our results however contribute to the debate whether carbon levels or carbon intensity is targeted, as we find a significant impact on carbon intensity but not on overall carbon emission levels. Bolton and Kacperczyk (2023) show that institutional investors, who may have influenced Refinitiv's scoring adjustment, tend to focus more on emission intensity. This metric is independent of firm size, allowing for a consistent comparison across firms of different sizes. This would support our results why firms with high carbon intensity levels aim reducing carbon intensity but results lack significance for carbon levels.

6   Conclusion

By leveraging Refinitiv's ESG methodology change in 2020, we examine how firms' ESG scores evolved after this revision. Our findings reveal that firms adversely affected by Refinitiv's ESG scores managed to recover in subsequent years by improving their scores. This positive rebound effect is evident not only in Refinitiv's ESG scores but also in those provided by S&P Global, particularly among firms with negative revisions following Refinitiv's adjustment.

Refinitiv's initial 'benefit of the doubt' approach provides incentives to only disclose positive values. Firms may have strategically decided to be intransparent about the inexistence of ESG initiatives and processes. The adjustment of the methodology now penalizes such strategic behavior, thereby fostering more comprehensive ESG reporting. We find that firms with negative revisions to their ESG scores actively increased their ESG disclosure by initiating explicit CSR/sustainability reporting, establishing CSR/sustainability committees, and responding to ESG surveys. However, the analysis of such ESG initiatives reveals pre-trends before Refinitiv's scoring adjustment. This suggests that firms may have already begun enhancing their ESG initiatives prior to the adjustment, indicating that Refinitiv's

revision might be a response to a broader market trend.

Our results provide evidence that firms negatively affected by Refinitiv's methodology adjustment improve their ESG scores particularly by enhancing their ESG reporting. Thus, the objective of Refinitiv's adjustment was achieved as it encouraged firms with missing metrics to increase their disclosure and transparency. While we observe a firm response, our study design does not allow us to separate to what extent this effect is driven by pre-exisiting market trends, such as investor engagement and management initiatives, or changed incentives resulting from the adjustment of Refinitiv's methodology itself. Furthermore, our analysis shows that firms with positive revisions to their ESG scores were the ones actively reducing carbon emission intensity. These firms started though at higher levels of emission intensity. This finding indicates that firms more exposed to ESG risks, particularly those with high emissions, demonstrated greater transparency in reporting and a keen interest in reducing carbon intensity.

This research contributes to ongoing debates on ESG rating regulation by providing empirical evidence on how changes in ESG scoring methodologies influence corporate ESG practices and disclosures. These findings have significant policy implications, as they can inform the European Parliament's proposal for a Regulation on the Transparency and Integrity of ESG Rating Activities. Our results highlight the need for clear and consistent scoring criteria to drive meaningful improvements in corporate ESG performance.

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Table 1: Descriptive statistics

This table provides the descriptive statistics for our sample of 6,149 firms with available Refinitiv ESG ratings affected by Refinitiv's 2020 methodology change. The average, median and standard deviation are reported, alongside the 25% and 75% percentiles. The variable definitions are provided in Table A-1 in the appendix.

	count	mean	sd	p25	p50	p75
Refinitiv ESG variables						
ESG Score	29,850	49.783	20.039	34.180	50.137	65.632
ESG Combined Score	29,850	48.204	19.018	33.808	48.391	62.697
Environmental Pillar Score	29,850	41.003	28.726	14.354	41.333	65.154
Social Pillar Score	29,850	51.789	22.846	33.683	51.728	70.575
Governance Pillar Score	29,850	53.199	22.173	35.940	54.704	71.239
ΔESG Score	29,850	-7.831	7.511	-12.770	-7.860	-3.160
S&P Global ESG variables						
S&P ESG Score	24,086	37.079	18.096	25.000	33.000	46.000
S&P Environmental Score	24,086	38.173	22.768	20.000	33.000	53.000
S&P Social Score	24,086	33.773	19.210	20.000	30.000	43.000
S&P Governance Score	24,086	38.781	16.600	28.000	36.000	46.000
ESG incentive& underlying data item variables						
CSR Sustainability Reporting	29,840	0.716	0.451	0.000	1.000	1.000
CSR Sustainability Committee	29,839	0.615	0.487	0.000	1.000	1.000
S&P Survey Respondent	24,086	0.280	0.449	0.000	0.000	1.000
Global Compact Signatory	29,838	0.197	0.398	0.000	0.000	0.000
ESG Item Ratio	21,813	0.371	0.194	0.200	0.358	0.526
Environmental Pillar Item Ratio	21,813	0.243	0.188	0.081	0.216	0.405
Social Pillar Item Ratio	21,813	0.346	0.163	0.211	0.342	0.474
Governance Pillar Item Ratio	21,894	0.517	0.182	0.400	0.500	0.650
Greenhouse gas variables						
Greenhouse gas emissions	27,289	2.261	0.319	2.077	2.294	2.483
Carbon Emissions Scope 1	27,231	10.057	2.965	7.985	9.907	11.949
Carbon Emissions Scope 2	27,272	10.210	2.296	8.704	10.300	11.879
Carbon Emissions Scope 3	27,291	11.989	2.137	10.423	12.059	13.542
Greenhouse gas emission intensity	27,289	1.681	4.765	0.032	0.126	0.414
Carbon Intensity Scope 1	27,289	1.609	4.632	0.031	0.126	0.403
Carbon Intensity Scope 2	27,291	0.392	0.597	0.063	0.161	0.424
Carbon Intensity Scope 3	27,291	1.412	1.420	0.353	0.865	1.941
Firm control variables						
TotalAssets	29,776	15.219	1.863	13.977	15.141	16.387
Leverage	29,774	0.260	0.202	0.092	0.239	0.385
ROA	29,580	3.395	12.498	1.210	4.245	8.210
Tangibility	29,416	0.280	0.272	0.049	0.189	0.444

