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. Validation tests confirm that it is 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. We corroborate our findings using U.S. industries that are likely affected by the EU's ESG reporting regulation.

Keywords: ESG reporting divergence, ESG rating disagreement, ESG fund, ESG regulation, Sustainability reporting, Global reporting initiative

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

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 the 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,

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[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 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 rely on ESG ratings to evaluate firms' ESG performance and make portfolio allocation decisions (Lacker et al. 2022). To the extent that ESG reporting divergence reduces the informativeness of ESG ratings about firms' future ESG performance, we expect it to weaken the positive association between ESG ratings and ESG fund allocation.

Nevertheless, ESG reporting is used by various stakeholders (e.g., investors, consumers, employees, and local communities) and covers a wide range of topics including carbon emissions, employee satisfaction, and anticorruption. It is unclear whether the comparability of ESG reporting improves its usefulness (Christensen et al. 2021). More comparable ESG reporting may lead to a loss of information to users, which in turn can lead to negative consequences, such as a poor information environment about ESG performance. Therefore, whether ESG reporting divergence has adverse consequences on ESG rating disagreement and

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[5] Note that firms may follow or mention multiple reporting frameworks in 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

ESG funds' reliance on ESG ratings in 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 based on SASB's industry classification. 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.[7] 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.

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 frameworks and those not using any framework, consistent with the notion that an ESG reporting framework provides 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 (proxied by ESG ratings) than for those with different ESG performance, consistent with ESG performance

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[7] That is, we capture the divergence in the recognition of ESG items, not the measurement of items conditional on recognition. Thus, our ESG reporting divergence understates the overall ESG reporting divergence.

[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).

being 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. Following prior studies (e.g., Berg, Kölbel, and Rigobon 2022), we measure ESG rating disagreement using the standard deviation of ESG ratings from five ESG rating providers: Morgan Stanley Capital International (MSCI), Refinitiv, Sustainalytics, Moody's, and Standard and Poor's. 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 4.5% increase in ESG rating disagreement compared with its sample standard deviation. The positive association also holds for each of the three individual pillars, environmental (E), social (S), and governance (G). These findings suggest 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 disagreement among ESG rating providers.

Because ESG ratings play an important role in guiding the portfolio allocation of ESG-oriented funds (Larker et al. 2022), 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 baseline sensitivity when *ESG_Diverg* is at the sample mean. This finding suggests that ESG reporting divergence reduces the informativeness of ESG ratings and thus ESG fund managers' reliance on ESG ratings in fund allocation.

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' reporting of these activities. To address this concern, we hold the business activities constant by comparing firms' ESG reporting divergence within the same industry and controlling for factors that influence ESG activities (e.g., firm size, profitability, institutional ownership) throughout the analyses. In addition, as discussed in Section 5.3 later, the disclosure items collected by Bloomberg are generic and not specific to firms' processes (e.g., "climate change opportunities discussed," "number of significant environmental fines," "water consumption," "policy against child labor," "number of customer complaints"). With reasonable effort, firms can collect such information and disclose it to stakeholders. Not providing information on many items is not because the items are not relevant but because firms choose not to disclose them. Nevertheless, to further address this concern, we conduct two additional analyses. First, we show that our inferences remain the same when we use the Hoberg-Phillips product similarity-based industry classification system (TNIC) to construct the ESG reporting divergence measure. The intuition behind this analysis is that firms having similar products should have similar production processes and thus similar ESG activities. Second, a firm's decisions on whether to report an ESG activity depends on whether the activity is material to the firm. Thus, ESG reporting divergence might be confounded by the variation in important ESG activities across firms. To address this concern, we map the SASB materiality items to the Bloomberg's ESG reporting items for each industry and construct the ESG reporting divergence measure based on the overlapping items. We obtain the same inferences using this alternative measure.

Another potential concern is that our results may be driven by the variation in ESG disclosure across firms (e.g., Christensen, Serafeim, and Sikochi 2022). We control for the level of firms' ESG disclosure throughout the analyses. To further address this concern, we split the full sample into high versus low ESG disclosure levels based on the sample mean of ESG disclosure. We find that the effects of ESG reporting divergence do not differ between the two

subsamples. Furthermore, we obtain the same inferences when we remove firms that have extreme values of ESG disclosures and high ESG reporting divergence. Thus, our results are unlikely to be driven by the variation in firms' ESG disclosure.

We conduct two sets of additional analyses to corroborate our main findings. First, an important assumption underlying our hypothesis regarding the negative effect of ESG reporting divergence on the association between ESG fund holdings and ESG ratings is that ESG ratings are less informative of future ESG performance when ESG reporting divergence is high. Consequently, ESG fund managers rely less on ESG ratings in fund allocation. Using one-year-ahead ESG news-based measure of future ESG performance, we document that the informativeness of ESG ratings about firms' future ESG performance decreases with ESG reporting divergence. In terms of economic magnitude, a one-standard-deviation increase in *ESG_Diverg* is associated with a 24% decrease in the informativeness of ESG ratings about firms' future ESG performance.

Second, we explore whether the passage of the European Union's (EU) ESG reporting regulation has a spillover effect on U.S. industries that have high proportions of firms with subsidiaries in the EU. We find that such industries experience a decline in ESG reporting divergence in the post-regulation period relative to 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 U.S. industries with high EU-exposure and that the association between ESG fund allocation and 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. 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 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 standards on sustainability reporting and the SEC's proposal on climate-related disclosures, both of which can improve the comparability of ESG reporting across firms.[9]

Second, we add to the growing literature that examines ESG rating disagreement among rating providers. Several recent studies have documented the existence and negative consequences of disagreements in ESG ratings (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 ESG rating disagreement leads to higher return volatility and a lower likelihood of obtaining external financing. 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, our study contributes to this line of literature by documenting that divergent ESG reporting can increase the information acquisition and processing costs for ESG rating providers and ESG fund managers.

Lastly, our study extends the literature on financial reporting comparability (e.g., De Franco, Kothari, Verdi 2011; Barth, Landsman, Land, and Williams 2012). For example, De Franco et al. (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

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[9] In June 2023, the ISSB issued two sustainability disclosure standards (IFRS S1 and S2). Comparability is one of the enhancing qualitative characteristics of sustainability-related information.

managers). Our findings suggest that increased comparability in ESG reporting can benefit users of ESG reporting by facilitating comparisons of firms within the same industry and improving the forecasting of future ESG performance.

