ESG Reporting Divergence*

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Abstract

In this paper, we provide the first large-sample empirical analysis of the consequences of ESG reporting divergence among U.S. firms. We construct and validate an ESG reporting divergence measure based on the dissimilarities in ESG reporting across firms. We find it to be lower for firm-pairs using the same ESG reporting framework, with similar size, and with similar ESG performance than for other firm-pairs. We find that ESG reporting divergence is positively associated with ESG rating disagreement and weakens the positive association between ESG ratings and ESG fund allocation. These results indicate that ESG reporting divergence reduces the usefulness of ESG reporting for ESG rating providers and ESG fund managers. Furthermore, we find that ESG reporting divergence reduces investors' reaction to negative ESG news. Finally, we corroborate our findings using a sample of U.S. firms that are likely affected by the EU ESG reporting regulation.

Keywords: ESG reporting divergence, ESG rating disagreement, ESG fund, ESG reporting regulation

JEL classifications: G24, M14, M41, M48, Q56

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1. Introduction

In November 2021, the International Accounting Standards Board announced the formation of the International Sustainability Standards Board (ISSB) with the mission of setting sustainability disclosure standards and improving the comparability and transparency of ESG reporting. When explaining the necessity of sustainability reporting proposals, the ISSB states that "These proposals respond to calls for more consistent, complete, *comparable* and verifiable sustainability-related financial information (ISSB S1 Exposure Draft, page 5, emphasis added)." [1] In March 2022, the SEC proposed rules to enhance and standardize climate-related disclosures, with the objectives being to "standardize the process so investors find it easier to make comparisons." [2] Against this backdrop of increasing demand for comparable ESG reporting, it is important to understand the status quo of ESG reporting divergence and more importantly, its potential consequences on users of ESG reporting.[3] In this paper, we take the first step in documenting the divergence of ESG reporting among U.S. firms and examining the potential adverse consequences of such divergence.

Due to the voluntary nature of ESG reporting in the U.S., firms can decide what to report about their ESG activities (Christensen, Hail, and Leuz 2021).[4] Some firms follow a specific reporting framework, while others do not. Even the firms that follow a reporting framework use different ESG reporting frameworks under the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the Task Force on Climate-Related Financial Disclosures (TCFD). These reporting frameworks differ in scope, topic coverage,

[1] See: https://www.ifrs.org/content/dam/ifrs/project/general-sustainability-related-disclosures/exposure-draft-ifrs-s1-general-requirements-for-disclosure-of-sustainability-related-financial-information.pdf
[2] See: https://www.wsj.com/articles/companies-skewer-secs-climate-disclosures-plan-in-comment-letters-11655834912
[3] Throughout the paper, we use the term "ESG reporting divergence" instead of "ESG reporting comparability" to highlight the heterogeneity in voluntary ESG reporting and its potential adverse consequences.
[4] Firms also have discretion in *how* to report ESG information. Some firms prepare standalone ESG reports, while others disclose ESG information in their regulatory filings such as 10K filings (Kimbrough, Wang, Wei, and Zhang 2022; SEC 2022). The divergence in ESG reporting venue and format can also increase information processing costs for users. However, an analysis of the divergence in ESG reporting venue and format is beyond the scope of this paper.

targeted audience, and materiality approach. According to a recent report by the Governance & Accountability Institute, of the S&P 500 firms that reported ESG information in 2020, 59% followed the GRI standards, 45% mentioned or aligned with the SASB standards, and 23% mentioned or aligned with the TCFD recommendations.[5]

The lack of comparable ESG information across firms increases the costs of information acquisition and processing for ESG rating providers and ESG fund managers. In a 2017 CFA Institute survey of 1,588 portfolio managers and research analysts, 50% of the respondents stated that a lack of comparability across firms limits their ability in using ESG information in investment decisions.[6] To the extent that less comparable ESG reporting reduces the overall quality of, and thus ESG rating providers' reliance on, publicly available ESG information, it can increase the disagreement in ESG ratings across rating providers. Therefore, we predict that ESG reporting divergence is positively correlated with ESG rating disagreement. Furthermore, ESG fund managers use ESG information and ESG ratings to make portfolio allocation decisions. The lack of comparable ESG information across firms and the disagreement in ESG ratings across rating providers are frequently regarded as important impediments to ESG investing.[7] To the extent that ESG reporting divergence reduces the usefulness of ESG information and ESG ratings, we expect it to weaken the positive association between ESG ratings and ESG fund allocation.

Nevertheless, ESG reporting is multidimensional in nature. It is unclear whether the comparability of ESG reporting improves its usefulness (Christensen et al. 2021). For example, ESG reporting is used by both investors and other stakeholders (e.g., consumers, employees, and local communities). As a result, ESG reporting needs to respond to the preferences of

[5] Note that firms may adopt multiple reporting frameworks for their sustainability reports. See: https://www.ga-institute.com/fileadmin/ga_institute/images/FlashReports/2021/Russell-1000/G&A-Russell-Report-2021-Final.pdf?vgo_ee=%2B5tojgMNJ7tWZhcJ5hxW1kgwkq9iYAW4%2F%2BofEH9udY0%3D

[6] See: https://www.cfainstitute.org/-/media/documents/survey/esg-survey-report-2017.ashx

[7] See: https://www.wsj.com/articles/esg-fund-managers-look-elsewhere-green-stocks-rise-11651003612

different stakeholders. Furthermore, ESG reporting covers a wide range of topics including carbon emission, employee satisfaction, and anticorruption, making it difficult to compare ESG reporting across firms. In addition, ESG rating providers likely have different objectives (Larcker, Pomorski, Tayan, and Watts 2022). Lastly, Christensen, Serafeim, and Sikochi (2022) find that more ESG disclosure leads to an increase instead of a decrease in ESG rating disagreement, suggesting that rating providers' subjectivity in interpreting ESG information increases as firms expand their ESG disclosures. Therefore, whether ESG reporting divergence has adverse consequences on ESG rating disagreement and the association between ESG ratings and ESG fund allocation is ultimately an empirical question.

To capture the divergence of ESG reporting across firms, we measure the extent to which a firm reports a different set of ESG items relative to its industry peers. We start with the raw ESG reporting data collected by Bloomberg and create a vector of 122 ESG reporting items for each firm-year based on whether a given ESG activity is disclosed by the firm. We then calculate the Tanimoto similarity between a firm's ESG reporting vector and that of each of its industry peers to construct a firm-pair-year level measure of divergence.[8] The Tanimoto similarity between two firms is the ratio of the number of ESG reporting items disclosed by both firms to the number of ESG reporting items disclosed by at least one firm in the pair. The lower the Tanimoto similarity, the more divergent the two firms' ESG reporting is. Finally, we create a firm-year level measure of ESG reporting divergence (*ESG_Diverg*) as one minus the mean of the firm-pair-year level Tanimoto similarity at the industry level for the focal firm.[9]

We conduct various tests to validate our ESG reporting divergence measure at the firm-pair-year level. Specifically, we demonstrate that the ESG reporting divergence measure is lower for firm-pairs using the same ESG reporting framework than for those using different

[8] Tanimoto similarity is suitable to measure the similarity between binary-valued vectors. It ranges from 0 to 1 and is frequently used in information retrieval and biology taxonomy (Han, Kamber, and Pei 2012).
[9] Our results are qualitative similar if we use the median of the firm-pair-year level Tanimoto similarity.

frameworks, consistent with the notion that the same ESG reporting framework provides standardized ESG disclosure guidelines for adopting firms. The ESG reporting divergence measure is also lower for firm-pairs with similar sizes than for those with different sizes, consistent with firms with similar sizes having similar costs and benefits of reporting ESG activities (e.g., Matsumura et al. 2014). Lastly, we find that the ESG reporting divergence measure is lower for firm-pairs with similar ESG performance than for those with different ESG performance, consistent with the finding in prior research that ESG performance is an important determinant of ESG reporting (e.g., Clarkson et al. 2008).

Using the firm-year level measure of ESG reporting divergence for a sample of U.S. firms over the period of 2006-2020, we first examine the impact of ESG reporting divergence on ESG rating disagreement. To capture ESG rating disagreement, we follow prior studies (e.g., Berg, Kölbel, and Rigobon 2022) and calculate the standard deviation of ESG ratings from five ESG rating providers: Morgan Stanley Capital International (MSCI), Refinitiv, Sustainalytics, Moody's (previously Vigeo Eiris), and Standard and Poor's (previously RobecoSAM). Consistent with our prediction, we find a significantly positive association between ESG reporting divergence and ESG rating disagreement. A one-standard-deviation increase in ESG reporting divergence is associated with a 2.4% increase in ESG rating disagreement compared with its sample mean. The positive association also holds for each of the three individual pillars, environmental (E), social (S), and governance (G). This finding suggests that when a firm's ESG reporting diverges from its industry peers, it is more difficult for ESG rating providers to process the firm's ESG information and benchmark it against its peers, leading to greater ESG rating disagreement among ESG rating providers.

Because ESG ratings play an important role in guiding the portfolio allocation of ESG oriented funds, our next set of analyses focuses on whether ESG reporting divergence affects the usefulness of ESG ratings in ESG fund allocation. We find that the positive association

between ESG fund allocation to a firm and its ESG ratings is attenuated when the firm's ESG reporting divergence is high. In terms of economic magnitude, a one-standard-deviation increase in *ESG_Diverg* reduces the sensitivity of ESG fund holdings to ESG ratings by 33% of the base sensitivity when *ESG_Diverg* is at the sample mean. This finding suggests that ESG reporting divergence increases the information processing costs for ESG fund managers and adversely affects the efficiency of ESG fund allocation with respect to firms' ESG performance.

We conduct a number of sensitivity tests to ensure the robustness of the results. First, in our main analyses, we use the SASB's Sustainable Industry Classification System (SICS) to identify industry peers. In an additional analysis, we use the four-digit Standard Industrial Classification (SIC) codes as an alternative classification of industries. Our results continue to hold.

Second, one potential concern with our ESG reporting divergence measure is that it captures the heterogeneity in firms' ESG activities instead of the heterogeneity in firms' ESG reporting of these activities. To address this concern, we compare firms' ESG reporting divergence within the same industry and control for the heterogeneity in firms' ESG activities (proxied by industry-year adjusted ESG performance) throughout the analyses. To further address this concern, we show that our results are robust to the inclusion of firm fixed effects, which controls for unobservable time-invariant firm characteristics that may affect ESG activities. In addition, industry peers with different sizes may engage in different ESG activities and thus disclose different sets of information relative to each other. In another sensitivity analysis, we use industry peers with similar sizes to construct ESG reporting divergence measures. The inferences remain the same.

Finally, another potential concern is that our results may be driven by firms that disclose very little ESG information and thus diverge significantly in ESG reporting from industry

peers. To mitigate this concern, we remove firm-year observations whose ESG disclosure scores are smaller than or equal to the 10th percentile and whose ESG reporting divergence measures are larger than or equal to the 90th percentile in the sample. The results remain the same.