Table 2: Impact of ESG score revisions on subsequent Refinitiv ESG scores

This table reports the regression results of the revisions to firms' ESG scores resulting from Refinitiv's 2020 methodology change *(ΔESG Score)* on Refinitiv's overall ESG score and its sub-scores. The sample includes Refinitiv scores from 2018 to 2023 for 6,149 firms affected by the methodology change. *Post* is defined as 1 if the ESG score is after the methodology change, and 0 otherwise. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression, except in model (4) which focuses on the difference between the latest ESG score available and the one used to calculate *ΔESG Score*. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3) Refinitiv ESG score	(4)	(5) Combined	(6) E score	(7) S score	(8) G score
	ALL	ALL	ex Base	CS	ALL	ALL	ALL	ALL
ΔESG Score $\times$ Post	-0.264***	-0.261***	-0.198***		-0.277***	-0.272***	-0.234***	-0.238***
	(0.014)	(0.014)	(0.014)		(0.016)	(0.020)	(0.017)	(0.023)
ΔESG Score				-0.382***				
				(0.020)				
Post	-1.271***	-1.235***	-0.851***		-0.941***	-1.211***	-1.601***	-0.375
	(0.231)	(0.233)	(0.271)		(0.294)	(0.330)	(0.275)	(0.431)
TotalAssets		2.680***	2.497***	-0.604***	2.238***	3.700***	2.671***	2.284***
		(0.239)	(0.266)	(0.083)	(0.251)	(0.342)	(0.304)	(0.362)
Leverage		-1.196	-1.824**	2.202***	-1.120	-0.867	-1.731*	-0.169
		(0.785)	(0.832)	(0.834)	(0.820)	(1.107)	(0.941)	(1.178)
ROA		0.001	0.006	0.079***	0.006	0.005	-0.004	0.004
		(0.006)	(0.007)	(0.012)	(0.007)	(0.009)	(0.008)	(0.011)
Tangibility		2.165**	3.061***	-1.010*	2.705**	3.312**	0.272	3.871**
		(1.048)	(1.067)	(0.597)	(1.126)	(1.451)	(1.278)	(1.645)
Observations	29,850	29,205	23,293	5,910	29,205	29,205	29,205	29,205
R-squared	0.924	0.924	0.939	0.071	0.879	0.928	0.912	0.825
Year FE	YES	YES	YES	NO	YES	YES	YES	YES
Firm FE	YES	YES	YES	NO	YES	YES	YES	YES

Table 3: Asymmetric effects of ESG score revisions on subsequent Refinitiv ESG scores

This table reports the regression results of the asymmetric effects of revisions to firms' ESG scores due to Refinitiv's 2020 methodology change *(ΔESG Score)* on Refinitiv's overall ESG score and its sub-scores. The sample includes Refinitiv scores from 2018 to 2023 for 6,149 firms affected by the methodology change. *Post* is defined as 1 if the ESG score is after the methodology change, and 0 otherwise. *Neg* is defined as 1 if the firm obtained a downgrade in its Refinitiv score due to Refinitiv's methdology change, and 0 otherwise. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Refinitiv ESG score	(2) Combined	(3) E score	(4) S score	(5) G score
ΔESG Score $\times$ Post $\times$ Neg	-0.191***	-0.217**	-0.162*	-0.136*	-0.207*
	(0.071)	(0.086)	(0.096)	(0.081)	(0.123)
ΔESG Score $\times$ Post	-0.062	-0.045	-0.065	-0.077	-0.061
	(0.068)	(0.083)	(0.091)	(0.077)	(0.119)
Post $\times$ Neg	1.344***	1.685***	2.349***	1.465***	0.190
	(0.434)	(0.548)	(0.607)	(0.519)	(0.751)
Post	-2.444***	-2.415***	-2.995***	-2.780***	-0.893
	(0.414)	(0.553)	(0.578)	(0.485)	(0.763)
TotalAssets	2.676***	2.233***	3.693***	2.667***	2.284***
	(0.239)	(0.250)	(0.342)	(0.303)	(0.362)
Leverage	-1.204	-1.124	-0.843	-1.724*	-0.210
	(0.785)	(0.820)	(1.107)	(0.940)	(1.178)
ROA	0.001	0.006	0.006	-0.004	0.004
	(0.006)	(0.007)	(0.009)	(0.008)	(0.011)
Tangibility	2.156**	2.685**	3.230**	0.234	3.940**
	(1.047)	(1.124)	(1.449)	(1.277)	(1.644)
Observations	29,205	29,205	29,205	29,205	29,205
R-squared	0.924	0.879	0.928	0.913	0.825
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES

Table 4: Impact of ESG score revisions on subsequent S&P Global ESG scores

This table reports the regression results of the revisions to firms' ESG scores resulting from Refinitiv's 2020 methodology change *(ΔESG Score)* on S&P Global's overall ESG score and its sub-scores. The sample includes 5,311 firms which had both a Refinitiv and S&P Global rating at the time of Refinitiv's scording adjustment. *Post* is defined as 1 if the ESG score is after the methodology change, and 0 otherwise. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
| | S&P Global ESG rating | | | S&P E score | S&P S score | S&P G score |
	ALL	ALL	ex Base	ALL	ALL	ALL
ΔESG Score × Post	-0.119***	-0.114***	-0.105***	-0.172***	-0.097***	-0.110***
	(0.017)	(0.016)	(0.016)	(0.021)	(0.019)	(0.016)
Post	-0.598**	-0.418*	-0.635**	-0.587*	0.152	-0.771***
	(0.240)	(0.240)	(0.273)	(0.346)	(0.291)	(0.234)
TotalAssets		2.719***	2.157***	2.941***	2.895***	2.575***
		(0.290)	(0.293)	(0.385)	(0.317)	(0.289)
Leverage		-2.413***	-2.307***	-3.336***	-2.750***	-1.319
		(0.885)	(0.865)	(1.176)	(1.026)	(0.849)
ROA		0.007	-0.002	0.019*	0.009	0.005
		(0.008)	(0.008)	(0.011)	(0.009)	(0.008)
Tangibility		-2.651**	-1.635	-3.493**	-1.949	-2.170*
		(1.225)	(1.206)	(1.587)	(1.405)	(1.176)
Observations	23,973	23,594	20,232	23,594	23,594	23,594
R-squared	0.922	0.923	0.934	0.902	0.908	0.908
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Table 5: Effect of ESG score revisions on firm's ESG initiatives and reporting over time