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 areas. For example, the most common environmental activities include cutting greenhouse gas emissions, the use of renewable energy, and the conservation of environment (e.g., the consumption of energy and water). The most common social activities are related to employee welfare and well-being, including employee safety, training, and pay, as well as gender and racial equality. The most common governance activities 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, and higher board independence imply better ESG performance. Given a lack of standards and information, market participants and researchers typically use ESG ratings to measure ESG performance.

In this paper, ESG reporting divergence refers to the differences in the *reporting* of ESG activities across firms. Similar to financial reporting comparability (e.g., Sunder 2010; Fang, Iselin, and Zhang 2022), ESG reporting comparability is intrinsically difficult to conceptualize

and measure, especially given the multidimensional nature of ESG activities. The International Financial Reporting Standards (IFRS) S1 defines comparability as "the characteristic that enables users to identify and understand similarities in, and differences among, items." It further clarifies that, for sustainability-related information to be comparable, "like things shall look alike and different things shall look different." In the construction of the measure of ESG reporting divergence, we follow the same rationale: if two firms engage in similar ESG activities, they should disclose similar ESG items; if a firm reports differently for similar ESG activities, its ESG reporting diverges from the other firm.

Note that our ESG reporting divergence measure differs from the commonly used financial reporting comparability measures such as the one constructed by De Franco et al. (2011) in two ways. First, 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, while EQT Corporation reported carbon monoxide emissions in 2020, Hess Corporation did not, even though carbon monoxide emissions can occur during various stages of the two energy firms' production process, including exploration, refining and transportation. Thus, comparability in our setting refers to whether firms disclose the same items for the same ESG activities. Due to a lack of information, we do not consider whether firms differ in the measurement of a particular ESG activity when they report such information.[10] In contrast, prior research on financial reporting comparability focuses on the measurement aspect of the mapping of economic activities to financial reporting (e.g., De Franco et al. 2011). Second, ESG reporting is voluntary in the U.S., and firms have discretion over what to report about their ESG activities and which reporting framework to

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[10] To the extent that our ESG reporting divergence measure does not capture the measurement differences in ESG reporting across firms, the adverse consequences of ESG reporting divergence documented in this paper represent a lower bound estimate.

adopt. In contrast, financial reporting is mandatory for publicly listed firms in the U.S., and firms are required to comply with the Generally Accepted Accounting Principles (GAAP). Hence, financial reporting comparability is based on firms' limited discretion pertaining to accounting choices within the GAAP, while the ESG reporting divergence captures firms' substantial discretion over ESG reporting in a voluntary regime. As a result, the potential consequences of ESG reporting divergence on users are arguably significantly larger than those of financial reporting divergence.

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 reporting items impedes ESG information users' ability to compare ESG activities across firms. We rely on the raw ESG reporting items collected by Bloomberg from firms' sustainability reports, annual reports, and corporate websites to identify whether a firm publicly discloses an ESG activity.[11] According to Bloomberg, these reporting items are selected based on existing ESG reporting frameworks such as GRI and Investor Stewardship Group, as well as emerging reporting frameworks such as Sustainable Finance Disclosure Regulation and World Economic Forum. Arguably, these reporting items are the most relevant ESG disclosure dimensions from the perspectives of standard setters and investors. 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. Please see Appendix A for the list of the 122 items.

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[11] Bloomberg also provides firms' ESG disclosure scores, which are constructed based on the number of ESG reporting items with a specific weight for each reporting item. Prior research, such as Christensen et al. (2022), has used the Bloomberg ESG disclosure score.

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 kth 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 emissions), 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:

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

where $v_{it} \cdot v_{jt}$ represents the product of the two vectors. 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. It 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 Hess Corporation and EQT

Corporation, two energy companies, as a firm-pair to illustrate the calculation of ESG_Diverg_{ijt}.

Finally, to obtain a firm-year level measure of ESG reporting divergence, 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}.[12]

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 Sustainable Industry Classification System (SICS) to define industries. The SASB develops industry-specific ESG reporting standards in the U.S. and classifies firms into 77 industries under 11 sectors. Most market participants and standard setters (e.g., the ISSB) follow the SICS in industry classification.[13] As discussed later, we use the product similarity-based industry classification and obtain the same inferences.[14]

2.3   Validation tests 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

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[12] Our results are qualitative similar if we use the median of the firm-pair-year level Tanimoto similarity.
[13] See: https://www.ifrs.org/issued-standards/sasb-standards/
[14] We also obtain the same inferences when using the four-digit Standard Industrial Classification (SIC) codes to define industries.

do not. The intuition behind this prediction is that a reporting framework provides ESG disclosure guidelines for adopting firms, leading to lower reporting divergence among firms adopting the same framework. We consider a firm-pair as adopting the same reporting framework if (1) both firms *i* and *j* adopt the SASB standards or (2) both firms *i* and *j* adopt the GRI standards. [15] 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 for other firm-pairs. The *p*-value for the difference in mean *ESG_Diverg* (-0.096) between 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 financial and nonfinancial 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

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[15] 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 in 2020.

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. Prior research shows that firms' financial performance affects their disclosure decisions (e.g., Dye 1985; Miller 2002). Clarkson et al. (2008) also 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. 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 1. 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.[16] 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 much they rely on ESG ratings in fund allocation.

We argue that ESG reporting divergence adversely affects the usefulness of ESG information for users. It is well known that investors consider 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, which has adverse implications for the two sets of 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). For example, S&P uses both publicly disclosed information and private information about firms' sustainability performance in its rating process (S&P Global 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 more on their private information, thereby increasing the disagreements among rating providers (e.g., Easley and O'Hara 2004; Garfinkel 2009). We thus hypothesize that:

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[16] In an untabulated firm-year level determinant analysis, we confirm that firms that adopt the same reporting framework as the majority of industry peers have lower ESG reporting divergence. Furthermore, firms that differ in ESG performance, size, accounting performance, analyst coverage, and institutional ownership from industry peers also have higher ESG reporting divergence.