We conduct two sets of additional analyses to corroborate our findings. First, investors rely on ESG news to update their beliefs about firms' ESG performance (Krüger 2015; Serafeim and Yoon 2022). To the extent that ESG reporting divergence reduces investors' ability to process ESG information and compare ESG performance across firms, higher ESG reporting divergence can reduce investors' ability to interpret negative ESG news and lead to a weaker market reaction to negative ESG news. We thus examine whether ESG reporting divergence weakens the market reaction to negative ESG news. Using negative ESG news compiled by RepRisk, we find that ESG reporting divergence attenuates the negative market reaction to negative ESG news. This finding is consistent with ESG reporting divergence increasing the difficulty in interpreting ESG news for investors, leading to weaker market reaction to negative news (Miller 1977; Li and Tan 2022).

Second, we explore whether the passage of the European Union's (EU) ESG reporting regulation has a spillover effect on U.S. firms in industries that have high proportions of firms with subsidiaries in the EU. We find that firms in such industries experience a decline in ESG reporting divergence in the post-regulation period relative to firms in other industries. The decline in ESG reporting divergence is driven by environmental reporting. Furthermore, we find that ESG rating providers disagree less over the environmental performance of high EU-exposure U.S. firms and that the efficiency of ESG fund allocation based on environmental ratings also improves in the post-regulation period. These results suggest that the EU's ESG reporting regulation has a positive spillover effect on U.S. firms in the industries with more firms operating in the EU and provide initial evidence on the potential benefits of mandatory

ESG reporting in the U.S.

Our paper contributes to the literature in three important ways. First, our results have important policy implications. While academics, industry practitioners, and regulators have debated on mandating ESG reporting in the U.S. and worldwide (Christensen et al. 2021; SEC 2022), we provide empirical evidence on the existence of considerable divergence in ESG reporting among U.S. firms and the adverse consequences of such divergence. Our results thus support the ISSB's proposals on sustainability reporting and the SEC's proposal on climate-related disclosures, both of which can arguably improve the comparability of ESG reporting across firms.

Second, we add to the growing literature that examines ESG rating disagreement among rating providers. Several recent studies have documented disagreements in ESG ratings, as well as the determinants and consequences of such disagreements (e.g., Berg et al. 2022; Chatterji, Durand, Levine, and Touboul 2016; Christensen et al. 2022; Kimbrough et al. 2022). For example, Christensen et al. (2022) find that greater ESG disclosure is associated with larger ESG rating disagreement, which then leads to higher return volatility, larger absolute price movements, and a lower likelihood of obtaining external financing. Their findings suggest that greater ESG disclosure reduces the usefulness of ESG ratings. Avramov et al. (2022) analytically and empirically show that ESG-sensitive investors reduce their demand for green assets when there is uncertainty about firms' ESG performance, as proxied by ESG rating disagreement. Holding the level of ESG disclosure constant,[10] our study adds to this line of literature by documenting the consequences of divergent ESG reporting in increasing ESG rating disagreement and reducing the efficiency of ESG fund allocation with respect to firms' ESG performance.

Lastly, our study extends the literature on financial reporting comparability (e.g., De

[10] We control for the level of ESG disclosure throughout our analyses.

Franco, Kothari, Verdi 2011; Barth, Landsman, Land, and Williams 2012). For example, De Franco, Kothari, Verdi (2011) document benefits of financial statement comparability for users of financial reporting (i.e., financial analysts). To the best of our knowledge, this study is the first to construct an empirical measure of nonfinancial reporting divergence and examine its adverse consequences for users of nonfinancial reporting (i.e., ESG rating providers and ESG fund managers).

2. Empirical Measures of ESG Reporting Divergence

In this section, we first explain the terms used in the paper – ESG activity, ESG performance, ESG reporting, and ESG reporting divergence. We then describe how we construct our empirical measure of ESG reporting divergence and report validity tests for the measure.

2.1 ESG activity, ESG performance, and ESG reporting divergence

ESG activities refer to firms' activities in the environmental, social, or governance area. For example, the most common activities in the environmental area include cutting greenhouse gas emission, the use of renewable energy, and the conservation of environment (e.g., the consumption of energy and water). The most common activities in the social area are related to employee welfare and well-being, including employee safety, training, and pay, as well as the equality in terms of gender and ethnic groups. The most common activities in the governance area relate to the size and composition of the board of directors and its committees, including the independence, female representation, and minority representation of the board.

ESG performance refers to a firm's performance in the environmental, social, and governance areas. For example, lower greenhouse gas emissions, reduced consumption of energy and water, lower incidence rate for employees, better employee training, higher board independence imply better ESG performance. Given a lack of standards and information,

market participants and researchers typically use ESG ratings to measure a firm's ESG performance.

While some countries such as the UK and EU members have started to require certain firms to provide disclosures on certain ESG activities, ESG reporting in the U.S. is voluntary. As such, U.S. firms can decide what to report about their ESG activities. Large firms are more likely to provide ESG reporting than small firms. For example, while about 92% of S&P 500 firms provided ESG reporting in 2020 based on a report by the Governance & Accountability Institute, only 70% of Russel 1000 firms reported on ESG activities in 2020. While some firms follow a specific reporting framework, others do not, as noted in the Introduction section.

In this paper, ESG reporting divergence refers to the differences in the reporting of ESG activities across firms. In the construction of the measure for ESG reporting divergence, we focus on the most rudimentary differences in the reporting of ESG activities – their recognition: provided that both firms undertake a specific ESG activity, whether both firms report the activity in ESG reports, sustainability reports, or website disclosures. For example, as reported in Appendix A, Advanced Micro reported the usage of renewable energy in 2020, Intel did not. While Intel reported water consumption, Advanced Micro did not. Similarly, only Advanced Micro reported information on employee turnover, and only Intel reported information about employee training in 2020. We do not consider whether firms differ in the measurement of a particular ESG activity when they report such information. For example, both Advanced Micro and Intel reported scope 1, scope 2, and scope 3 greenhouse gas emissions in 2020, they likely differed in the measurement and estimation, which we do not capture due to a lack of information. As such, our empirical measure of ESG reporting divergence underestimates the differences in ESG reporting across firms, and thus the documented adverse consequences of ESG reporting divergence represent a lower bound estimate.

2.2 Construction of the ESG reporting divergence measure

Because most of the ESG activities, which determine the content of ESG reporting, are industry specific (Christensen et al. 2021), we focus on ESG reporting divergence across firms within the same industry. In particular, we measure the difference in a firm's reporting of ESG items relative to its industry peers. The intuition behind the measure is that the heterogeneity in the availability of relevant ESG items impedes ESG information users' ability to compare the reported ESG activities across firms. We rely on the raw ESG reporting data collected by Bloomberg from firms' sustainability reports, annual reports, and corporate websites to identify whether a firm publicly discloses an ESG activity.[11] Bloomberg provides 122 standardized reporting fields for all firms in its universe of covered firms, which facilitates the comparison of ESG reporting items across firms.[12] Please see Appendix A for the list of the 122 items.

To construct the measure of ESG reporting divergence, we first create a 122 × 1 vector with indicators that represent the availability of each ESG reporting item for a firm-year as follows:

$$v_{it} = (d_{it,1}, d_{it,2}, \dots, d_{it,121}, d_{it,122})$$

where $d_{it,k}, k \in [1,122]$, is a dummy variable indicating whether the k^{th} reporting field is disclosed by firm i in year t. For binary reporting fields (e.g., whether a firm has discussed climate change risk), we code "Y" as 1 and "N" as 0. For quantitative fields (e.g., greenhouse gas scope 1 emission), we code the reported numerical values as 1 and "NA" as 0. Thus, v_{it} represents the set of ESG information that firm i discloses in year t.

Next, we calculate the Tanimoto similarity of vectors v_{it} and v_{jt} for a pair of firms i and j in year t as follows:

[11] Bloomberg also provides firms' ESG disclosure scores, generated from ESG reporting items with a weight for each reporting item. Prior research, such as Christensen et al. (2022), has used the Bloomberg ESG disclosure score. We use the raw ESG reporting items underlying the disclosure scores to capture firms' ESG reporting.

[12] According to Bloomberg, these reporting fields are selected based on industry agnostic frameworks – Global Reporting Initiative (GRI), Investor Stewardship Group (ISG), as well as other emerging reporting frameworks – Sustainable Finance Disclosure Regulation (SFDR), World Economic Forum (WEF). Arguably, these 122 reporting fields are the most relevant ESG disclosure items from the perspectives of standard setters and investors.

$$Tanimoto\ Similarity_{ijt} = \frac{v_{it} \cdot v_{jt}}{v_{it} \cdot v_{it} + v_{jt} \cdot v_{jt} - v_{it} \cdot v_{jt}},$$

where $v_{it} \cdot v_{jt}$ represents the product of the two vectors. Essentially, the Tanimoto similarity for a firm-pair is the ratio of the number of ESG reporting items disclosed by both firms to the number of ESG reporting items disclosed by at least one firm. The Tanimoto similarity is higher when firms i and j disclose more of the same ESG reporting fields. Compared with the cosine similarity used in prior studies (e.g., Bozanic, Loumioti, and Vasvari 2018), the Tanimoto similarity is more suitable to measure the similarity between binary-valued vectors (Han et al. 2012).

We then measure ESG reporting divergence between firms *i* and *j* in year *t* (ESG_Diverg_{ijt}) as one minus $Tanimoto\ Similarity_{ijt}$:

$$ESG\_Diverg_{ijt} = 1 - Tanimoto\ Similarity_{ijt}$$

The value of ESG_Diverg_{ijt} ranges from 0 to 1, with a value of 0 representing that firms *i* and *j* disclose the same ESG reporting fields and a value of 1 representing that firms *i* and *j* disclose completely different ESG reporting fields. In Appendix A, we use Advanced Micro Devices and Intel as a firm-pair to illustrate the calculation of ESG_Diverg_{ijt}.

Finally, to obtain a firm-year level measure of ESG reporting divergence, ESG_Diverg_{it}, we calculate ESG reporting divergence for each firm i–j pair for all of the other J firms in the same industry (i.e., other than firm *i*) in year t. We then take the mean of the J values of ESG_Diverg_{ijt} as the firm-year level measure of ESG reporting divergence for firm *i* in year *t*, ESG_Diverg_{it}.

We use the same approach to calculate the reporting divergence measures for each of the three ESG pillars: E_Diverg_{it} for the environmental (E), S_Diverg_{it} for the social (S), and G_Diverg_{it} for the governance (G) pillar. There are 46 reporting fields under the E pillar, 46 under the S pillar, and 30 under the G pillar.

In the main analyses, we use the SASB's SICS to define industry classification. The SASB develops industry-specific ESG reporting standards in the U.S. It classifies firms into 77 industries under 11 sectors. We use the SICS industry classification in the main analyses because market participants recognize the importance of the SASB and may use its classification to compare ESG reporting across firms.[13] In addition, the ISSB uses the SICS industry classification in its proposals on sustainability reporting. In a robustness test, we use the four-digit SIC codes as an alternative classification of industries and obtain the same inferences.