This table reports regression results of the revisions to firms' ESG scores resulting from Refinitiv's 2020 methodology change *(ΔESG Score)* on the firm's CSR Sustainability Reporting, CSR Sustainability Committee, S&P Survey Respondent, and Global Compact Signatory. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) CSR Reporting	(2) CSR Committee	(3) Survey Respondent	(4) Global Compact Signatory
2018 × ΔESG Score	-0.001	0.000	-0.001	0.001*
	(0.001)	(0.001)	(0.001)	(0.000)
2019 × ΔESG Score	-0.004***	-0.001	-0.002	0.001**
	(0.001)	(0.001)	(0.001)	(0.000)
2020 × ΔESG Score	-0.008***	-0.003***	-0.004***	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
2021 × ΔESG Score	-0.010***	-0.006***	-0.003***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
2022 × ΔESG Score	-0.011***	-0.007***	-0.004***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
2023 × ΔESG Score	-0.012***	-0.009***	-0.006***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
TotalAssets	0.081***	0.085***	0.066***	0.019***
	(0.009)	(0.010)	(0.011)	(0.005)
Leverage	-0.085***	-0.072**	0.010	-0.023
	(0.029)	(0.030)	(0.037)	(0.018)
ROA	-0.000	-0.000	0.001**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Tangibility	0.084**	0.142***	-0.097*	-0.003
	(0.042)	(0.045)	(0.053)	(0.027)
Observations	35,311	35,351	32,104	35,224
R-squared	0.767	0.758	0.676	0.829
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES

Table 6: Moderating impact of ESG initiatives on Refinitiv scores

This table reports the regression results for the moderating impact of ESG initiatives, interacted with revisions to the firm's ESG score resulting from Refinitiv's 2020 methodology change, on Refinitiv ESG scores. ESG initiatives are proxied by whether the firm publishes CSR/ sustainability reporting, established a CSR/sustainability committee, responds to S&P Global ESG surveys, and is a signatory of the Global Compact. The variable X captures the respective variable. *Post* is defined as 1 if the ESG score is after the methodology change, and 0 otherwise. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sustain. report		Committee		S&P survey		GC Signatory	
	Refinitiv ESG score		Refinitiv ESG score		Refinitiv ESG score		Refinitiv ESG score	
X $\times$ ΔESG Score $\times$ Post	-0.152***	-0.137***	-0.104***	-0.096***	-0.027	-0.016	-0.077**	-0.062*
	(0.030)	(0.031)	(0.029)	(0.029)	(0.032)	(0.032)	(0.034)	(0.034)
ΔESG Score $\times$ Post	-0.116***	-0.127***	-0.152***	-0.158***	-0.255***	-0.252***	-0.215***	-0.217***
	(0.026)	(0.027)	(0.025)	(0.025)	(0.019)	(0.019)	(0.016)	(0.017)
X $\times$ ΔESG Score	0.116***	0.113**	0.002	0.003	-0.029	-0.030	-0.097**	-0.106**
	(0.044)	(0.044)	(0.036)	(0.037)	(0.034)	(0.034)	(0.044)	(0.043)
X $\times$ Post	1.194***	1.415***	-0.278	-0.101	-2.325***	-2.165***	-2.408***	-2.196***
	(0.338)	(0.349)	(0.310)	(0.314)	(0.275)	(0.277)	(0.278)	(0.281)
X	9.499***	9.184***	7.172***	6.962***	3.599***	3.515***	3.743***	3.547***
	(0.510)	(0.519)	(0.391)	(0.398)	(0.309)	(0.310)	(0.404)	(0.405)
Post	-1.998***	-2.170***	-0.736**	-0.853**	-0.545**	-0.535*	-0.451*	-0.488*
	(0.363)	(0.374)	(0.336)	(0.340)	(0.275)	(0.277)	(0.252)	(0.255)
TotalAssets		2.031***		2.138***		2.740***		2.531***
		(0.216)		(0.220)		(0.302)		(0.238)
Leverage		-0.630		-0.748		-1.414		-0.912
		(0.723)		(0.734)		(0.931)		(0.780)
ROA		0.003		0.001		0.000		0.001
		(0.006)		(0.006)		(0.008)		(0.006)
Tangibility		1.641*		1.325		2.743**		2.032*
		(0.966)		(0.974)		(1.290)		(1.042)
Observations	29,840	29,195	29,839	29,194	23,973	23,594	29,838	29,193
R-squared	0.935	0.934	0.932	0.932	0.928	0.929	0.925	0.925
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 7: Moderating impact of ESG initiatives on S&P Global ESG scores

This table reports the regression results for the moderating impact of ESG initiatives, interacted with revisions to the firm's ESG score resulting from Refinitiv's 2020 methodology change, on S&P Global ESG scores. ESG initiatives are proxied by whether the firm publishes CSR/ sustainability reporting, established a CSR/sustainability committee, responds to S&P Global ESG surveys, and is a signatory of the Global Compact. The variable X captures the respective variable. *Post* is defined as 1 if the ESG score is after the methodology change, and 0 otherwise. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sustain. report		Committee		S&P survey		GC Signatory	
	S&P ESG score		S&P ESG score		S&P ESG score		S&P ESG score	
$X \times \Delta$ESG Score $\times$ Post	-0.176***	-0.158***	-0.146***	-0.148***	-0.123***	-0.114***	-0.173***	-0.161***
	(0.029)	(0.030)	(0.030)	(0.030)	(0.033)	(0.033)	(0.044)	(0.043)
ΔESG Score $\times$ Post	0.012	-0.001	-0.025	-0.023	-0.073***	-0.072***	-0.052***	-0.054***
	(0.022)	(0.023)	(0.021)	(0.022)	(0.015)	(0.015)	(0.018)	(0.018)
$X \times \Delta$ESG Score	0.103***	0.090**	0.150***	0.155***	0.174***	0.167***	0.052	0.048
	(0.036)	(0.036)	(0.039)	(0.039)	(0.040)	(0.040)	(0.062)	(0.061)
$X \times$ Post	0.938***	1.284***	-0.119	0.088	-0.485*	-0.307	-2.023***	-1.777***
	(0.309)	(0.313)	(0.317)	(0.321)	(0.282)	(0.281)	(0.382)	(0.382)
X	0.627	0.077	2.450***	2.177***	9.646***	9.424***	3.736***	3.480***
	(0.411)	(0.413)	(0.434)	(0.439)	(0.380)	(0.381)	(0.551)	(0.545)
Post	-1.273***	-1.387***	-0.454	-0.445	-0.268	-0.175	0.200	0.281
	(0.320)	(0.325)	(0.314)	(0.317)	(0.241)	(0.241)	(0.264)	(0.264)
TotalAssets		2.807***		2.673***		2.346***		2.581***
		(0.289)		(0.290)		(0.255)		(0.288)
Leverage		-2.739***		-2.367***		-3.040***		-2.056**
		(0.873)		(0.877)		(0.771)		(0.874)
ROA		0.006		0.007		-0.001		0.009
		(0.008)		(0.008)		(0.007)		(0.008)
Tangibility		-2.605**		-2.885**		-1.800*		-2.796**
		(1.202)		(1.216)		(1.080)		(1.219)
Observations	23,967	23,588	23,966	23,587	23,973	23,594	23,965	23,586
R-squared	0.923	0.924	0.923	0.924	0.936	0.936	0.923	0.924
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 8: ESG score revisions and subsequent change in greenhouse gas emissions