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

Second, anecdotal and academic evidence suggests that ESG fund managers usually rely on ESG ratings to evaluate firms' long-term ESG performance when making fund allocation. ESG funds have different investment strategies; while some funds exclude firms whose operations do not align with basic ESG values (e.g., tobacco, alcohol, and casinos), other funds adopt an ESG rebalancing approach and allocate funds based on ESG ratings (Boffo and Patalano 2020). ESG fund managers typically use ESG ratings to decide whether to include certain firms in their funds and how much capital to allocate to each firm. Firms with higher ESG ratings attract higher ESG fund holdings (Lacker et al. 2022). To the extent that ESG reporting divergence reduces the informativeness of ESG ratings about firms' long-term ESG performance and increases the information processing costs for ESG fund managers, a higher level of ESG reporting divergence can lead fund managers to rely less on ESG ratings in fund allocation.[17] Thus, we predict that more divergent ESG reporting reduces the informativeness of ESG ratings about future ESG performance and ESG funds' reliance on ESG ratings in fund allocation. We thus hypothesize that:

> *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.*

We might not find results consistent with H1 and H2 for the following reasons. First, ESG reporting is multidimensional in nature, and it needs to respond to various stakeholders' preferences (Christensen et al. 2021). ESG rating providers also have different rating scopes and objectives (Larcker et al. 2022). Thus, ESG rating providers and ESG fund managers might only consider the information they regard as important and do not consider the divergence of

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[17] This is analogous to the role of financial reporting comparability in the informativeness of stock prices about future earnings (Choi, Choi, Myers, and Ziebart 2019). More comparable financial reporting makes stock price more informative of future earnings because it allows investors to process firm-specific information at a lower cost and help them evaluate alternative investments.

the overall ESG reporting as a cost. Second, one underlying argument for the hypotheses is that more comparable information can lead to a better information environment about ESG performance and thus improves ESG information users' decisions. However, more comparable ESG reporting at the cost of less information provided can lead to a poor information environment about ESG performance.

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 fields, 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 I/B/E/S, 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 the Center for Research in Security Prices (CRSP) 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 measures

Table 3, Panel A provides descriptive statistics on ESG reporting divergence measures at the firm-year level 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. The finding that firms report governance activities similarly to their industry peers is consistent with U.S. firms being subject to extensive reporting requirements on corporate governance, such as disclosures on the size and composition of the board of directors.

Panel B of Table 3 presents the mean ESG reporting divergence and the three individual reporting divergence measures by year. 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.[18]

Panel C of Table 3 presents the mean ESG reporting divergence by the SICS sector. There

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

is a large variation in *ESG_Diverg* across sectors. The Financials sector has the lowest level of

ESG reporting divergence (0.252), while the Renewable Resources & Alternative Energy

sector has the highest level of ESG reporting divergence (0.424). Similarly, the individual

reporting divergence measures also vary across SICS sectors. For example, the Health Care

sector has the highest level of environmental reporting divergence, and the Food & Beverage

sector has the highest level of social reporting divergence. We also find significant variation in

ESG reporting divergences across the 77 SICS industries (untabulated). The large variation

across industries 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:

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

where *ESG Rating Disagreement* is measured as the standard deviation of a firm's ESG ratings

from the five rating providers: MSCI, Refinitiv, Sustainalytics, Moody's, and S&P (e.g., Berg

et al. 2022).[19] Following Christensen et al. (2022), when a rating provider issues multiple

ratings for firm *i*'s ESG performance in year *t*, we retain its last rating in the 12 months before

year *t*+1's fiscal year-end. We calculate the disagreement for the environmental (*E Rating*

Disagreement), social (*S Rating Disagreement*), and governance (*G Rating Disagreement*)

ratings similarly. *ESG_Diverg* is the firm-year level measure of ESG reporting divergence, as

explained in Section 2. Since a firm's ESG disclosure usually occurs before the ESG rating

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[19] 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. Separately, we multiply MSCI's ratings by 10 to make them comparable to the other ratings.

assessment, our model estimates how the firm's ESG reporting divergence affects subsequent ESG rating disagreement (Christensen et al. 2022). 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 firms' industry-year-adjusted ESG performance (*ESG_Rating*), which serves as a proxy for firms' ESG performance. Specifically, we first calculate the average ESG rating that firm *i* receives from the five ESG rating providers and then adjust it by subtracting the industry mean ESG rating that excludes firm *i* in the same year.[20] Thus, *ESG_Rating$_{it}$* captures the extent to which firm *i*'s ESG performance deviates from that of its industry peers. Second, we control for the level of ESG disclosure (*ESG Disclosure*) to distinguish between the effect of ESG reporting divergence and that of ESG disclosure level on ESG rating disagreement.

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*), analysts following (*Analysts*), and institutional ownership (*Institutional Ownership*). Appendix B provides definitions of these variables. We winsorize all continuous variables at the 1st and 99th percentiles. We also include year and industry fixed effects to control for time trends and the effects of time-invariant industry characteristics, respectively. Finally, 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. Because each ESG rating provider has its own rating metrics and objectives, we include ESG rater combination fixed effects (*ESG Rater FE*) to control for the characteristics of ESG rating providers. We use heteroskedasticity-robust standard errors clustered by firm to calculate *t*-statistics.

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[20] In the calculation of *ESG_Rating*, we standardize ESG ratings from each rating provider by subtracting the sample mean and dividing it by the sample standard deviation.

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, higher than the average social (15.255) and 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 *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*, 4.5% of its sample standard deviation.

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 significantly negative at the 10% level. 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 and the corresponding rating disagreement. 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*), 12.0% (4.8%, 4.9%) of its sample standard deviation.

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. To the extent that higher ESG rating disagreements lead to higher return volatility and a lower likelihood of obtaining external financing (Christensen et al. 2022), higher ESG reporting divergence is costly for firms.

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:

$$
\begin{aligned}
ESG\ Fund\ Holding_{it+1} \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (2)\\
= a_0 + a_1\ ESG\_Diverg_{it} + a_2\ ESG\_Rating_{it}\\
+ a_3\ ESG\_Rating_{it} \times ESG\_Diverg_{it} + a_4\ ESG\ Disclosure_{it}\\
+ Firm\ Controls + Year\ FE\ + Industry\ FE + ESG\ Rater\ FE\\
+ \varepsilon_{it}\ ,
\end{aligned}
$$

where *ESG Fund Holding*$_{it+1}$ is measured as the percentage of firm *i*'s outstanding shares held by ESG mutual funds at the end of year *t+1*. As higher ESG ratings attract more ESG fund investment (Hartzmark and Sussman 2019), we expect the coefficient on *ESG_Rating* (a_2) 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 $ESG\_Rating \times ESG\_Diverg$ (a_3) 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.[21]

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 $ESG\_Rating \times ESG\_Diverg$ 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 ($=0.254 \times 0.118$), 32.6% of the base sensitivity when *ESG_Diverg* is at the sample mean (0.092). In untabulated analyses, we also include an interaction term between *ESG Rating Disagreement* and *ESG_Diverg* and find that the negative coefficient on $ESG\_Rating \times ESG\_Diverg$ remains significantly negative.[22]

In Columns (2)-(4) of Table 6, we examine the effect of individual reporting divergence on the association between the corresponding ESG ratings and ESG fund allocation.[23] We find that the coefficients on *E_Rating* and *S_Rating* are significantly positive and that the coefficients on $E\_Rating \times E\_Diverg$ and $S\_Rating \times S\_Diverg$ are significantly negative,

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[21] In untabulated results, we find that our results are robust to controlling for institutional ownership.