2.3 Validation of the ESG reporting divergence measure

As our ESG reporting divergence measure is new to the literature, we investigate its validity at the firm-pair-year level by examining whether it varies systematically with firms' adoption of reporting frameworks, size, and ESG performance. We conduct the validation tests using all firm-pair-year observations with data on ESG reporting divergence measure and the specific variable required for each validation test. First, we expect firm-pairs that adopt the same reporting framework to exhibit a lower level of ESG reporting divergence than those that do not. The intuition underlying this prediction is that the same reporting framework provides standardized ESG disclosure guidelines for adopting firms. We consider a firm-pair as adopting the same reporting framework if (1) both firms *i* and *j* adopt the SASB standard or (2) both firms *i* and *j* adopt the GRI standard.[14] We then compare the level of ESG reporting divergence for firm-pairs adopting the same reporting framework with that for other firm-pairs in our sample. As reported in Panel A of Table 1, the ESG reporting divergence measure, *ESG_Diverg*, is significantly lower for firm-pairs adopting the same reporting framework than

[13] See: https://www.ifrs.org/issued-standards/sasb-standards/

[14] We do not consider whether a firm has adopted the TCFD framework because we do not have such information. However, according to the report by the Governance & Accountability Institute mentioned earlier, only 23% of the S&P 500 firms followed the TCFD recommendations, while 59% of them used the GRI standards and 45% of them adopted the SASB standards.

for other firm-pairs. The *p*-value for the difference in mean *ESG_Diverg* (-0.096) across the two groups of firm-pairs is 0.001. The same holds when we examine the three individual measures of reporting divergence. The difference is the largest for *E_Diverg*, followed by *S_Diverg*, and then by *G_Diverg*.

Second, prior research finds that firm size is an important determinant of firms' disclosure decisions pertaining to management forecast, financial information, and ESG information (e.g., Baginski and Hassell 1997; Allee and Yohn 2009; Matsumura et al. 2014), consistent with the costs and benefits of voluntary disclosures varying with firm size. It thus follows that undertaking the same ESG activities, firms with similar sizes are more comparable to each other in terms of reporting of such activities than those with different sizes. If so, we expect firms with similar sizes to exhibit lower levels of ESG reporting divergence than those with different sizes. We consider firm-pairs in the same extreme size quintiles as having similar sizes and those in the opposite extreme size quintiles as having different sizes. Specifically, we sort firm-pairs into quintiles first based on firm *i*'s size (market capitalization) and then based on firm *j*'s size, resulting in 25 mutually exclusive partitions. We form a group of firm-pairs with both firms in the same extreme quintiles (i.e., both firms in the top or bottom quintile) and a group of firm-pairs with firms in the two opposite extreme quintiles (i.e., one firm in the top and the other in the bottom quintile). We then compare the level of ESG reporting divergence between these two groups. Consistent with our expectation, Panel B of Table 1 shows that *ESG_Diverg* is significantly lower for firm-pairs with similar sizes than for those with different sizes. The difference in means (-0.133) is significantly different from zero at the 0.001 level. We observe similar pattern for reporting divergence in individual pillars. The difference is again the largest for *E_Diverg*. These findings suggest that firms with similar sizes tend to report ESG activities more similarly to each other than those with different sizes.

Finally, we validate our ESG reporting divergence measure based on firms' ESG

performance, proxied by their average ESG ratings from rating providers. This test is based on the conclusion from prior analytical and empirical research that a firm's disclosure decision is affected by firm performance (e.g., Dye 1985; Miller 2002), and this conclusion applies to ESG disclosures as well. For example, Clarkson et al. (2008) document that firms with better environmental performance disclose more information about environmental activities. Thus, all else equal, firms with similar ESG performance should report similarly to each other compared to those with different ESG performance. To do so, we construct two groups of firm-pairs: firm-pairs in the same extreme ESG performance quintile (both firms in the top or the bottom quintile) versus those in the opposite extreme ESG performance (i.e., one in the top and the other in the bottom quintile). We then compare the difference in mean ESG reporting divergence between these two groups and report the results in Panel C of Table 2. Consistent with our expectation, we find that firm-pairs with similar ESG performance exhibit significantly lower ESG reporting divergence than those with different ESG performance. The difference in mean *ESG_Diverg* (-0.117) is significantly different from zero at the 0.001 level. The differences in means are also significantly different from zero for individual reporting divergence measures.

Taken together, the validity tests show that ESG reporting divergence varies systematically with firms' adoption of ESG reporting frameworks, size, and ESG performance. These results increase our confidence that our measure of ESG reporting divergence captures the heterogeneity in ESG reporting across firms.

3. Hypothesis Development

In this section, we develop hypotheses about the effect of ESG reporting divergence on two sets of primary ESG information users – ESG rating providers and ESG fund managers. For the impact on ESG rating providers, our focus is ESG rating disagreement. For the impact on ESG fund managers, our focus is their fund allocation with respect to ESG performance –

how effectively their fund allocation is tied to firms' ESG performance.

We argue that ESG reporting divergence adversely affects the usefulness of ESG information for users. It is well known that investors make inferences about similarities and differences across comparable firms when making investment decisions. Consequently, the effort exerted by users to compare and analyze ESG information of firms with their peers is higher when ESG information is more divergent across firms than when it is less divergent. That is, when ESG reporting is more divergent across comparable firms, the information processing costs are higher for users. This increase in information processing costs has the following two adverse implications for ESG information users.

First, ESG rating providers rely on both public and private information to evaluate firms' ESG performance and assign ESG ratings (Larcker et al. 2022). When the quality of public information is lower due to more divergent ESG reporting, ESG rating providers will rely less on public information and rely more on their private information, thereby increasing the disagreements among rating providers (e.g., Easley and O'Hara 2004; Garfinkel 2009).

Second, ESG fund managers usually rely on ESG ratings to evaluate firms' long-term ESG performance (Avramov et al. 2022), and ESG fund allocation is more efficient with respect to ESG performance when firms with better ESG performance (i.e., higher ESG ratings) attract more ESG fund holdings (Lacker et al. 2022). Hartzmark and Sussman (2019) show that mutual funds experience an increase in fund inflows when their investments are based on firms' ESG ratings. To the extent that ESG reporting divergence increases the information processing costs for ESG fund managers, they may find it difficult to evaluate firms' ESG performance based on ESG ratings, which are primarily based on public ESG information. Consequently, a higher level of ESG reporting divergence can negatively affect ESG fund allocation efficiency with respect to firms' ESG performance.

Taken together, the above discussions lead to the following two hypotheses (in alternative

form):

H1: Ceteris paribus, ESG reporting divergence is positively associated with ESG rating disagreement.

H2: Ceteris paribus, the association between ESG ratings and ESG fund allocation is weaker for firms with high ESG reporting divergence than for firms with low ESG reporting divergence.

However, we might not find results consistent with the hypotheses for the following reasons. First, ESG reporting has diverse sets of users, such as investors, consumers, employees, and governments (Christensen et al. 2021). As a result, ESG reporting needs to respond to these stakeholders' preferences (Larcker et al. 2022). Given that ESG reporting is multidimensional in nature, it is possible that the comparability in ESG reporting might improve at the cost of less information for some users. Second, one underlying argument for the hypotheses is that a better information environment about ESG performance improves ESG information users' decisions. However, Christensen et al. (2022) find that more ESG disclosures do not reduce ESG rating disagreement, arguably because the subjectivity in rating providers' interpretation of ESG information increases with the level of firms' ESG disclosures. Kim and Verecchia (1994) and Kandel and Pearson (1995) show analytically that public disclosures can lead to a more divergent beliefs among users. Lastly, ESG rating providers use different sets of, measurements of, and weights on ESG attributes to calculate ESG ratings. Berg et al. (2022) argue that the measurement divergence (i.e., different ESG rating providers using different indicators for the same attribute) is the main reason for rating disagreements among ESG rating providers.[15] To the extent that ESG reporting divergence does not affect the measurement divergence, which follows rater- and firm-specific patterns (Berg et al. 2022), it may not affect ESG rating disagreement.

[15] This finding is consistent with that in Cookson and Niessner (2020), who document that disagreement across investors mainly arise from the differing investment models, followed by the differences in information sets.

4. Data and Sample

4.1 Data

To examine the effect of ESG reporting divergence on ESG rating disagreement and ESG fund allocation, we use the firm-year level ESG reporting divergence measures constructed from the raw Bloomberg ESG reporting items, as discussed in Section 2. Bloomberg started to collect firms' ESG disclosures from publicly available sources around 2005. Our initial sample covers 34,132 firm-year observations with non-missing ESG disclosure divergence measures over the period of 2005-2021. We then merge them with ESG ratings from five ESG rating providers for U.S. firms: MSCI, Refinitiv, Sustainalytics, Moody's, and S&P. To facilitate the construction of ESG rating disagreement, we only keep firm-year observations with ESG ratings from at least two out of the five rating providers. Because we only have comprehensive data on ESG ratings from 2006 to 2020, we are left with 15,196 firm-year observations in the period of 2006-2020. Next, we obtain financial information from Compustat, analyst information from IBES, and institutional ownership from Thomson Reuters. The final ESG rating disagreement sample consists of 14,927 firm-year observations over the period of 2006-2020. Table 2 presents the sample selection process.

To construct the ESG fund holding sample, we use the ESG fund list published by Morningstar, which comprises 149 ESG mutual funds. We then obtain data on quarterly fund holdings from Thomson Reuters's Mutual Fund Holdings database and construct firm-year level ESG fund holdings based on the last quarter's fund holdings. After merging the ESG rating disagreement sample with ESG fund holding data, we obtain the final ESG fund holding sample of 12,573 firm-year observations over the period of 2006-2020.

4.2 Descriptive Statistics on ESG Reporting Divergence

Table 3 provides descriptive statistics on ESG reporting divergence measures at the firm-year level. Panel A provides descriptive statistics for the full sample. *ESG_Diverg* has a mean

of 0.316 and a standard deviation of 0.118. For individual pillars, firms tend to diverge more over the reporting of environmental activities than that of social or governance activities, which is reflected in the high mean reporting divergence for environmental activities (0.916). The level of divergence in firms' reporting of social activities is also high, with a mean of 0.600. These statistics suggest that firms report environmental and social activities very differently relative to their industry peers. The divergence in firms' reporting of governance activities is the smallest, with a mean of 0.095. That is, firms report governance activities similar to their industry peers. This result is consistent with U.S. firms subject to extensive reporting requirements on corporate governance, such as comprehensive disclosures on the size and composition of the board of directors.

We also examine whether the divergence of ESG reporting changes over time. In Panel B of Table 3, we present the mean ESG reporting divergence and the three individual reporting divergence measures by year over the sample period. In general, ESG reporting divergence remains stable over time. However, when we examine the time trend of the three individual reporting divergence measures, we observe that while the divergence in firms' reporting of environmental and governance activities remains largely stable over time, the divergence in firms' reporting of social activities is lower in the more recent years than in the earlier years of the sample period. This trend is consistent with the recent regulatory requirement and social pressure on firms to disclose more information on corporate diversity and pay ratio.[16,17]

Panel C of Table 3 presents the ESG reporting divergence by the SASB industry sector. The SASB classifies firms into 77 industries under 11 sectors. There is a large variation in *ESG_Diverg* across industry sectors. The Financials sector has the lowest level of ESG reporting divergence (0.252), while the Renewable Resources & Alternative Energy sector has

[16] See: https://www.sec.gov/news/speech/lee-cii-2020-conference-20200922
[17] See: https://www.sec.gov/news/press-release/2015-160

the highest level of ESG reporting divergence (0.429). Similarly, the individual reporting divergence measures related to environmental, social, and governance activities also vary across industry sectors. The large variation across industry sectors suggests the importance of controlling for industry fixed effects.