This table reports regression results of the impact of ESG score revisions resulting from Refinitiv's 2020 methodology change on the firm's greenhouse gas emissions. Carbon emissions from a company are proxied using direct emissions from production (Scope 1), indirect emissions from consumption of purchased electricity, heat, or steam (Scope 2), and other indirect upstream emissions from the production of purchased materials, product use, waste disposal, outsourced activities, etc. (Scope 3). The first four models report total level of emissions, while the last four columns report emission intensity which measures carbon emissions per unit of sales. Data is obtained from S&P Global Trucost and scaled as in Bolton and Kacperczyk (2021, 2023). *Post* is defined as 1 if the ESG score is after the methodology change, and 0 otherwise. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Absolute measures				Intensity measures		
	GHG	Scope 1	Scope 2	Scope 3	GHG	Scope 1	Scope 2	Scope 3
ΔESG Score $\times$ Post	0.000	-0.001	-0.002	-0.002***	-0.012***	-0.013***	-0.001**	-0.002***
	(0.000)	(0.002)	(0.001)	(0.001)	(0.004)	(0.003)	(0.001)	(0.001)
Post	-0.012***	-0.114***	-0.114***	-0.151***	0.082	0.104*	0.016*	-0.019*
	(0.003)	(0.025)	(0.021)	(0.011)	(0.060)	(0.056)	(0.008)	(0.011)
TotalAssets	0.040***	0.350***	0.376***	0.424***	0.011	0.019	0.007	0.026**
	(0.004)	(0.030)	(0.027)	(0.019)	(0.053)	(0.052)	(0.011)	(0.012)
Leverage	-0.015	-0.190**	-0.102	-0.131***	-0.124	-0.137	0.015	0.032
	(0.012)	(0.087)	(0.087)	(0.049)	(0.142)	(0.139)	(0.030)	(0.032)
ROA	-0.000	-0.000	0.000	0.002***	-0.003*	-0.003	-0.001***	-0.001**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.000)	(0.000)
Tangibility	-0.017	-0.115	-0.159	-0.020	0.715*	0.713*	0.092	0.284***
	(0.016)	(0.136)	(0.132)	(0.071)	(0.415)	(0.407)	(0.060)	(0.054)
Observations	26,788	26,734	26,771	26,790	26,788	26,788	26,790	26,790
R^2	0.951	0.964	0.951	0.984	0.931	0.934	0.890	0.967
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

## Table 9: Effect of ESG score revisions on available data items

This table reports regression results of the impact of ESG score revisions resulting from Refinitiv's 2020 methodology change on the firm's underlying ESG data items. Variables are calculated as Boolean variables with positive polarity having a value of 1 divided by the total number of items available. Refinitiv ESG scores are based on 178 items of which are 107 are Boolean and a positive polarity, split in 38 from the environmental pillar, 40 from the social pillar, 29 from the governance pillar, respectively. *Post* is defined as 1 if the ESG score is after the methodology change, and 0 otherwise. All variable definitions are provided in Table A-1. Firm and year fixed effects are included in the regression. Standard errors are clustered by firm and reported in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
	All items		Environmental items		Social items		Governance items	
TRESGSup $\times$ Post	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Post	-0.003*	-0.003	-0.000	-0.001	-0.004**	-0.003*	-0.006***	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
TotalAssets		0.017***		0.013***		0.014***		0.021***
		(0.002)		(0.002)		(0.002)		(0.002)
Leverage		-0.009		-0.002		-0.010		-0.013*
		(0.007)		(0.007)		(0.007)		(0.008)
ROA		-0.000***		-0.000*		-0.000***		-0.000
		(0.000)		(0.000)		(0.000)		(0.000)
Tangibility		-0.010		0.008		-0.016*		0.007
		(0.010)		(0.010)		(0.009)		(0.011)
Observations	21,811	21,291	21,811	21,291	21,811	21,291	21,892	21,371
R^2	0.953	0.953	0.951	0.951	0.943	0.943	0.928	0.928
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 1: Distribution of Refinitiv ESG Scores before and after the methodology change

This figure shows the distribution of changes in ESG scores resulting from Refinitiv's 2020 methodology change. Panel A displays the density of ESG scores before and after the methodology change, while Panel B illustrates the distribution of changes in the firm's ESG ratings.

Panel A: ESG scores before and after Refinitiv's 2020 methodology change
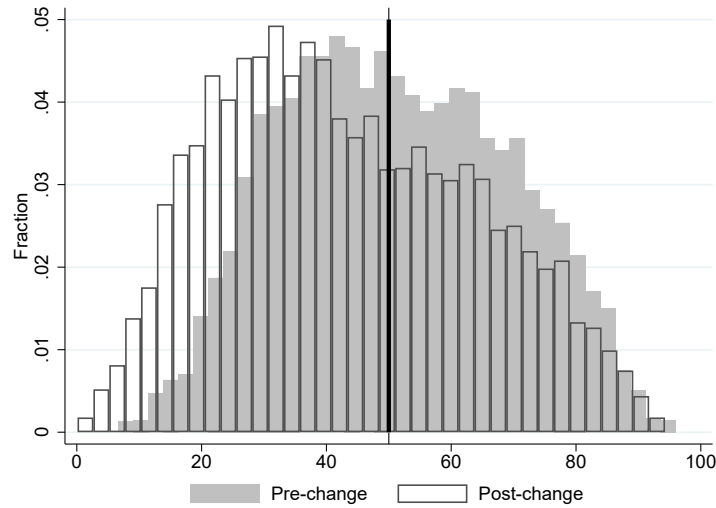
Panel B: Changes of firms' Refinitiv ESG scores resulting from Refinitiv's 2020 methodology change
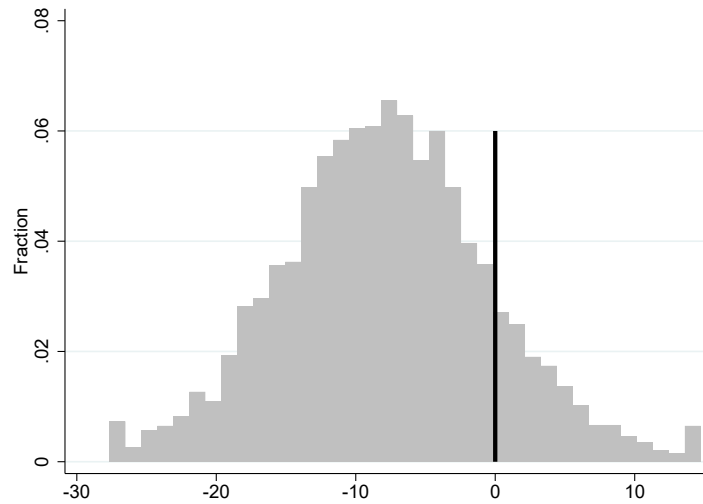
Figure 2: Monthly frequencies of firms' fiscal year ends in sample dataset