[22] The interaction term between *ESG_Rating* and *ESG_Diverg* also remains significantly negative if we include the interaction term between *ESG_Rating* and *ESG Disclosure*.

[23] Morningstar's ESG funds do not separate fund holdings in the individual pillars (E, S, and G). Thus, we are unable to examine the effect of individual reporting divergence on the association between the corresponding ESG ratings and the corresponding individual pillar fund allocation.

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.

While the coefficient on *ESG_Diverg* is insignificant (Column (1)), the coefficient on *E_Diverg* is significantly negative (Column (2)). This finding is consistent with the recent evidence that institutional investors value and demand disclosures of climate risk (e.g., Flammer, Toffel, and Viswanathan 2021; Ilhan, Krueger, Sautner, and Starks 2023). As more divergent environmental reporting increases the information uncertainty about firms' environmental performance (Avramov et al. 2022), ESG fund managers allocate less funds to firms with higher environmental reporting divergence. For control variables, firms with stronger financial performance (*ROA*) and higher analyst coverage (*Analysts*) have higher ESG fund holdings, while larger firms (*Firm Size*) have lower ESG fund holdings.

Overall, these results suggest that higher divergence in ESG reporting, particularly in the reporting of environmental and social activities, can reduce the informativeness of ESG ratings and thus is associated with reduced usefulness of ESG ratings in ESG fund allocation.

5.3   An alternative explanation: ESG reporting divergence vs. ESG activity heterogeneity

Our ESG reporting divergence measure captures the extent to which firms report ESG activities differently from their industry peers, assuming that they have the same ESG activities. Throughout the analyses, we hold firms' ESG activities constant by comparing firms within the same industry. This assumption is reasonable because a close look at the 122 items covered by Bloomberg suggests that these items are not specific to production processes. For example,

as reported in Appendix A, for environmental disclosures, Hess did not provide information on carbon monoxide emissions, climate change opportunities, the number and amount of significant environmental fines, and water consumption. For social disclosures, EQT did not provide information on policy against child labor, the number of customer complaint, % disabled in workforce, and fair renumeration policy. It is hard to argue that the lack of disclosures of these items is due to the difference in ESG activities. With reasonable effort, the companies can collect such information and provide it to stakeholders. Note that collecting related information is part of disclosure. As stated in the ISSB's S1 and S2, companies are required to collect "all reasonable and supportable information that is available to the entity at the reporting date without undue cost or effort." The ISSB further states that "the greater the usefulness of information ..., the greater the effort expected of an entity in obtaining that information (IFRS S1 Basis for conclusions, page 9)."

Nevertheless, in this section, we conduct two additional analyses to further rule out the alternative explanation that our results are driven by ESG activity heterogeneity rather than ESG reporting divergence.

5.3.1   ESG reporting divergence measure based on the TNIC industry classification

Given that firms' ESG activities are related to their operations, firms with similar products should have similar ESG activities. For example, oil and gas firms tend to focus their ESG investments on developing renewable energy. The Hoberg-Phillips product similarity-based industry classification system (TNIC) defines industries based on the textual similarity of firms' product descriptions in 10-K filings (Hoberg and Phillips 2010). We thus use the TNIC to construct the ESG reporting divergence measure. Specifically, for firm *i*, we calculate the ESG divergence measure for each firm *i-j* pair for all of the other *J* firms in the same TNIC industry (i.e., other than firm *i*). To ensure that a firm has the most similar products and thus the most similar ESG activities as its industry peers, we take the mean of ESG reporting

divergence of its 10 closest peers as the firm-year level measure of ESG reporting divergence (Hoberg and Phillips 2010; Zhu 2019).

Table 7 presents the regression results using this alternative ESG reporting divergence measure. Column (1) reports the result for the effect of ESG reporting divergence on ESG rating disagreement. Similar to the result reported in Table 5, we find a significantly positive coefficient on *ESG_Diverg* ($t = 1.93$). Column (2) reports the result for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation. Consistent with that reported in Table 6, we find a significantly negative coefficient on *ESG_Rating* $\times$ *ESG_Diverg* ($t = -2.25$), suggesting that ESG reporting divergence reduces the positive association between ESG ratings and ESG fund allocation. To the extent that firms' ESG activities are largely driven by the types of products they have, these results indicate that our inferences are unlikely to be driven by the heterogeneity in firms' ESG activities.

5.3.2   ESG reporting divergence measures based on SASB materiality mapping

Throughout our analyses, we rely on the 122 standardized ESG reporting items collected by Bloomberg to construct our ESG reporting divergence measures. However, a potential concern is that the 122 items might not be important for all firms. That is, a firm does not disclose an item likely because the activity underlying that reporting item is not important for the firm. As a result, the ESG reporting divergence measure is potentially confounded by the difference in important ESG activities across firms. To address this concern, we focus on the important ESG activities for all firms in the same industry and construct ESG reporting divergence measures based on the material items identified by the SASB for each industry.[24]

The SASB standards recommend a specific set of material ESG reporting items for each industry. Based on the evidence of materiality tests (i.e., evidence of interest, evidence of

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[24] GRI provides materiality topics only for a few sectors (e.g., Agriculture, Aquaculture, and Fishing Sectors) and largely leaves firms to determine which topics are material. We thus focus on the materiality items identified by the SASB for each industry in this analysis.

financial impact, and forward impact adjustment), the SASB determines the relative importance of and decides on the list of material items from its initial list of 43 generic sustainability issues, primarily in the environmental and social pillars (Khan, Serafeim, and Yoon 2016). For the governance pillar, the SASB standards take a different approach. They only include industry-based performance metrics indicative of firms' governance quality such as fines and settlements, violations, accidents. They exclude the majority of the traditional governance topics such as board structures and shareholder rights, because those topics have been addressed by existing regulations (e.g., the Sarbanes-Oxley Act).[25] As a result, we do not consider the governance pillar in this analysis. We adopt the approach in Grewal, Hauptmann, and Serafaim (2021) to map SASB materiality items to Bloomberg reporting items. The number of Bloomberg environmental (social) material items ranges from 0 to 31 (0 to 32) for SICS industries. We then reconstruct our environmental and social reporting divergence measures using the material reporting items for each industry.