5. Main Results

5.1 ESG reporting divergence and ESG rating disagreement

To test whether ESG reporting divergence is positively associated with ESG rating disagreement (hypothesis H1), we estimate the following model:

$$\begin{aligned} ESG\ Rating\ Disagreement_{it} &= a_0 + a_1\, ESG\_Diverg_{it} + a_2\, ESG\ Disclosure_{it} + a_3\, ESG\_Rating_{it} \\ &+ Firm\ Controls + Industry\ FE\ + Year\ FE \\ &+ ESG\ Rater\ Combination\ FE + \varepsilon_{it}\,, \end{aligned} \tag{1}$$

where *ESG Rating Disagreement* is measured as the standard deviation of a firm's ESG ratings from the rating providers. We consider the following five ESG rating providers used in recent studies (e.g., Berg et al. 2022): MSCI, Refinitiv, Sustainalytics, Moody's, and S&P.[18] Following Christensen et al (2022), when a rating provider issues multiple ESG ratings for a firm in a given year, we retain the last rating issued before the firm's fiscal year-end. *ESG_Diverg* is the firm-year level measure of ESG reporting divergence, as explained in Section 2. H1 predicts the coefficient on *ESG_Diverg* (a_1) to be positive.

In the regression, we control for two ESG-related variables. First, we control for the level of ESG disclosure (*ESG Disclosure*) throughout our analyses to distinguish between the effect of ESG reporting divergence and that of ESG disclosure level on ESG rating disagreement. Christensen et al. (2022) find that greater ESG disclosure is associated with larger ESG rating disagreement. Second, a potential concern with our ESG reporting divergence measure is that

[18] Berg et al. (2022) also use ESG ratings from KLD. However, KLD was acquired by MSCI in 2010 and integrated into MSCI's ESG ratings. We multiply MSCI's ratings by 10 to make them comparable to the other ratings.

it might capture the heterogeneity in firms' ESG activities instead of the heterogeneity in firms' ESG reporting of these activities. To address this concern, we control for firms' industry-year adjusted ESG performance (*ESG_Rating*), which serves as a proxy for the heterogeneity in firms' ESG activities, which are unobservable. Specifically, we first calculate the average ESG ratings that firm *i* receives from the five ESG rating providers.[19] We then adjust firm *i*'s average ESG rating by subtracting the industry mean ESG rating that excludes firm *i* in the same year. Thus, ESG_Rating_{it} captures the extent to which firm *i*'s ESG performance deviates from that of its industry peers.

Furthermore, following prior research (e.g., Christensen et al. 2022), we include a set of firm characteristics that may affect ESG rating disagreement: firm size (*Firm Size*), profitability (*ROA*), market-to-book ratio (*MTB*), leverage (*Leverage*), analyst following (*Analysts*), and institutional ownership (*Institutional Ownership*). Appendix B provides detailed definitions of these variables. We winsorize all continuous variables at the 1st and 99th percentiles. Lastly, we include industry, year, and ESG rater combination fixed effects to control for the effects of time-invariant industry characteristics, time trends, and the characteristics of ESG rating providers. We control for ESG rater combination fixed effects because firms are rated by different groups of ESG rating providers.[20] We use robust standard errors clustered by firm to calculate *t*-statistics.

Table 4 reports the summary statistics on regression variables. The average ESG rating disagreement is 13.991. Furthermore, the average environmental rating disagreement is 21.219, which is much higher than the average social (15.255) or governance (14.338) rating disagreement. This result suggests that rating providers disagree more over firms' environmental performance than over their social or governance performance. The average

[19] We standardize ESG ratings from each rating provider by subtracting the sample mean and dividing it by the sample standard deviation.

[20] As we require ESG ratings from at least two rating providers to calculate *ESG Rating Disagreement*, the calculation might be based on two, three, four, or five ratings from different combinations of rating providers.

ESG_Rating is about zero by design. The average ESG disclosure score is about 38, which is lower than that reported in Christensen et al. (2022), likely driven by different samples of the two papers: While we focus on U.S. firms, Christensen et al. (2022) study a sample of international firms from 69 countries. The average firm in our sample has total assets of US$ 24.3 billion, is profitable (*ROA* of 0.06), and has *MTB* of 3.77, *Leverage* of 0.28, and *Institutional Ownership* of 70%. On average, firms in our sample are followed by about 12 equity analysts.

Table 5 reports the results of the effect of ESG reporting divergence on ESG rating disagreement. In Column (1), we examine the relation between the overall ESG reporting divergence and ESG rating disagreement. The coefficient on *ESG_Diverg* is significantly positive at the 5% level, consistent with H1 that ESG reporting divergence is positively associated with ESG rating disagreement. In terms of economic significance, a one-standard-deviation increase in ESG reporting divergence is associated with an increase of 0.332 (= 2.810 × 0.118) in ESG rating disagreement, 2.4% of its sample mean.

For control variables, we find that the coefficient on *ESG_Rating* is significantly positive, suggesting that ESG rating providers tend to disagree more about firms whose ESG performance deviates more from that of industry peers. Furthermore, the coefficient on *ESG Disclosure* is negative and marginally significant. Note that while Christensen et al. (2022) find that greater ESG disclosure is associated with greater ESG rating disagreement using an international sample, Kimbrough et al. (2022) find that ESG rating disagreement is lower for firms that voluntarily issue ESG reports using a U.S. sample. Finally, firm size is negatively associated with ESG rating disagreement, suggesting that ESG rating providers tend to disagree less about large firms' ESG performance.

In Columns (2)-(4) of Table 5, we examine the relation between individual reporting divergence measures and their respective rating disagreement measures. The coefficients on

E_Diverg, *S_Diverg*, and *G_Diverg* are all significantly positive at the 1% level, suggesting that the positive association between ESG reporting divergence and ESG rating disagreement holds for each of the individual pillars. A one-standard-deviation increase in *E_Diverg* (*S_Diverg*, *G_Diverg*) is associated with an increase of 1.368 (0.375, 0.383) in *E_Rating Disagreement* (*S_Rating Disagreement*, *G_Rating Disagreement*), 6.4% (2.5%, 2.7%) of its sample mean.

Taken together, these results suggest that firms with higher divergence in ESG reporting from their industry peers, arguably imposing higher information processing costs on ESG rating providers, have higher ESG rating disagreements.

5.2 ESG reporting divergence and ESG fund allocation

To test whether ESG reporting divergence is negatively associated with the usefulness of ESG ratings in ESG fund allocation (hypothesis H2), we estimate the following regression model:

$$\begin{aligned} ESG\ Fund\ Holding_{it} &= a_0 + a_1\ ESG\_Rating_{it} + a_2\ ESG\_Diverg_{it} \times ESG\_Rating_{it} \\ &+ a_3\ ESG\_Diverg_{it} + a_4\ ESG\ Disclosure_{it} + Firm\ Controls \\ &+ Industry\ FE\ + Year\ FE + ESG\ Rater\ Combination\ FE + \varepsilon_{it}\ , \end{aligned} \tag{2}$$

where *ESG Fund Holding*$_{it}$ is measured as the percentage of firm *i*'s outstanding shares held by ESG mutual funds at the end of year *t*, and *ESG_Rating*$_{it}$ is firm *i*'s average standardized ESG ratings minus the industry mean ESG rating (excluding firm *i*) in year *t*. As higher ESG ratings attract more ESG fund investment (Hartzmark and Sussman 2019), we expect the coefficient on *ESG_Rating* (a_1) to be positive. If ESG reporting divergence negatively affects the usefulness of ESG ratings in ESG fund allocation, we expect the coefficient on the interaction term *ESG_Diverg* × *ESG_Rating* (a_2) to be negative. To facilitate the interpretation of economic magnitudes, we demean *ESG_Diverg* in the analyses of ESG fund holdings. Therefore, the coefficient on *ESG_Rating* captures the association between ESG fund holdings and ESG ratings when *ESG_Diverg* is at the sample mean. We include the same set of control

variables and fixed effects as in Model (1) with one exception: we do not control for institutional ownership since our dependent variable *ESG Fund Holding* and contemporaneous institutional ownership might be affected by the same factors, such as firm performance. In untabulated results, we find that our results are robust to controlling for institutional ownership.

Table 6 reports the regression results. In Column (1), we examine the effect of the overall ESG reporting divergence on the relation between ESG ratings and ESG fund allocation. Consistent with higher ESG ratings attracting more ESG fund investment, the coefficient on *ESG_Rating* (0.092) is significantly positive at the 1% level. More importantly, the coefficient on the interaction term between *ESG_Diverg* and *ESG_Rating* is significantly negative at the 1% level. In terms of economic magnitude, a one-standard-deviation increase in *ESG_Diverg* reduces the sensitivity of ESG fund holdings to ESG ratings by 0.030 (=0.254 × 0.118), 32.6% of the base sensitivity when *ESG_Diverg* is at the sample mean (0.092).[21]

In Columns (2)-(4) of Table 6, we examine the effect of individual reporting divergence measures on the association between the corresponding ESG ratings and ESG fund allocation. We find that the coefficients on *E_Rating* and *S_Rating* are significantly positive and that the coefficients on *E_Diverg* × *E_Rating* and *S_Diverg* × *S_Rating* are significantly negative, consistent with H2. However, as reported in Column (4), while the coefficient on *G_Rating* is significantly positive, the coefficient on its interaction term with *G_Diverg* is insignificant. These results suggest that the negative effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation is driven by the heterogeneity in the reporting of environmental and social activities. The insignificant results for governance reporting divergence are in line with the relatively consistent reporting of corporate governance activities by U.S. firms during our sample period.

[21] In untabulated analyses, we also include an interaction term between *ESG_Diverg* and *ESG Rating Disagreement* and find that the negative coefficient on the interaction term between *ESG_Diverg* and *ESG_Rating* remains significantly negative.

For control variables, firms with stronger financial performance (*ROA*) and higher analyst coverage (*Analysts*) have higher ESG fund holdings, while larger firms have lower ESG fund holdings.

Overall, these results suggest that higher divergence in ESG reporting, particularly in the reporting of environmental and social activities, is associated with reduced usefulness of ESG ratings in ESG fund allocation and thus adversely affects the efficiency of ESG fund allocation with respect to firms' ESG performance.

5.3 Sensitivity tests

In this section, we report results from four sets of sensitivity tests to ensure the robustness of our results. First, in our main analyses, we use the SASB's SICS to identify industry peers. In the first sensitivity check, we use the four-digit SIC codes as an alternative classification of industries. In our sample, there are 283 industries based on the four-digit SIC codes. Columns (1)-(2) of Table 7 present the regression results using four-digit SIC codes to construct ESG reporting divergence measures. Column (1) reports the results for the effect of ESG reporting divergence on ESG rating disagreement. Similar to the results reported in Table 5, we find a significantly positive coefficient on *ESG_Diverg*. Column (2) reports the results for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation. Consistent with those reported in Table 6, we find a significantly negative coefficient on *ESG_Diverg* × *ESG_Rating*, suggesting that ESG reporting divergence reduces the positive association between ESG ratings and ESG fund allocation.

Second, we control for industry fixed effects in our main analyses as ESG activities are largely driven by industry-specific factors and comparing ESG reporting of firms within the same industry is also in line with prior literature on financial reporting comparability (e.g., De Franco et al. 2011). However, to address the concern that the results are confounded by firms' specific ESG activities or time-invariant firm characteristics, we include firm fixed effects

instead of industry fixed effects. We report the regression results in Columns (3)-(4) of Table 7. The inferences remain the same.