The figure displays monthly frequencies of firms' fiscal year ends in our sample. The black bars represent observations used to calculate $\Delta ESG\ Score$ from our February 2020 data download, comprising mainly December 2018 observations, with additional data from early 2018 or 2019. Light grey bars denote observations not available to investors in 2020, reflecting periods prior to Refinitiv's 2020 methodology change, implying no further ESG disclosure adjustments by firms. The dark grey bars indicate observations treated as post-adjustment, with an end-of-May 2020 cutoff chosen to allow firms time to react.
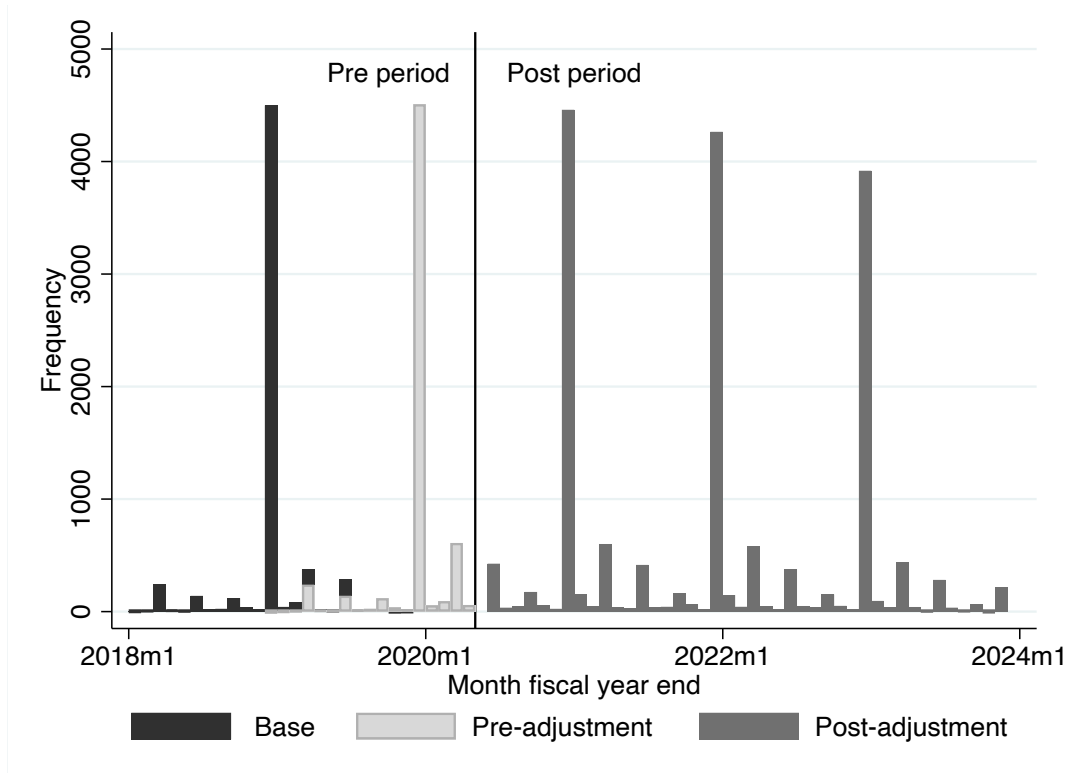
Figure 3: Coefficient estimates for Refinitiv ESG scores over years

This figures presents the coefficient estimates of four different regressions on the firm's Refinitiv ESG score and its three sub-pillars on environment, social and governance for the period of 2018–2023. The regression includes firm and year fixed effects. The 95% confidence intervals is displayed in the figure.
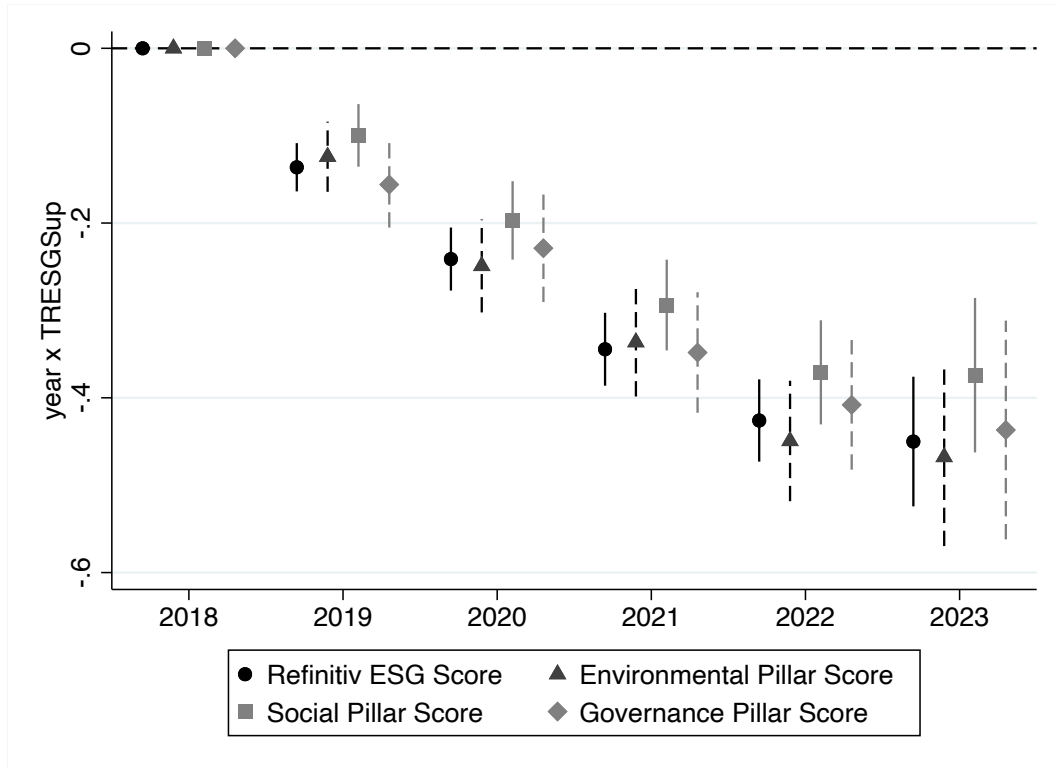
Figure 4: Coefficient estimates S&P Global ESG scores over years