Table 8 report the regression results using the environmental and social reporting divergence measures based on industry-specific material items. Columns (1) and (2) of Table 8 present the results for the effect of environmental and social reporting divergence on the corresponding rating disagreement, respectively. The coefficient on *E_Diverg* (*S_Diverg*) is significantly positive at the 1% level, suggesting that the positive association between environmental (social) reporting divergence and the environmental (social) rating disagreement holds for material reporting items. Column (3) ((4)) reports the results for the effect of environmental (social) reporting divergence on the association between environmental (social) ratings and ESG fund allocation. We continue to find significantly negative coefficients on *E_Rating* × *E_Diverg* (t = -2.08) and *S_Rating* × *S_Diverg* (t = -2.16) in explaining ESG

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[25] See: https://help.sasb.org/hc/en-us/articles/360052463771-What-is-the-approach-to-Governance-the-G-in-ESG-in-the-SASB-Standards-

fund holdings. These results indicate that our inferences are unlikely to be driven by the heterogeneity in the materiality of ESG reporting items.

5.4 The effects of ESG reporting divergence versus ESG disclosure level

While ESG reporting divergence captures the difference in ESG disclosure across firms within the same industry, it is possible that the firms that diverge in ESG reporting from industry peers provide more ESG information, which can lead to disagreements among ESG rating providers due to their different interpretations of the information. Indeed, Christensen et al. (2022) find that greater ESG disclosure is associated with larger ESG rating disagreement, although Kimbrough et al. (2022) find the opposite. We address this concern by controlling for the level of ESG disclosure throughout the analyses. To further address this concern, we split the full sample into high versus low ESG disclosure subsamples based on the sample median of *ESG Disclosure*. If we find similar effects of ESG reporting divergence across the two subsamples, then our results are unlikely to be driven by the level of ESG disclosure.

Table 9 reports the regression results for the two subsamples. Columns (1) and (2) report the results for the effect of ESG reporting divergence on ESG rating disagreement for the high and low ESG disclosure subsamples, respectively. The coefficient on *ESG_Diverg* is significantly positive at the 1% level in both subsamples. More importantly, the coefficients are not significantly different between the high and low disclosure subsamples ($p = 0.849$), as reported at the bottom of the table. Columns (3) and (4) present the results for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation for the high and low ESG disclosure subsamples, respectively. The coefficient on *ESG_Diverg* $\times$ *ESG_Rating* is negative in both subsamples, while only significant for the high ESG disclosure

subsample, and the coefficients for the two subsamples are not significantly different from each other ($p = 0.163$).[26]

To address the concern that our results may be driven by firms that disclose very little ESG information and thus diverge significantly in ESG reporting from industry peers, we remove 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. The untabulated analyses indicate that our results continue to hold. Similarly, we obtain the same inferences after removing firm-year observations whose ESG disclosure scores and ESG reporting divergence are larger than or equal to the 90th percentile of their respective sample distributions. Taken together, these tests indicate that our results are unlikely to be driven by the level of ESG disclosure.

5.5   Controlling for firm-fixed effects

While firms' ESG activities are significantly influenced by the industries they operate in, firms within the same industry may still exhibit heterogeneity in ESG activities due to incentives such as being the industry leader or raising external capital. To address this concern, we control for time-varying firm characteristics such as firm size and institutional ownership that affect these incentives throughout the analyses. To control for time-invariant firm characteristics, we replicate the main tests by including firm fixed effects instead of industry fixed effects. Table 10 reports the regression results. Column (1) reports the result 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 (2) reports the result for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund allocation. Consistent with that reported in Table 6, we find a significantly negative coefficient on

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[26] One of the possible reasons for the insignificant result for *ESG_Rating* × *ESG_Diverg* and the small effect on *ESG_Rating* in explaining ESG fund holdings for the low disclosure subsample is that for firms with a lower level of ESG disclosure, ESG ratings are based on less public information about firms' ESG activities and are thus likely less informative.

ESG_Rating × *ESG_Diverg*.

6. Additional Analyses

6.1 *ESG Reporting Divergence and ESG Rating Quality*

An important assumption underlying our second hypothesis is that the quality of ESG ratings in capturing firms' future ESG performance declines with ESG reporting divergence. As a result, ESG fund managers rely less on ESG ratings to allocate their funds. In this subsection, we test this assumption by investigating whether ESG reporting divergence negatively affects ESG ratings' informativeness of future ESG performance, proxied by one-year-ahead ESG-news-based insight score from Factset's Truevalue Labs. Truvalue Labs uses artificial intelligence to analyze a variety of third-party information such as analyst reports, media coverage, and reports from advocacy groups and government regulators. Based on the analysis, it categorizes positive versus negative ESG news and constructs an insight score, which captures firms' long-term ESG performance. The higher the insight score, the better the long-term ESG performance.

Table 11 presents the regression results using the one-year-ahead ESG insight score from Truvalue Labs as the dependent variable. In Column (1), we first validate whether ESG ratings are positively associated with firms' future ESG performance. Consistent with the finding in Serafeim and Yoon (2022), we find that the coefficient on *ESG_Rating* is significantly positive at the 1% level, suggesting that the current year's ESG ratings are informative of future ESG performance. In Column (2), we further include *ESG_Diverg* and its interaction with *ESG_Rating*. Again, to facilitate the interpretation of the economic magnitude, we demean *ESG_Diverg* in this analysis. The coefficient on *ESG_Rating* remains significantly positive, and more importantly, the coefficient on *ESG_Rating* × *ESG_Diverg* is significantly negative (t = -2.72). In terms of economic magnitude, a one-standard-deviation increase in *ESG_Diverg* reduces the informativeness of ESG ratings about future ESG performance by 0.650 (= 5.465

× 0.119), 24.3% of the baseline informativeness of ESG ratings when *ESG_Diverg* is at the sample mean (2.673).[27] These results suggest that the informativeness of ESG ratings declines with ESG reporting divergence, supporting the assumption underlying H2 that when ESG reporting divergence increases, ESG fund managers rely less on ESG ratings in allocating their funds due to the reduced informativeness of ESG ratings.