Third, industry peers with different sizes may engage in different ESG activities and thus disclose information very differently from each other. To control for the potential confounding effect of firm size on ESG reporting divergence measures, we use industry peers in the same size quintile to construct ESG reporting divergence measures.[22] Columns (5)-(6) of Table 7 report the regression results based on these measures. Column (5) reports the results for the effect of ESG reporting divergence on ESG rating disagreement. Consistent with Table 5, we find a significantly positive coefficient on *ESG_Diverg*. Column (6) reports the results for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation. Consistent with those reported in Table 6, we find a significantly negative coefficient on *ESG_Diverg* × *ESG_Rating*.

Lastly, another potential concern is that our results may be driven by firms that disclose very little ESG information and thus diverge significantly in ESG reporting from industry peers. To address this concern, in Columns (7) and (8) of Table 7, we report the regression results after removing firm-year observations whose ESG disclosure scores are smaller than or equal to the 10th percentile of the sample distribution and whose ESG reporting divergence measures are larger than or equal to the 90th percentile in the sample. We find that our results continue to hold.[23]

6. Additional Analyses

6.1 Market reaction to negative ESG news

Investors update their beliefs about firms' ESG performance based on ESG news (Krüger

[22] Untabulated analyses show that our results are even stronger if we use industry-peers in the same size tercile or quartile to construct ESG reporting divergence measures.
[23] In untabulated results, we remove firm-year observations in the top and bottom quintiles of ESG reporting divergence and find qualitatively similar results.

2015; Serafeim and Yoon 2022). Krüger (2015) shows that investors react negatively to negative ESG news, particularly to the news that conveys adverse information about firms' relation with communities and the environment. To the extent that ESG reporting divergence reduces investors' ability to process ESG information and compare ESG performance across firms, higher ESG reporting divergence can reduce investors' ability to interpret negative ESG news and lead to a weaker market reaction to negative ESG news.

To test this prediction, we use negative ESG incidents compiled by RepRisk to capture firms' negative ESG news. RepRisk screens and identifies material ESG risks that firms face. Using machine learning, RepRisk collects daily negative ESG incidents from 100,000 public sources, including print media, online media, social media, regulators, think tanks, and other online sources. We then merge firms in the ESG rating disagreement sample with those covered in RepRisk to construct the negative ESG news sample, and we only keep the firm-days when there are negative ESG incidents. To rule out confounding news, we remove firm-days with extreme stock market returns (i.e., days on which the firms' cumulative abnormal returns are above 90% or below 10% of the sample distribution). The final sample consists of 36,604 ESG news firm-days from 4,804 firm-years over the period of 2006-2020.

To measure the stock market's reaction to negative ESG news, we use the two-day cumulative abnormal returns around the negative ESG news day multiplied by 100 (*CAR (0, +1))*. Abnormal returns are calculated from a market-adjusted model using the equal-weighted index of the Center for Research in Security Prices (CRSP). Consistent with investors reacting negatively to negative ESG news, the mean of *CAR (0, +1)* is significantly negative (not tabulated).

To test the prediction that higher ESG reporting divergence reduces investors' ability to interpret negative ESG news and leads to a weaker market reaction to negative ESG news, we estimate the following regression model:

$$CAR\ (0,+1)_{it} = a_0 + a_1\ ESG\_Diverg_{it} + a_2\ ESG\ Rating_{it} + a_3\ ESG\ Disclosure_{it} + Firm\ Controls + Industry\ FE + Date\ FE + ESG\ Rater\ Combination\ FE + \varepsilon_{it} \quad (3)$$

The variables are defined as above. We include the same set of control variables as in Model (1) except that we include date instead of year fixed effects because this analysis is conducted at the firm-day level. We expect a positive coefficient on *ESG_Diverg;* that is, the market reaction to negative ESG news is less negative when ESG reporting divergence is higher.

Table 8 reports the regression results. The coefficient on *ESG_Diverg* is significantly positive at the 1% level, suggesting that ESG reporting divergence weakens the negative stock market reaction to ESG incidents.

To rule out the possibility that the relation between ESG reporting divergence and the stock market reaction to negative ESG news is a general phenomenon, we follow prior literature (e.g., Larcker, Ormazabal, and Taylor 2011; Bushee, Gow, and Taylor 2018) and conduct a Monte Carlo simulation analysis of samples of non-ESG news days. Specifically, for each ESG news day of the sample, we randomly select a non-ESG news day for the same firm within the 250-day window around the negative ESG news day, re-estimate Model (3) using this random sample, and obtain a coefficient estimate on *ESG_Diverg*. We repeat these steps 1000 times and obtain a distribution of the coefficient estimate on *ESG_Diverg*. Untabulated analysis indicates that the estimated coefficient on *ESG_Diverg* from the ESG news days (0.414, as reported in Table 8) is significantly different from the mean of the estimated coefficient on *ESG_Diverg* on the randomly selected non-ESG news days (0.081) at the 0.001 level. Thus, this non-parametric test suggests that the relation between ESG reporting divergence and the stock market reaction to negative ESG news is not random and is unique to negative ESG news.

Overall, the results in Table 8 suggest that when firms report ESG information differently from their industry peers, investors discount the information conveyed in negative ESG news.

This finding is consistent with ESG reporting divergence increasing the difficulty in interpreting negative news for investors, leading to weaker market reaction to negative ESG news (Miller 1977; Li and Tan 2022).

6.2 The spillover effect of the EU ESG reporting regulation on U.S. firms

In 2014, the European Union (EU) passed Directive 2014/95, which requires public-interest entities in the EU with more than 500 employees to prepare annual nonfinancial reports (i.e., ESG reports) from fiscal year 2017. The objective of this directive is "to increase the relevance, consistency and *comparability*" of ESG reporting among the EU firms (Directive 2014/95, recital 21, emphasis added).[24] For multinational U.S. firms with operations in the EU, their EU subsidiaries are subject to the EU ESG reporting mandate. To the extent that the subsidiary-level ESG reporting has a spillover effect on the parent-level ESG reporting, the U.S. parent firms' ESG reporting may converge to the requirements under the EU Directive 2014/95. This argument is similar to that in Dyreng, Hanlon, and Maydew (2012) regarding financial reporting; they argue and find that multinational U.S. firms manage earnings less when they have a higher concentration of subsidiaries in foreign countries with a strong rule of law.

To test the spillover effect of EU Directive 2014/95 on U.S. firms, we compare ESG reporting divergence of U.S. firms that belong to an industry with a higher proportion of firms with subsidiaries in the EU, i.e., the treatment firms, versus that of other U.S. firms. Specifically, we conjecture that, when an industry has a sufficiently high number of firms that have material subsidiaries in the EU, the firms within this industry are more likely to follow EU ESG reporting regulation in their ESG reporting and thus exhibit more comparable ESG reporting to their industry peers' (i.e., lower ESG reporting divergence).

To test this conjecture, we collect data on U.S. firms' subsidiaries from Exhibit 21 of

[24] See: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0095

their 10-K filings, where U.S. firms are required to disclose their material subsidiaries.[25] We merge firms in the ESG rating disagreement sample with the data on U.S. firms' subsidiaries. We exclude observations in the transition period (2014-2017) of the EU Directive 2014/95 from the sample and set the pre-regulation period as 2011-2013 and the post-regulation period as 2018-2020. The final sample consists of 6,471 firm-year observations. We then construct an indicator variable, *Treat_Post*, for the treatment firms in the post-regulation period. Specifically, $Treat\_Post_{it}$ takes the value of one if firm *i* belongs to an industry in which the proportion of firms that have subsidiaries in the EU is in the top decile (referred to as high EU-proportion industries) and year *t* is in the post-regulation period, and zero otherwise.

We first examine whether the adoption of the EU ESG reporting regulation affects the overall ESG reporting divergence of U.S. firms in high versus low EU-proportion industries. We include the same control variables and fixed effects as in Model (1). The standalone effects of the treatment and post-regulation indicators are subsumed by the industry and year fixed effects. As reported in Panel A of Table 9, we find a significantly negative coefficient on *Treat_Post,* suggesting that U.S. firms in high EU-proportion industries experience a decline in ESG reporting divergence in the post-regulation period. The decline is also economically significant; the coefficient on *Treat_Post* implies a relative reduction of 19% from the sample mean of *ESG_Diverg* (0.062/0.327=0.19).[26] Figure 1 presents the dynamic effect of the EU ESG reporting regulation on ESG reporting divergence in each year. We observe a significant drop in the overall ESG reporting divergence from 2018 onwards.

In Columns (2) to (4) of Panel A of Table 9, we further examine the effect of the EU ESG reporting regulation on the individual reporting divergence measures. We find that the effect is significantly negative for environmental reporting divergence, but not for social or

[25] We obtained the subsidiary data from Scott Dyreng's website, and we thank him for generously sharing the data with us (https://sites.google.com/site/scottdyreng/Home/data-and-code).
[26] The sample mean of *ESG_Diverg* is 0.327 for the sample used in this analysis.

governance reporting divergence. This result suggests that the spillover effect of EU ESG reporting regulation only applies to environmental reporting.

We then use the EU ESG reporting regulation as a shock to ESG reporting divergence for U.S. firms in high EU-proportion industries to examine the effect of the ESG reporting divergence on ESG rating disagreement and the association between ESG ratings and ESG fund allocation. Because we only observe a reduction in environmental reporting divergence among U.S. firms in high EU-proportion industries, our analysis focuses on environmental reporting. Panel B of Table 9 reports the results. In Column (1), where the dependent variable is environmental rating disagreement, we find a significantly negative coefficient on *Treat_Post*. This result suggests that as the EU ESG reporting regulation reduces environmental reporting divergence among U.S. firms in high EU-proportion industries, the disagreement over firms' environmental performance among ESG rating providers declines. In Column (2) of Panel B, where the dependent variable is ESG fund ownership, we find a significantly positive coefficient on *Treat_Post* × *E_Rating.* This result suggests that the EU ESG reporting regulation improves the efficiency of ESG fund allocation for U.S firms in high EU-proportion industries with respect to firms' environmental performance, relative to those in low EU-proportion industries.

Overall, the results reported above suggest that mandatory EU ESG reporting regulation has a positive spillover effect on U.S. firms in industries with high proportions of firms with subsidiaries in the EU. These results corroborate the main findings and provide initial evidence on the potential benefits of mandatory ESG reporting in the U.S.

7. Conclusion

In this paper, we construct a measure of ESG reporting divergence and document the negative consequences of ESG reporting divergence among U.S. firms. We find that the level of divergence in firms' reporting of environmental or social activities is significantly higher

than that of governance reporting, suggesting that firms report environmental and social activities very differently from their industry peers. In terms of the adverse consequences of such divergence, we find that a higher level of ESG reporting divergence is associated with more ESG rating disagreement among ESG rating providers and weaker association between ESG ratings and ESG fund allocation. These results suggest that ESG reporting divergence increases the information processing costs and adversely affects the usefulness of ESG information to ESG rating providers and ESG fund managers. We also find that a higher level of ESG reporting divergence is associated with weaker market reaction to negative ESG news. Lastly, we corroborate our findings using a sample of U.S. firms that are likely affected by the EU ESG reporting regulation.