This figures presents the coefficient estimates of four different regressions on the firm's S&P Global ESG scores, the firm's S&P Global Environmental Score, the firm's S&P Global Social score, and the firm's S&P Global Governance score for the period of 2018–2023. The regression includes firm and year fixed effects. The 95% confidence intervals is displayed in the figure.
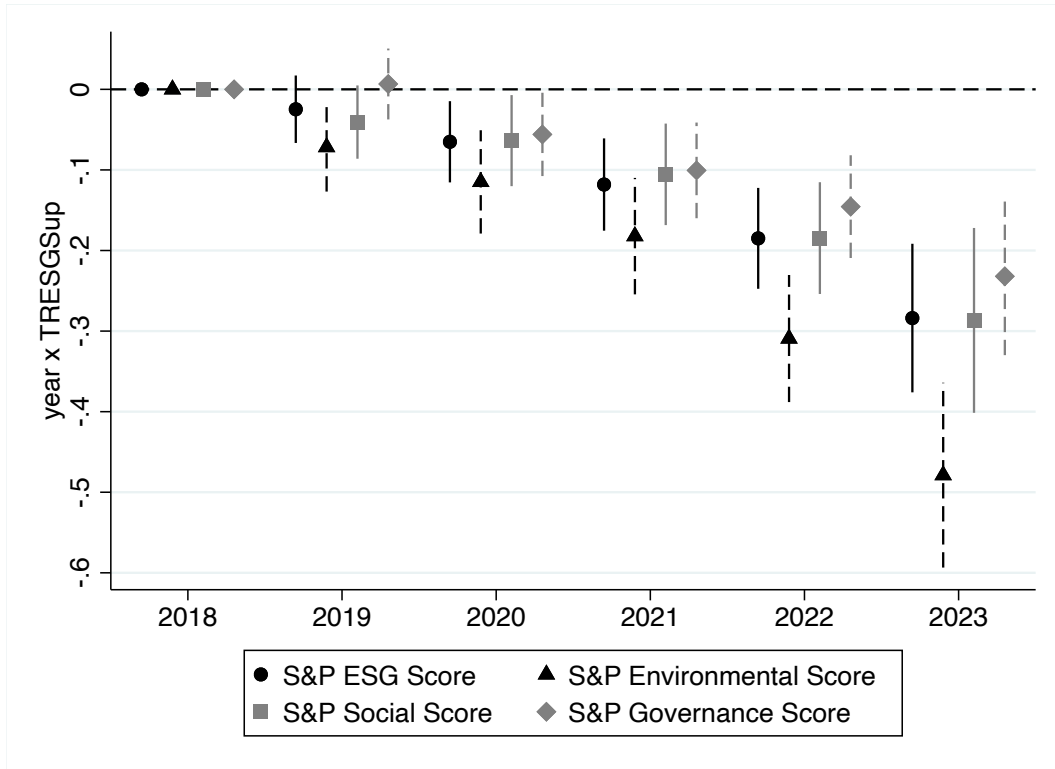
Figure 5: ESG initiative trends conditional on Refinitiv's ESG score revision

This figures presents the percentage of firms which publish a CSR/Sustainability report, have a CSR/Sustainability Committee, respond to S&P Global ESG surveys, and are signatory of the Global Compact, conditional on how the firm's Refinitiv ESG score changed due to Refinitiv's methodology change in 2020. Variables are obtained from Refinitiv and S&P Global, respective and definitions are provided in Table A-1.
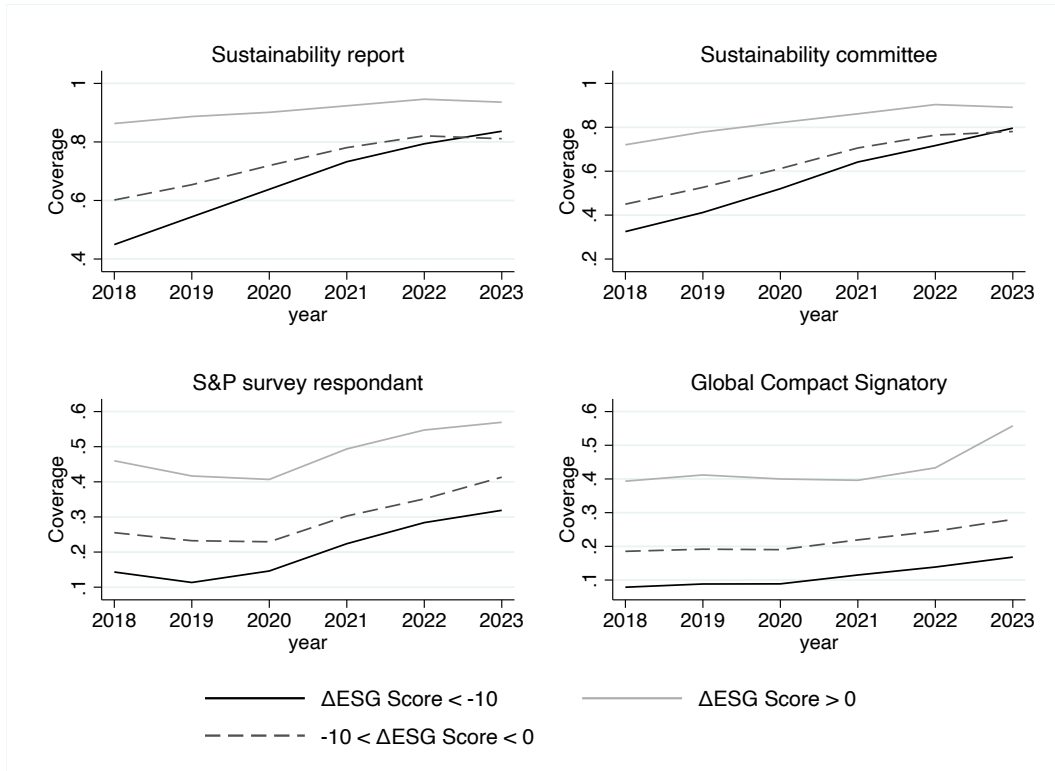
Figure 6: Underlying ESG items conditional on Refinitiv's ESG score revision