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).[28] For multinational U.S. firms, 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 collect data on U.S. firms' subsidiaries from Exhibit 21 of their 10-K filings, where U.S. firms are required to disclose their material subsidiaries.[29] 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 2011-2013 as the pre-regulation period and 2018-2020 as the post-regulation period. The final sample consists of

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[27] The standard deviation of *ESG_Diverg* is 0.119 for the sample used in this analysis.
[28] See: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0095
[29] 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).

6,471 firm-year observations. We then construct an indicator variable, *Treat_Post*$_{it}$, which 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 (i.e., treatment industries) and year *t* is in the post-regulation period, and zero otherwise. We argue that when an industry has a sufficiently high number of firms with material subsidiaries in the EU, the firms in the industry are more likely to follow EU ESG reporting regulation and thus exhibit less divergent ESG reporting compared to each other.[30]

We first examine whether the adoption of the EU ESG reporting regulation affects the overall ESG reporting divergence of firms in treatment versus control 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, respectively. As reported in Panel A of Table 12, we find a significantly negative coefficient on *Treat_Post* (*t* = -4.64) in the analysis of *ESG_Diverg,* suggesting that firms in treatment 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).[31] Figure 1 presents the dynamic effect of the EU ESG reporting regulation on ESG reporting divergence. We observe a significant drop in the overall ESG reporting divergence from 2018 onwards.

In Columns (2) to (4) of Panel A, 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 (*t* = -5.35), but not for social or governance reporting divergence. This result suggests that the spillover effect of EU ESG reporting regulation only applies to environmental reporting.

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[30] In an untabulated test, we confirm that firms in treatment industries experience a larger increase in ESG disclosure in the post-regulation period than firms in other industries.

[31] The sample mean of *ESG_Diverg* is 0.327 for the sample used in this analysis.

We then use the EU ESG reporting regulation as a shock to ESG reporting divergence for treatment industries to examine the effect of the ESG reporting divergence. Because we only observe a reduction in environmental reporting divergence in treatment industries, our subsequent analysis focuses on environmental reporting divergence. Panel B of Table 12 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 the disagreement over firms' environmental performance among ESG rating providers is lower in the post-regulation period, arguably because the EU ESG reporting regulation reduces environmental reporting divergence in treatment industries. In Column (2) of Panel B, where the dependent variable is ESG fund holdings, we find a significantly positive coefficient on *E_Rating × Treat_Post*. This result suggests that ESG fund allocation is more sensitive to firms' environmental performance for U.S firms in treatment industries in the post-regulation period, relative to those in control industries.

Overall, the results reported above suggest that the EU's mandatory ESG reporting regulation has a positive spillover effect on U.S. 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 validate the measure by documenting that the ESG reporting divergence measure is lower for firm-pairs using the same ESG reporting framework, with similar size, and with similar ESG performance than for other firm-pairs. We also 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 more differently from their

industry peers than they report governance activities. 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 disclosure to ESG rating providers and ESG fund managers. We also find that the informativeness of ESG ratings about firms' future ESG performance declines with ESG reporting divergence. Lastly, we corroborate our findings using U.S. industries that are likely affected by the EU's ESG reporting regulation.

Our results have important policy implications. While the European Union has mandated ESG reporting for large public-interest firms since 2017, ESG reporting is still voluntary in the U.S. and many other countries. In March 2022, the SEC proposed rules to enhance and standardize climate-related disclosures to facilitate the comparison across firms. In June 2023, the ISSB issued sustainability disclosure standards with the objective of improving the comparability and transparency of sustainability reporting. Our results provide strong empirical support for the SEC's and the ISSB'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 Hess Corporation and EQT Corporation, two energy companies, 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 "Hess" and "EQT" 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	Hess (i)	EQT (j)	$i \times j$	$i \times i$	$j \times j$
ES007	Nitrogen Oxide Emissions	1	1	1	1	1
ES009	VOC Emissions	1	1	1	1	1
ES010	Carbon Monoxide Emissions	0	1	0	0	1
ES013	Particulate Emissions	1	1	1	1	1
F0949	Sulphur Dioxide / Sulphur Oxide Emissions	1	1	1	1	1
ES036	Emissions Reduction Initiatives	1	1	1	1	1
ES071	Climate Change Policy	1	1	1	1	1
ES105	Climate Change Opportunities Discussed	0	0	0	0	0
ES106	Risks of Climate Change Discussed	1	1	1	1	1
ES001	Direct CO2 Emissions	1	1	1	1	1
ES002	Indirect CO2 Emissions	1	0	0	1	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	0	0	1	0
ES262	Scope of Disclosure	1	1	1	1	1
ES399	Carbon per Unit of Production	1	1	1	1	1
ES088	Biodiversity Policy	1	1	1	1	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	0	1	0	0	1
SA359	Amount of Significant Environmental Fines	0	1	0	0	1
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	0	0	1	0
ES109	Fuel Used - Crude Oil/Diesel	1	0	0	1	0
ES384	Self Generated Renewable Electricity	0	0	0	0	0
ES494	Energy Per Unit of Production	1	0	0	1	0
ES039	Waste Reduction Policy	1	1	1	1	1
ES019	Hazardous Waste	1	1	1	1	1
ES020	Total Waste	1	0	0	1	0
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	0	0	0	0
Total				27	34	30

E_Diverg = 1- *Tanimoto Similarity* = $1 - \frac{27}{34+30-27} = 0.270$

APPENDIX A (cont'd)

Panel B: Social Reporting Divergence (S_Diverg)