Our results have important policy implications. While the European Union has mandated ESG reporting for large public-interest firms since 2014, ESG reporting is still voluntary in the U.S. and many other countries. In November 2021, the ISSB was established to provide sustainability disclosure standards with the objective of improving the comparability and transparency of ESG reporting. In March 2022, the SEC proposed rules to enhance and standardize climate-related disclosures to facilitate the comparison across firms. Our results provide strong empirical support for the ISSB's and the SEC's initiatives on sustainability reporting, which can arguably improve the comparability and thus the usefulness of ESG reporting.

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APPENDIX A
Example of Calculating Firm-Pair Level Measure of ESG Reporting Divergence

This appendix uses ESG reporting information for Advanced Micro and Intel in 2020 as a firm-pair to illustrate how ESG reporting divergence is calculated: Panel A for environmental reporting divergence, Panel B for social reporting divergence, Panel C for governance reporting divergence, and Panel D for the overall ESG reporting divergence. For the two columns under "Advanced Micro" and "Intel" of the first three panels, a value of 1 (0) indicates that the firm reports (does not report) information about the field. Please see Appendix B for variable definitions.

Panel A: Environmental Reporting Divergence (E_Diverg)

Field_ID	Field_Description	Advanced Micro (*i*)	Intel (*j*)	*i*×*j*	*i*×*i*	*j*×*j*
ES007	Nitrogen Oxide Emissions	0	1	0	0	1
ES009	VOC Emissions	0	1	0	0	1
ES010	Carbon Monoxide Emissions	0	1	0	0	1
ES013	Particulate Emissions	0	0	0	0	0
F0949	Sulphur Dioxide / Sulphur Oxide Emissions	0	0	0	0	0
ES036	Emissions Reduction Initiatives	1	1	1	1	1
ES071	Climate Change Policy	0	1	0	0	1
ES105	Climate Change Opportunities Discussed	0	0	0	0	0
ES106	Risks of Climate Change Discussed	0	1	0	0	1
ES001	Direct CO2 Emissions	1	1	1	1	1
ES002	Indirect CO2 Emissions	0	0	0	0	0
ES012	ODS Emissions	0	0	0	0	0
ES076	GHG Scope 1	1	1	1	1	1
ES077	GHG Scope 2	1	1	1	1	1
ES078	GHG Scope 3	1	1	1	1	1
ES255	Scope 2 Market Based GHG Emissions	1	1	1	1	1
ES262	Scope of Disclosure	1	1	1	1	1
ES399	Carbon per Unit of Production	0	0	0	0	0
ES088	Biodiversity Policy	0	1	0	0	1
ES032	Number of Environmental Fines	1	1	1	1	1
ES033	Environmental Fines (Amount)	1	1	1	1	1
SA231	Number of Significant Environmental Fines	1	0	0	1	0
SA359	Amount of Significant Environmental Fines	1	0	0	1	0
ES035	Energy Efficiency Policy	1	1	1	1	1
ES014	Total Energy Consumption	1	1	1	1	1
ES015	Renewable Energy Use	1	0	0	1	0
ES080	Electricity Used	1	1	1	1	1
ES107	Fuel Used - Coal/Lignite	0	0	0	0	0
ES108	Fuel Used - Natural Gas	1	1	1	1	1
ES109	Fuel Used - Crude Oil/Diesel	0	1	0	0	1
ES384	Self Generated Renewable Electricity	0	0	0	0	0
ES494	Energy Per Unit of Production	0	0	0	0	0
ES039	Waste Reduction Policy	1	1	1	1	1
ES019	Hazardous Waste	1	1	1	1	1
ES020	Total Waste	1	1	1	1	1
ES021	Waste Recycled	1	1	1	1	1
ES025	Raw Materials Used	0	0	0	0	0
ES026	% Recycled Materials	0	0	0	0	0
ES104	Waste Sent to Landfills	1	1	1	1	1
ES498	Percentage Raw Material from Sustainable Sources	0	0	0	0	0
ES037	Environmental Supply Chain Management	1	1	1	1	1
ES247	Water Policy	1	1	1	1	1
ES081	Total Water Discharged	1	1	1	1	1
ES082	Water per Unit of Production	0	0	0	0	0
ES269	Total Water Withdrawal	1	1	1	1	1
SA484	Water Consumption	0	1	0	0	1
Total				22	25	30

$E\_Diverg = 1 - Tanimoto\ Similarity = 1 - \frac{22}{25+30-22} = 0.333$

APPENDIX A (cont'd)

Panel B: Social Reporting Divergence (S_Diverg)

Field_ID	Field_Description	Advanced Micro (*i*)	Intel (*j*)	*i*×*j*	*i*×*i*	*j*×*j*
ES059	Human Rights Policy	1	1	1	1	1
ES332	Policy Against Child Labor	1	1	1	1	1
ES369	Quality Assurance and Recall Policy	0	1	0	0	1
ES370	Consumer Data Protection Policy	1	1	1	1	1
ES055	Community Spending	1	1	1	1	1
ES120	Number of Customer Complaints	0	0	0	0	0
ES488	Total Corporate Foundation and Other Giving	1	1	1	1	1
ES058	Equal Opportunity Policy	1	1	1	1	1
ES479	Gender Pay Gap Breakout	0	1	0	0	1
ES046	% Women in Management	1	1	1	1	1
ES047	% Women in Workforce	1	1	1	1	1
ES048	% Minorities in Management	0	0	0	0	0
ES049	% Minorities in Workforce	0	0	0	0	0
ES091	% Disabled in Workforce	0	1	0	0	1
ES480	Percentage Gender Pay Gap for Senior Management	0	0	0	0	0
ES481	Percentage Gender Pay Gap Mid & Other Management	0	0	0	0	0
ES482	Percentage Gender Pay Gap Employees Ex Management	0	0	0	0	0
ES483	% Gender Pay Gap Tot Empl Including Management	0	1	0	0	1
ES484	% Women in Middle and or Other Management	1	1	1	1	1
ES069	Business Ethics Policy	1	1	1	1	1
ES197	Anti-Bribery Ethics Policy	1	1	1	1	1
ES067	Political Donations	1	1	1	1	1
ES057	Health and Safety Policy	1	1	1	1	1
ES052	Fatalities - Contractors	0	1	0	0	1
ES053	Fatalities - Employees	0	1	0	0	1
ES054	Fatalities - Total	0	1	0	0	1
ES092	Lost Time Incident Rate	0	1	0	0	1
ES121	Total Recordable Incident Rate	1	1	1	1	1
ES260	Lost Time Incident Rate - Contractors	0	0	0	0	0
ES261	Total Recordable Incident Rate - Contractors	0	0	0	0	0
SA201	Total Recordable Incident Rate - Workforce	0	0	0	0	0
SA202	Lost Time Incident Rate - Workforce	0	0	0	0	0
ES068	Training Policy	1	1	1	1	1
ES070	Fair Renumeration Policy	0	0	0	0	0
ES043	Number of Employees - CSR	1	1	1	1	1
ES044	Employee Turnover %	1	0	0	1	0
ES045	% Employees Unionized	1	1	1	1	1
ES094	Employee Training Cost	0	0	0	0	0
ES199	Total Hours Spent by Firm - Employee Training	0	1	0	0	1
ES258	Number of Contractors	0	0	0	0	0
ES118	Social Supply Chain Management	1	1	1	1	1
ES116	Number of Suppliers Audited	1	1	1	1	1
ES117	Number of Supplier Audits Conducted	0	1	0	0	1
ES119	Number Supplier Facilities Audited	0	1	0	0	1
ES250	Percentage of Suppliers in Non-Compliance	0	0	0	0	0
ES499	Percentage Suppliers Audited	1	0	0	1	0
Total				19	21	30

S_Diverg = 1- *Tanimoto Similarity* = $1 - \frac{19}{21+30-19} = 0.406$

Appendix A (cont'd)

Panel C: Governance Reporting Divergence (G_Diverg)

Field_ID	Field_Description	Advanced Micro (*i*)	Intel (*j*)	*i*×*j*	*i*×*i*	*j*×*j*
ES101	Audit Committee Meetings	1	1	1	1	1
ES182	Years Auditor Employed	1	1	1	1	1
ES299	Size of Audit Committee	1	1	1	1	1
ES300	Number of Independent Directors on Audit Committee	1	1	1	1	1
ES304	Audit Committee Meeting Attendance Percentage	1	1	1	1	1
SA198	Company Conducts Board Evaluations	1	1	1	1	1
ES061	Size of the Board	1	1	1	1	1
ES065	Number of Board Meetings for the Year	1	1	1	1	1
ES066	Board Meeting Attendance %	1	1	1	1	1
ES194	Number of Executives / Company Managers	1	1	1	1	1
ES284	Number of Non Executive Directors on Board	1	1	1	1	1
SA193	Company Has Executive Share Ownership Guidelines	1	1	1	1	1
SA213	Director Share Ownership Guidelines	1	1	1	1	1
ES305	Size of Compensation Committee	1	1	1	1	1
ES306	Num of Independent Directors on Compensation Cmte	1	1	1	1	1
ES310	Number of Compensation Committee Meetings	1	1	1	1	1
ES311	Compensation Committee Meeting Attendance %	1	1	1	1	1
ES098	Board Age Limit	1	1	1	1	1
ES290	Number of Female Executives	1	1	1	1	1
ES292	Number of Women on Board	1	1	1	1	1
ES294	Age of the Youngest Director	1	1	1	1	1
ES295	Age of the Oldest Director	1	1	1	1	1
ES062	Number of Independent Directors	1	1	1	1	1
ES312	Size of Nomination Committee	1	1	1	1	1
ES313	Num of Independent Directors on Nomination Cmte	1	1	1	1	1
ES317	Number of Nomination Committee Meetings	1	1	1	1	1
ES318	Nomination Committee Meeting Attendance Percentage	1	1	1	1	1
ES073	Verification Type	1	1	1	1	1
ES093	Employee CSR Training	0	1	0	0	1
ES064	Board Duration (Years)	1	1	1	1	1
Total				29	29	30

G_Diverg = 1 - *Tanimoto Similarity* =1 - $\frac{29}{29+30-29}$ =0.033

Appendix A (cont'd)

Panel D: ESG Reporting Divergence (ESG_Diverg)