This figure presents the number of Boolean items with a positive polarity from 2018–2021, conditioned on firms' ESG score revisions resulting from Refinitiv's 2020 methodology change. Variables are calculated as Boolean variables with positive polarity having a value of 1 divided by the total number of items available. Refinitiv ESG scores are based on 178 items of which are 107 are Boolean and a positive polarity, split in 38 from the environmental pillar, 40 from the social pillar, 29 from the governance pillar, respectively. Variable definitions are provided in Table A-1.
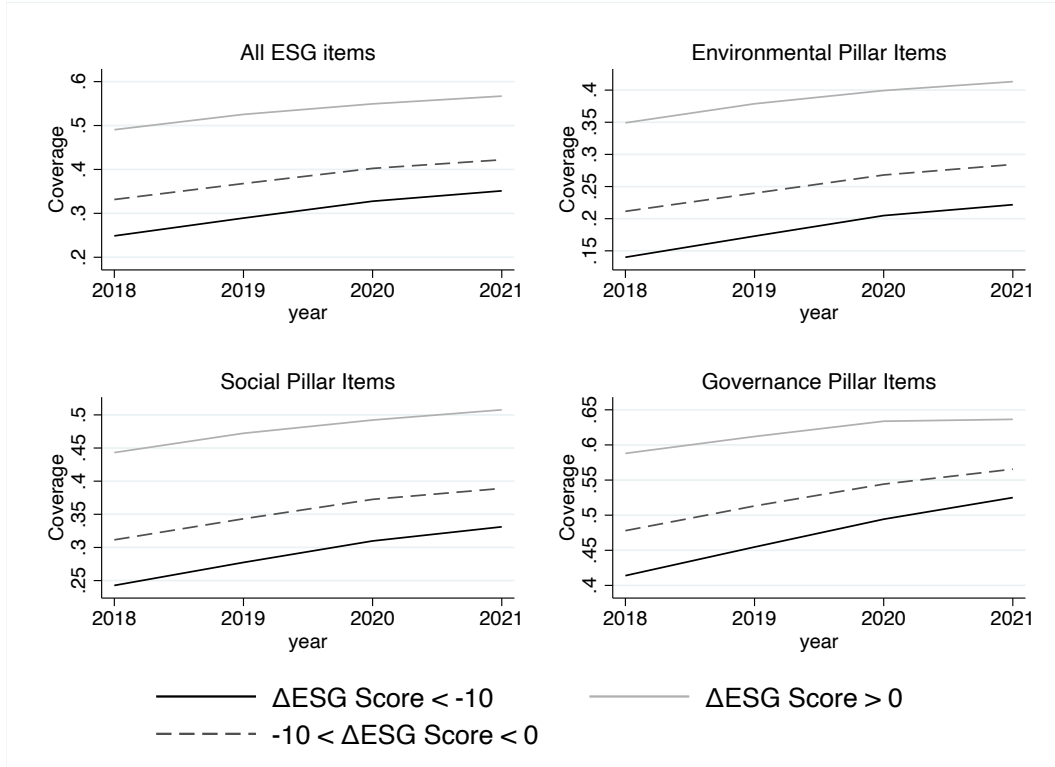
Figure 7: Carbon emission intensity conditional on Refinitiv's ESG score update