Field_ID	Field_Description	Hess (*i*)	EQT (*j*)	*i×j*	*i×i*	*j×j*
ES059	Human Rights Policy	1	1	1	1	1
ES332	Policy Against Child Labor	1	0	0	1	0
ES369	Quality Assurance and Recall Policy	0	0	0	0	0
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	0	1	0	0	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	1	1	1	1	1
ES049	% Minorities in Workforce	1	1	1	1	1
ES091	% Disabled in Workforce	0	0	0	0	0
ES480	Percentage Gender Pay Gap for Senior Management	0	1	0	0	1
ES481	Percentage Gender Pay Gap Mid & Other Management	0	1	0	0	1
ES482	Percentage Gender Pay Gap Employees Ex Management	0	0	0	0	0
ES483	% Gender Pay Gap Tot Empl Including Management	0	0	0	0	0
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	0	1	0	0	1
ES057	Health and Safety Policy	1	1	1	1	1
ES052	Fatalities - Contractors	1	1	1	1	1
ES053	Fatalities - Employees	1	1	1	1	1
ES054	Fatalities - Total	1	1	1	1	1
ES092	Lost Time Incident Rate	1	1	1	1	1
ES121	Total Recordable Incident Rate	1	1	1	1	1
ES260	Lost Time Incident Rate - Contractors	1	1	1	1	1
ES261	Total Recordable Incident Rate - Contractors	1	1	1	1	1
SA201	Total Recordable Incident Rate - Workforce	1	0	0	1	0
SA202	Lost Time Incident Rate - Workforce	1	0	0	1	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	1	0	0	1	0
ES258	Number of Contractors	0	0	0	0	0
ES118	Social Supply Chain Management	1	1	1	1	1
ES116	Number of Suppliers Audited	0	0	0	0	0
ES117	Number of Supplier Audits Conducted	0	0	0	0	0
ES119	Number Supplier Facilities Audited	0	0	0	0	0
ES250	Percentage of Suppliers in Non-Compliance	0	0	0	0	0
ES499	Percentage Suppliers Audited	0	0	0	0	0
Total				23	28	28

$S\_Diverg = 1 - Tanimoto\ Similarity = 1 - \frac{23}{28+28-23} = 0.303$

Panel C: Governance Reporting Divergence (G_Diverg)

Field_ID	Field_Description	Hess (*i*)	EQT (*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	0	0	1	0
ES093	Employee CSR Training	0	1	0	0	1
ES064	Board Duration (Years)	1	1	1	1	1
Total				28	29	29

$$G\_Diverg = 1 - Tanimoto\ Similarity = 1 - \frac{28}{29+29-28} = 0.067$$

Panel D: ESG Reporting Divergence (ESG_Diverg)

$$ESG\_Diverg = 1 - Tanimoto\ Similarity = 1 - \frac{27+23+28}{(34+28+29)+(30+28+29)-(27+23+28)} = 1 - \frac{78}{91+87-78} = 0.22$$

APPENDIX B
Variable Definitions

Variable Name	Definition	Source
ESG-related Variables		
ESG_Diverg	One minus the average Tanimoto similarity of firm *i*'s ESG disclosure vector with that of its industry peers; please see the text for detailed discussions.	Bloomberg
E_Diverg (S_Diverg, G_Diverg)	One minus the average Tanimoto similarity of firm *i*'s environmental (social, governance) disclosure vector with that of its industry peers; please see the text for detailed discussions.	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.	I/B/E/S
Institutional Ownership	Shares held by institutions divided by the outstanding shares of a firm.	Thomson Reuters

FIGURE 1

The Dynamic Effect of the EU's ESG Reporting Regulation on U.S. Firms' ESG Reporting Divergence

This figure presents the dynamic effect of the EU's 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's ESG reporting regulation (except for 2013, which is the benchmark year) and the indicator for firms in treatment industries (i.e., U.S. industries with high proportions of firms with subsidiaries in the EU), controlling for the same variables and fixed effects as in Model (1).
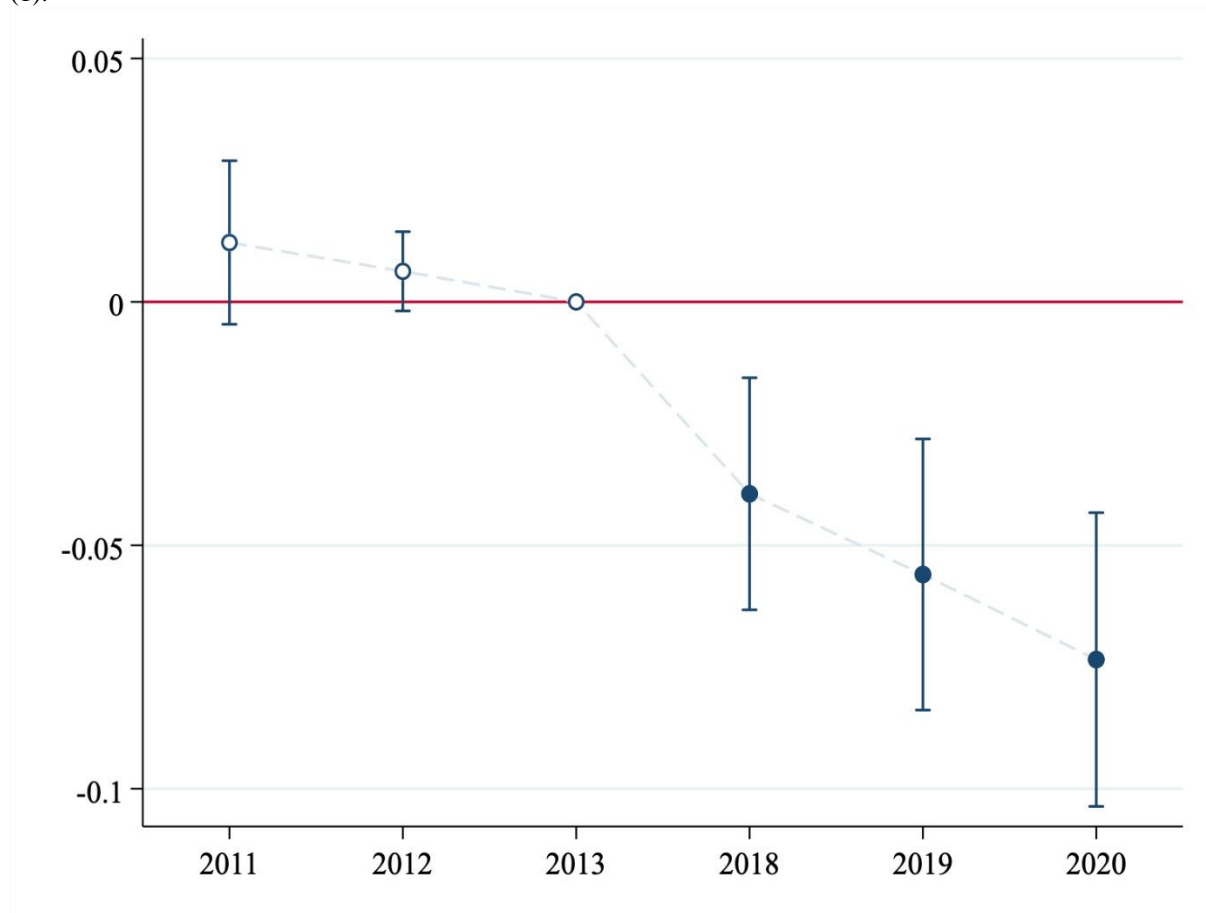
TABLE 1
Validity Tests for ESG Reporting Divergence

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 framework 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. Please see Appendix B for variable definitions.