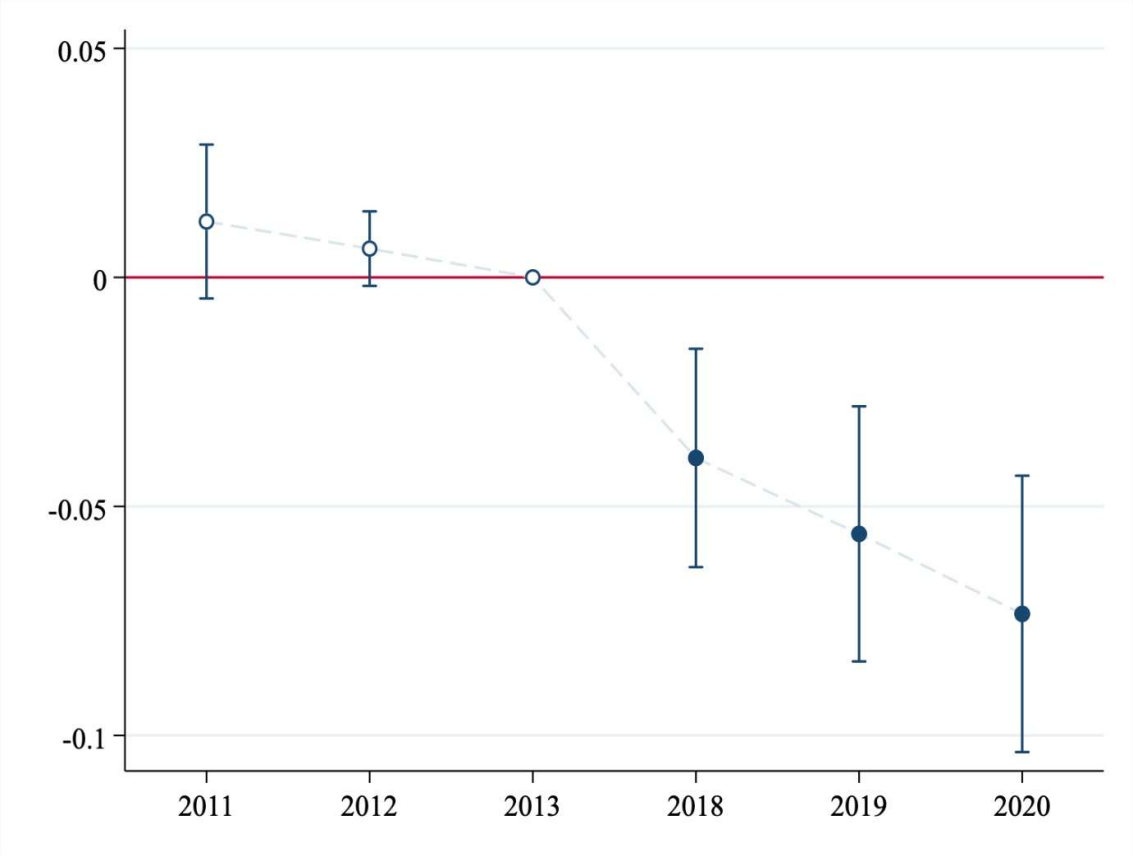
	Advanced Micro (*i*)	Intel (*j*)	*i*×*j*	*i*×*i*	*j*×*j*
Environmental reporting fields			22	25	30
Social reporting fields			19	21	30
Governance reporting fields			29	29	30
Total			70	75	90

ESG_Diverg = 1 - *Tanimoto Similarity* =1 - $\frac{70}{75+90-70}$ =0.263

APPENDIX B
Variable Definitions

Variable Name	Definition	Source
ESG-Related Variables		
ESG_Diverg	One minus the mean of the Tanimoto similarity of firm *i*'s with each industry peer firm *j*'s ESG disclosure vectors.	Bloomberg
E_Diverg (S_Diverg, G_Diverg)	One minus the mean of the Tanimoto similarity of firm *i*'s with each industry peer firm *j*'s environmental (social, governance) disclosure vectors.	Bloomberg
ESG Rating Disagreement	Standard deviation of ESG ratings that a firm receives for a given year's ESG performance from the five ESG rating providers.	Sustainalytics, Moody's, S&P, Refinitiv, and MSCI
E Rating Disagreement (S Rating Disagreement, G Rating Disagreement)	Standard deviation of environmental (social, governance) pillar ratings that a firm receives for a given year's environmental (social, governance) performance from the five ESG rating providers.	Sustainalytics, Moody's, S&P, Refinitiv, and MSCI
ESG Disclosure	A firm's ESG disclosure score for a given year, calculated as the sum of weighted ESG disclosure fields the firm provides information on.	Bloomberg
E Disclosure (S Disclosure, G Disclosure)	A firm's environmental (social, governance) disclosure score for a given year, calculated as the sum of weighted environmental (social, governance) disclosure fields the firm provides information on.	Bloomberg
ESG_Rating	The average of standardized ESG ratings that a firm receives for a given year's ESG performance from the five ESG rating providers minus the industry mean (excluding the focal firm).	Sustainalytics, Moody's, S&P, Refinitiv, and MSCI
E_Rating (S_Rating, G_Rating)	The average of standardized ratings a firm receives for a given year's environmental (social, governance) performance from the five ESG rating providers minus the industry mean (excluding the focal firm).	Sustainalytics, Moody's, S&P, Refinitiv, and MSCI
ESG Fund Holding	A firm's shares held by ESG funds divided by the outstanding shares of the firm and multiplied by 100. We identify the ESG funds based on the list of ESG funds provided by Morningstar.	CRSP, Morningstar
Other variables		
Firm Size	Natural logarithm of total assets (in US$ millions).	Compustat
ROA	Net income divided by total assets.	Compustat
MTB	Market value of equity divided by the book value of equity.	Compustat
Leverage	Total liabilities divided by total assets.	Compustat
Analysts	Natural logarithm of one plus the number of analysts that cover a firm.	IBES
Institutional Ownership	Shares held by institutions divided by the outstanding shares of a firm.	Thomson Reuters
log (Market Cap)	Natural logarithm of the beginning-of-day market capitalization for a firm on a given day.	CRSP
CAR (0, +1)	The two-day cumulative market-adjusted abnormal returns around the ESG news day, multiplied by 100.	CRSP

FIGURE 1
The Dynamic Effect of the EU ESG Reporting Regulation on ESG Reporting Divergence



This figure presents the dynamic effect of the EU ESG reporting regulation on the overall ESG reporting divergence (*ESG_Diverg*). It shows coefficient estimates of regressing *ESG_Diverg* on the interaction between indicators for each year around the implementation of the EU ESG reporting regulation (except for 2013, which is the benchmark year) and the indicator for treatment firms (i.e., U.S. firms in industries with high proportions of firms with subsidiaries in the EU), controlling for the same variables and fixed effects as in Model (1).

TABLE 1
Validity Tests for ESG Reporting Divergence

This table provides validity tests for the firm-pair-year level measures of ESG reporting divergence over the period of 2005-2021. Panel A reports the mean difference in the divergence measures between firm-pairs using the same ESG reporting frameworks and other firm-pairs. Panel B reports the mean difference in the divergence measures between firm-pairs in the same extreme size quintile and those in the opposite extreme size quintile. Panel C reports the mean difference in the divergence measures between firm-pairs in the same extreme ESG performance quintile and those in the oppositive extreme ESG performance quintile.

Panel A: ESG Reporting Divergence by Reporting Framework

	Firm *i* and firm *j* adopt the same reporting frameworks		Other firm-pairs		Difference	
	Mean	N	Mean	N	Mean	p-value
ESG_Diverg	0.294	23,227	0.390	412,954	-0.096	0.001
E_Diverg	0.614	18,589	0.929	346,714	-0.315	0.001
S_Diverg	0.525	18,684	0.668	394,984	-0.143	0.001
G_Diverg	0.058	23,227	0.105	412,954	-0.047	0.001

Panel B: ESG Reporting Divergence by Firm Size

	Firm *i* and firm *j* in the same extreme firm size quintile		Firm *i* and firm *j* in the opposite extreme firm size quintile		Difference	
	Mean	N	Mean	N	Mean	p-value
ESG_Diverg	0.254	165,734	0.387	98,800	-0.133	0.001
E_Diverg	0.812	77,330	0.990	68,103	-0.178	0.001
S_Diverg	0.598	139,073	0.719	94,954	-0.121	0.001
G_Diverg	0.096	165,734	0.146	98,800	-0.050	0.001

Panel C: ESG Reporting Divergence by ESG Performance (ESG Rating)

	Firm *i* and firm *j* in the same extreme ESG performance quintile		Firm *i* and firm *j* in the opposite extreme ESG performance quintile		Difference	
	Mean	N	Mean	N	Mean	p-value
ESG_Diverg	0.251	106,232	0.368	65,739	-0.117	0.001
E_Diverg	0.836	61,800	0.987	26,990	-0.151	0.001
S_Diverg	0.586	95,741	0.678	54,256	-0.092	0.001
G_Diverg	0.079	107,475	0.097	61,457	-0.018	0.001

TABLE 2
Sample Selection

This table presents the sample selection process. The ESG rating disagreement sample includes 14,927 firm-year observations from 2,146 firms for the period of 2006-2020. The ESG fund holding sample includes 12,573 firm-year observations from 1,844 firms for the period of 2006-2020. The ESG fund holding sample is constructed based on the ESG rating disagreement sample.

Selection Criteria	# Firm-years	# Firms
The ESG rating disagreement sample:		
Firm-year observations with non-missing ESG disclosure divergence measures from 2005 to 2021	34,132	3,098
Keep firm-year observations with ESG ratings from at least two raters from 2006 to 2020	15,196	2,156
Keep firm-year observations with non-missing values on control variables	14,927	2,146
The ESG fund holding sample:		
Keep firm-year observations with non-missing values on ESG fund holdings	12,573	1,844

TABLE 3
Descriptive Statistics for ESG Reporting Divergence

This table presents the descriptive statistics for firm-year level measures of ESG reporting divergence over the period of 2006-2020. Panel A presents the descriptive statistics on the divergence measures for the full sample. Panel B presents the average firm-year level measures of ESG reporting divergence by year. Panel C presents the average firm-year level measures of ESG reporting divergence by the 11 SICS industry sector. Please see Appendix B for variable definitions.

Panel A: Descriptive Statistics on ESG Reporting Divergence

Variables	N	Mean	Std. Dev.	P25	Median	P75
ESG_Diverg	14,927	0.316	0.118	0.222	0.295	0.401
E_Diverg	14,927	0.916	0.105	0.863	0.957	1.000
S_Diverg	14,927	0.600	0.161	0.478	0.583	0.715
G_Diverg	14,927	0.095	0.051	0.064	0.085	0.108

Panel B: ESG Reporting Divergence by Year

Year	N	*ESG_Diverg*	*E_Diverg*	*S_Diverg*	*G_Diverg*
2006	97	0.352	0.879	0.618	0.091
2007	272	0.289	0.947	0.609	0.088
2008	387	0.293	0.941	0.616	0.087
2009	537	0.292	0.930	0.620	0.084
2010	583	0.300	0.939	0.751	0.075
2011	667	0.314	0.941	0.777	0.080
2012	711	0.325	0.937	0.770	0.081
2013	748	0.336	0.933	0.768	0.081
2014	774	0.342	0.930	0.757	0.083
2015	1,082	0.332	0.932	0.672	0.107
2016	1,523	0.315	0.934	0.656	0.107
2017	1,704	0.306	0.921	0.527	0.106
2018	1,915	0.306	0.914	0.499	0.104
2019	1,969	0.314	0.894	0.484	0.098
2020	1,958	0.325	0.863	0.492	0.096

TABLE 3 (cont'd)

Panel C: ESG Reporting Divergence by SICS Industry Sector

SICS Sector	N	*ESG_Diverg*	*E_Diverg*	*S_Diverg*	*G_Diverg*
Consumer Goods	1,240	0.322	0.901	0.599	0.085
Extractives & Minerals Processing	1,137	0.386	0.846	0.641	0.111
Food & Beverage	558	0.407	0.875	0.662	0.113
Financials	2,424	0.252	0.962	0.572	0.100
Health Care	1,826	0.284	0.973	0.568	0.095
Infrastructure	2,050	0.307	0.845	0.584	0.072
Renewable Resources & Alternative Energy	114	0.429	0.879	0.652	0.132
Resource Transformation	1,763	0.349	0.891	0.625	0.086
Services	1,008	0.281	0.949	0.591	0.103
Technology & Communications	2,182	0.327	0.955	0.613	0.105
Transportation	625	0.370	0.874	0.617	0.116

TABLE 4
Summary Statistics

This table presents the summary statistics for the variables used in the regressions. Please see Appendix B for variable definitions.