This figure presents the carbon emission intensity, conditioned on firms' ESG score revisions resulting from Refinitiv's 2020 methodology change. We follow Bolton and Kacperczyk (2021, 2023) and categorize carbon emissions into all direct external environmental impacts of a company (GHG), direct emissions from production under the firm's control (Scope 1), indirect emissions from the consumption of purchased electricity, heat, or steam (Scope 2), and other indirect upstream emissions from activities such as the production of purchased materials, product use, waste disposal, and outsourced activities (Scope 3). Carbon emission intensity is scaled by revenues and is obtained from S&P Trucost. Variable definitions are provided in Table A-1.
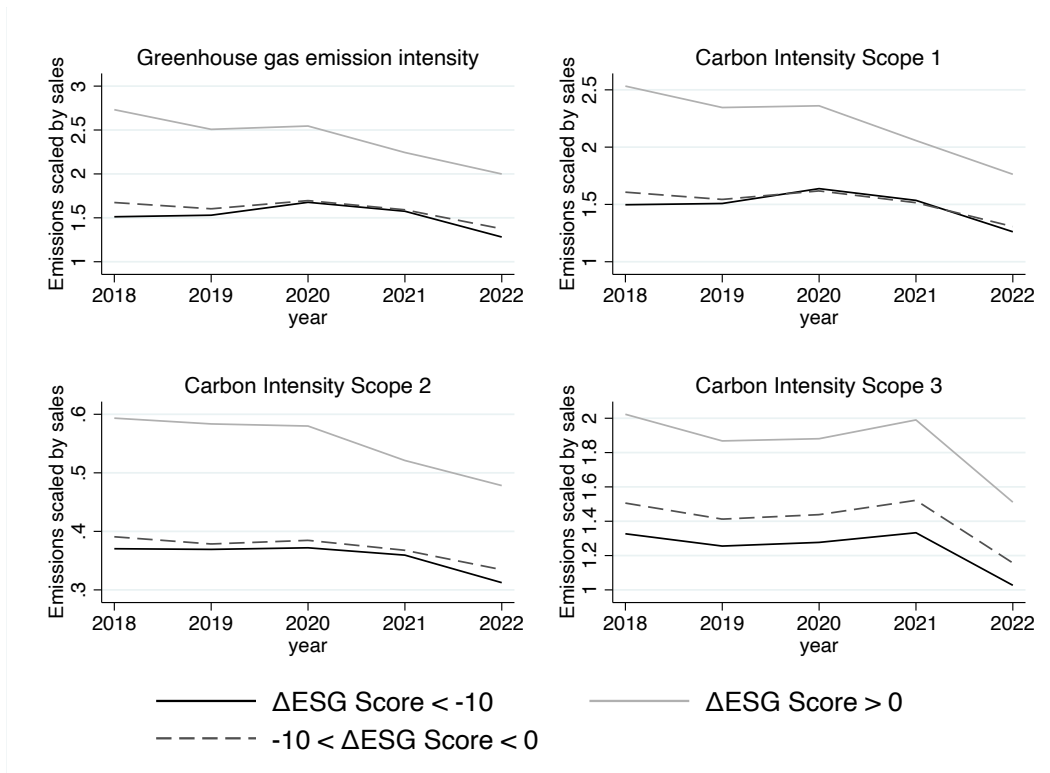
Variable	Definition	Source
Refinitiv ESG variables		
ESG Score	The firm's overall Refinitiv's company score (item *TRESGS*), downloaded after Refinitiv's methodology change.	Refinitiv
ESG Combined Score	The firm's overall Refinitiv's company score (item *TRESGCS*) with an ESG Controversies overlay, downloaded after Refinitiv's methodology change.	Refinitiv
Environmental Pillar Score	The firm's Refinitiv's Environment Pillar Score (item *TRESGS*), downloaded after Refinitiv's methodology change.	Refinitiv
Social Pillar Score	The firm's Refinitiv's Social Pillar Score (item *SOSCORE*), downloaded after Refinitiv's methodology change.	Refinitiv
Governance Pillar Score	The firm's Refinitiv's Governance Pillar Score (item *CGSCORE*), downloaded after Refinitiv's methodology change.	Refinitiv
ΔESG Score	The difference in the firm's overall ESG company score of the firm's last fiscal year due to Refinitiv's methodology update.	Refinitiv
Post	Binary variable defined as 1 if the ESG score is after the methodology change, and 0 otherwise	Refinitiv
S&P Global ESG variables		
S&P ESG Score	The firm's S&P Global ESG score (item *367810*).	S&P Global
S&P Environmental Score	The firm's S&P Global environmental score (item *367811*).	S&P Global
S&P Social Score	The firm's S&P Global social score (item *367813*).	S&P Global
S&P Governance Score	The firm's S&P Global governance and economic score (item *367815*).	S&P Global
ESG incentive variables & underlying data item variables		
CSR Sustainability Reporting	Binary variable defined as 1 if the company publishes a separate sustainability report or publishes a section in its annual report on sustainability (item *CGVSDP026*), 0 otherwise.	Refinitiv
CSR Sustainability Committee	Binary variable defined as 1 if the company has a CSR comittee or team (item *CGVSDP005*), 0 otherwise.	Refinitiv
S&P Survey Respondent	Binary variable defined as 1 if the S&P Global is based on a survey response of the firm, 0 if the rating is based on a public assessment.	S&P Global
Global Compact Signatory	Binary variable defined as 1 if the firm is a signatory of the Global Compact (item *CGVSO03S*), 0 otherwise.	Refinitiv
ESG Item Ratio	Ratio of all Boolean variables with positive polarity having a value of 1 divided by the total number of all ESG items available (107).	Refinitiv
Environmental Pillar Item	Ratio of Boolean variables with positive polarity in the environmental pillar having a value of 1 divided by the total number of all environmental pillar items available (38).	Refinitiv

Variable	Definition	
Social Pillar Item	Ratio of Boolean variables with positive polarity in the social pillar having a value of 1 divided by the total number of all social pillar items available (40).	Refinitiv
Governance Pillar Item	Ratio of Boolean variables with positive polarity in the governance pillar having a value of 1 divided by the total number of all governance pillar items available (38).	Refinitiv
Greenhouse gas variables		
Greenhouse gas emissions	Logarithm of greenhouse gas emissions generated from burning fossil fuels and production processes which are owned or controlled by the company measured in CO2e.	S&P Global Trucost
Carbon Emissions Scope 1	Logarithm of carbon emissions Scope 1 measured in tons CO2e.	S&P Global Trucost
Carbon Emissions Scope 2	Logarithm of carbon emissions Scope 2 measured in tons CO2e.	S&P Global Trucost
Carbon Emissions Scope 3	Logarithm of carbon emissions Scope 3 measured in tons CO2e.	S&P Global Trucost
Greenhouse gas emission intensity	Greenhouse gas emissions from sources that are owned or controlled by the company relative to the company's revenue.	S&P Global Trucost
Carbon Intensity Scope 1	Greenhouse gas emissions from sources owned or controlled by the firm relative to the company's revenue (Scope 1), winsorized at 2.5%.	S&P Global Trucost
Carbon Intensity Scope 2	Greenhouse gas emissions from the consumption of purchased electricity, heat, or steam by the company, relative to the company's revenue (Scope 2), winsorized at 2.5%.	S&P Global Trucost
Carbon Intensity Scope 3	Greenhouse gas emissions from other upstream activities not covered in scope 2 relative to the company's revenue, winsorized at 2.5%.	S&P Global Trucost
Firm control variables		
TotalAssets	Logarithm of the firm's total asset in USD (item *WC02999*), lagged by one year and winsorized at 1%.	Refinitiv
Leverage	Ratio of the firm's total debt (item *WC03255*) divided by the firm's total asset (item *WC02999*), lagged by one year and winsorized at 1%.	Refinitiv
ROA	The firm's return on assets (item *WC08326*), lagged by one year and winsorized at 1%.	Refinitiv
Tangibility	Ratio of property, plant, and equipment (item *WC02501*) divided by total assets (item *WC02999*), lagged by one year and winsorized at 1%.	Refinitiv

Note: This tables provides the variables and the variable descriptions that are used across the paper.

Figure A-1: Missing ESG items conditional on Refinitiv's ESG score revision

This figure presents the number of missing Boolean items with a positive polarity from 2018–2021, conditioned on firms' ESG score revisions resulting from Refinitiv's 2020 methodology change. Variables are calculated as missing Boolean variables with positive polarity divided by the total number of items available. Refinitiv ESG scores are based on 178 items of which are 107 are Boolean and a positive polarity, split in 38 from the environmental pillar, 40 from the social pillar, 29 from the governance pillar, respectively. Variable definitions are provided in Table A-1.