Variables	N	Mean	Std. Dev.	P25	Median	P75
ESG-related Variables						
ESG Rating Disagreement	14,927	13.991	7.322	8.974	13.928	18.504
E Rating Disagreement	14,927	21.219	11.389	13.322	19.797	27.863
S Rating Disagreement	14,927	15.255	7.850	9.581	15.438	20.338
G Rating Disagreement	14,927	14.338	7.794	8.700	13.874	19.090
ESG_Rating	14,927	0.004	0.746	-0.510	-0.077	0.440
E_Rating	14,927	0.001	0.700	-0.488	-0.125	0.407
S_Rating	14,927	0.003	0.665	-0.452	-0.059	0.410
G_Rating	14,927	0.004	0.645	-0.403	0.018	0.443
ESG Disclosure	14,927	37.541	10.055	30.912	33.000	42.118
E Disclosure	14,927	12.422	17.916	0.000	0.906	20.930
S Disclosure	14,927	15.732	11.102	8.767	12.455	20.000
G Disclosure	14,927	84.253	5.410	83.000	84.979	87.000
ESG Fund Holding	12,573	0.252	0.479	0.023	0.084	0.252
Control variables						
Total Assets (US$ millions)	14,927	24,298	667,12	1,849	5,341	16,059
Firm Size	14,927	8.628	1.672	7.522	8.583	9.684
ROA	14,927	0.063	0.128	0.025	0.066	0.119
MTB	14,927	3.765	7.303	1.405	2.379	4.393
Leverage	14,927	0.282	0.212	0.106	0.261	0.412
#Analysts	14,927	11.534	8.291	5.000	10.000	17.000
Analysts	14,927	2.266	0.792	1.792	2.398	2.890
Institutional Ownership	14,927	0.702	0.298	0.628	0.799	0.909

TABLE 5
ESG Reporting Divergence and ESG Rating Disagreement

This table reports the regression results for the effect of ESG reporting divergence on ESG rating disagreement. Column (1) reports the results for the overall ESG rating disagreement. Columns (2), (3), and (4) report the results for rating disagreements related to the environmental, social, and governance pillars, respectively. The sample consists of 14,927 firm-year observations with data on regression variables over the period of 2006-2020. Please see Appendix B for variable definitions. Firm-clustered heteroskedasticity-robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable		*ESG Rating Disagreement*	*E Rating Disagreement*	*S Rating Disagreement*	*G Rating Disagreement*
	H1	(1)	(2)	(3)	(4)
ESG_Diverg	+	2.810**			
		(2.10)			
E_Diverg	+		13.029***		
			(6.94)		
S_Diverg	+			2.329***	
				(2.77)	
G_Diverg	+				7.519***
					(2.99)
ESG_Rating		1.445***			
		(7.60)			
E_Rating			2.889***		
			(9.59)		
S_Rating				1.494***	
				(7.91)	
G_Rating					-1.571***
					(-10.67)
ESG Disclosure		-0.032*			
		(-1.80)			
E Disclosure			-0.119***		
			(-9.10)		
S Disclosure				-0.006	
				(-0.49)	
G Disclosure					0.048**
					(2.24)
Firm Size		-0.211**	-1.013***	0.056	-0.172*
		(-2.09)	(-5.91)	(0.51)	(-1.81)
ROA		-0.770	-7.183***	3.407***	-1.014
		(-0.87)	(-6.31)	(3.70)	(-1.25)
MTB		0.008	0.012	0.008	0.009
		(0.71)	(0.88)	(0.77)	(0.88)
Leverage		-0.139	2.022***	-0.238	0.284
		(-0.27)	(2.67)	(-0.41)	(0.53)
Analysts		0.110	0.054	-0.088	0.490***
		(0.66)	(0.20)	(-0.45)	(2.95)
Institutional Ownership		-0.623	-1.343**	-1.235***	-0.703
		(-1.42)	(-2.17)	(-2.74)	(-1.55)
Year FE		Yes	Yes	Yes	Yes
Industry FE		Yes	Yes	Yes	Yes
ESG Rater Combination FE		Yes	Yes	Yes	Yes
N		14,927	14,927	14,927	14,927
Adj. R^2		0.169	0.403	0.210	0.113

TABLE 6
ESG Reporting Divergence and ESG Fund Allocation

This table reports the regression results for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation. Column (1) reports the results for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation. Columns (2), (3), and (4) report the results for the effect of individual reporting divergence measures on the association between corresponding ESG ratings and ESG fund allocation. The sample consists of 12,573 firm-year observations with data on regression variables over the period of 2006-2020. Please see Appendix B for variable definitions. Firm-clustered heteroskedasticity-robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable		*ESG Fund Holding*			
	H2	(1)	(2)	(3)	(4)
ESG_Rating		0.092***			
		(7.15)			
E_Rating			0.079***		
			(5.23)		
S_Rating				0.056***	
				(4.47)	
G_Rating					0.034**
					(2.36)
ESG_Diverg × *ESG_Rating*	−	-0.254***			
		(-2.72)			
E_Diverg × *E_Rating*	−		-0.164*		
			(-1.69)		
S_Diverg × *S_Rating*	−			-0.243***	
				(-3.91)	
G_Diverg × *G_Rating*	−				-0.022
					(-0.10)
ESG_Diverg		0.093			
		(0.77)			
E_Diverg			-0.381***		
			(-3.99)		
S_Diverg				-0.023	
				(-0.45)	
G_Diverg					0.195
					(1.01)
ESG Disclosure		0.000			
		(0.16)			
E Disclosure			-0.000		
			(-0.64)		
S Disclosure				0.001	
				(1.13)	
G Disclosure					0.004**
					(2.03)
Firm Size		-0.036***	-0.040***	-0.027***	-0.024***
		(-3.74)	(-4.08)	(-3.28)	(-2.99)
ROA		0.172***	0.171***	0.178***	0.158***

	(3.19)	(3.14)	(3.42)	(2.97)
MTB	0.001	0.001	0.001	0.001
	(1.12)	(1.11)	(1.39)	(1.41)
Leverage	-0.031	-0.035	-0.043	-0.044
	(-0.75)	(-0.85)	(-1.04)	(-1.06)
Analysts	0.044***	0.045***	0.046***	0.049***
	(3.75)	(3.99)	(3.92)	(4.12)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
ESG Rater Combination FE	Yes	Yes	Yes	Yes
N	12,573	12,573	12,573	12,573
Adj. R^2	0.198	0.196	0.190	0.187

TABLE 7
Sensitivity Tests

This table reports the results from sensitivity tests. Columns (1)-(2) present the regression results using four-digit SIC codes (SIC4) as the industry classification. Columns (3)-(4) present the regression results using firm fixed effects instead of industry fixed effects. Columns (5)-(6) present the regression results of using industry peers in the same size quintile for the construction of ESG reporting divergence measures. Columns (7)-(8) present the regression results after removing extreme observations, whose ESG disclosure scores are smaller than or equal to the 10th percentile and ESG reporting divergence measures are larger than or equal to the 90th percentile. The sample consists of firm-year observations with data on regression variables over the period of 2006-2020. Please see Appendix B for variable definitions. Firm-clustered heteroskedasticity-robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	*ESG Rating Disagreement*	*ESG Fund Holding*	*ESG Rating Disagreement*	*ESG Fund Holding*	*ESG Rating Disagreement*	*ESG Fund Holding*	*ESG Rating Disagreement*	*ESG Fund Holding*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG_Diverg	3.612***	0.164*	4.191***	0.079	2.107*	0.051	2.351*	0.089
	(2.79)	(1.81)	(2.72)	(0.77)	(1.84)	(0.53)	(1.69)	(0.71)
ESG_Rating	0.879***	0.063***	0.238	0.031**	1.419***	0.097***	1.427***	0.092***
	(5.54)	(5.70)	(0.98)	(2.28)	(7.51)	(7.01)	(7.47)	(7.12)
ESG_Diverg × *ESG_Rating*		-0.187***		-0.139*		-0.260***		-0.253***
		(-2.95)		(-1.80)		(-3.00)		(-2.68)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	No	No	No	No
ESG Rater Combination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,756	11,286	14,813	12,468	14,119	11,949	14,859	12,550
Adj. R^2	0.210	0.234	0.482	0.613	0.175	0.193	0.168	0.198

TABLE 8
ESG Reporting Divergence and the Market Reaction to Negative ESG News

This table reports the regression results for the relation between ESG reporting divergence and the market reaction to negative ESG news. *CAR (0, +1)* is the two-day cumulative market-adjusted abnormal returns around the negative ESG news day multiplied by 100. Please see Appendix B for variable definitions. Firm-clustered heteroskedasticity-robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	*CAR (0, +1)*
ESG_Diverg	0.414***
	(3.19)
ESG_Rating	-0.001
	(-0.11)
ESG Disclosure	-0.004***
	(-2.94)
Log (Market Cap)	-0.001
	(-0.10)
ROA	0.001
	(0.87)
MTB	0.006
	(0.04)
Leverage	-0.049
	(-0.91)
Analysts	0.038*
	(1.91)
Institutional Ownership	0.088
	(1.59)
Date FE	Yes
Industry FE	Yes
ESG Rater Combination FE	Yes
N	36,604
Adj. R^2	0.115

TABLE 9
The Spillover Effect of the EU ESG Reporting Regulation on U.S. Firms

This table reports the regression results for the spillover effect of the EU Directive 2014/95 regarding ESG reporting on U.S. firms. $Treat\_Post_{it}$ equals one if firm *i* belongs to an industry in which the proportion of firms that have subsidiaries in the EU is in the top decile of the sample distribution and year *t* is in the post-regulation period, and zero otherwise. Please see Appendix B for variable definitions. Firm-clustered heteroskedasticity-robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: The Effect of the EU ESG Reporting Regulation on U.S. Firms' ESG Reporting Divergence

Dependent variable	*ESG_Diverg*	*E_Diverg*	*S_Diverg*	*G_Diverg*
	(1)	(2)	(3)	(4)
Treat_Post	-0.062***	-0.059***	0.006	-0.002
	(-4.64)	(-5.35)	(0.35)	(-0.38)
Control Variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
ESG Rater Combination FE	Yes	Yes	Yes	Yes
N	6,471	6,471	6,471	6,471
Adj. R^2	0.699	0.749	0.713	0.559

Panel B: The Effect of the EU ESG Reporting Regulation on E Rating Disagreement and the Efficiency of ESG Fund Allocation

Dependent variable	*E Rating Disagreement*	*ESG Fund Holding*
	(1)	(2)
Treat_ Post	-0.071**	0.096
	(-2.01)	(1.56)
E_Rating		0.098***
		(4.85)
Treat_ Post × *E_Rating*		0.134*
		(1.69)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
ESG Rater Combination FE	Yes	Yes
N	6,471	5,618
Adj. R^2	0.586	0.202