Panel A: ESG Reporting Divergence by Reporting Framework

	Firm i and firm j adopt the same reporting framework		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 in the period of 2006-2020. The ESG fund holding sample includes 12,573 firm-year observations from 1,844 firms in 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 SICS 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	0.353	0.879	0.618	0.090
2007	272	0.290	0.947	0.610	0.088
2008	387	0.293	0.941	0.617	0.086
2009	537	0.293	0.930	0.622	0.083
2010	583	0.300	0.939	0.751	0.075
2011	667	0.314	0.941	0.777	0.079
2012	711	0.324	0.938	0.770	0.081
2013	748	0.335	0.934	0.768	0.081
2014	774	0.341	0.931	0.757	0.082
2015	1,082	0.331	0.932	0.672	0.107
2016	1,523	0.315	0.935	0.656	0.106
2017	1,704	0.306	0.921	0.527	0.106
2018	1,915	0.306	0.915	0.499	0.104
2019	1,969	0.314	0.895	0.485	0.097
2020	1,958	0.325	0.865	0.492	0.095

TABLE 3 (cont'd)

Panel C: ESG Reporting Divergence by SICS 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	0.385	0.846	0.641	0.110
Food & Beverage	558	0.407	0.875	0.662	0.113
Financials	2,424	0.252	0.962	0.573	0.100
Health Care	1,826	0.283	0.973	0.569	0.095
Infrastructure	2,050	0.307	0.849	0.584	0.072
Renewable Resources & Alternative Energy	114	0.424	0.879	0.652	0.131
Resource Transformation	1,763	0.349	0.891	0.625	0.086
Services	1,008	0.281	0.949	0.591	0.102
Technology & Communications	2,182	0.327	0.955	0.613	0.104
Transportation	625	0.370	0.878	0.617	0.114

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	0.439
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	0.409
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, based on two-sided tests.

Dependent Variable	H1	ESG Rating Disagreement (1)	E Rating Disagreement (2)	S Rating Disagreement (3)	G Rating Disagreement (4)
ESG_Diverg	+	**2.810****			
		(2.10)			
ESG_Rating		1.445***			
		(7.60)			
ESG Disclosure		-0.032*			
		(-1.79)			
E_Diverg	+		**13.029*****		
			(6.94)		
E_Rating			2.891***		
			(9.60)		
E Disclosure			-0.119***		
			(-9.10)		
S_Diverg	+			**2.329*****	
				(2.77)	
S_Rating				1.495***	
				(7.91)	
S Disclosure				-0.006	
				(-0.49)	
G_Diverg	+				**7.519*****
					(2.99)
G_Rating					-1.571***
					(-10.67)
G Disclosure					0.048**
					(2.24)
Firm Size		-0.211**	-1.013***	0.055	-0.172*
		(-2.09)	(-5.91)	(0.51)	(-1.81)
ROA		-0.770	-7.182***	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	-1.342**	-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 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 holdings. Column (1) reports the results for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund holdings. Columns (2), (3), and (4) report the corresponding results for individual pillars. 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, based on two-sided tests.

Dependent Variable		ESG Fund Holding			
	H2	(1)	(2)	(3)	(4)
ESG_Diverg		0.093			
		(0.77)			
ESG_Rating		0.092***			
		(7.15)			
ESG_Rating × ESG_Diverg	–	**-0.254***			
		(-2.72)			
E_Diverg			-0.381***		
			(-3.99)		
E_Rating			0.079***		
			(5.23)		
E_Rating × E_Diverg	–		**-0.164***		
			(-1.69)		
S_Diverg				-0.023	
				(-0.45)	
S_Rating				0.056***	
				(4.47)	
S_Rating × S_Diverg	–			**-0.243***	
				(-3.91)	
G_Diverg					0.195
					(1.01)
G_Rating					0.034**
					(2.36)
G_Rating × G_Diverg	–				**-0.022**
					(-0.10)
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 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
ESG Reporting Divergence Measure based on the TNIC Industry Classification

This table reports the regression results using the ESG reporting divergence measure based on the product similarity-based industry classification; please see the text for the construction of the measure. Column (1) reports the result for the effect of ESG reporting divergence on ESG rating disagreement. Column (2) reports the result for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund holdings. 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, based on two-sided tests.

Dependent Variable	*ESG Rating Disagreement*	*ESG Fund Holding*
	(1)	(2)
ESG_Diverg	2.248*	0.193**
	(1.93)	(2.42)
ESG_Rating		0.068***
		(6.37)
ESG_Rating × *ESG_Diverg*		-0.154***
		(-2.25)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
ESG Rater FE	Yes	Yes
N	11,101	8,908
Adj. R^2	0.188	0.174

TABLE 8
ESG Reporting Divergence Measures based on SASB Materiality Items

This table reports the regression results using ESG reporting divergence measures based on the SASB materiality items; please see the text for the construction of the measures. Columns (1) and (2) present the regression results for the effect of environmental and social reporting divergence on the corresponding rating disagreement, respectively. Column (3) ((4)) presents the regression results for the effect of environmental (social) reporting divergence on the association between environmental (social) ratings and ESG fund holdings. 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, based on two-sided tests.

Dependent Variable	E Rating Disagreement	S Rating Disagreement	ESG Fund Holding	
	(1)	(2)	(3)	(4)
E_Diverg	5.636***		-0.129	
	(4.14)		(-1.63)	
E_Rating	2.640***		0.081***	
	(8.58)		(5.08)	
E_Rating × E_Diverg			-0.132**	
			(-2.08)	
S_Diverg		2.778***		-0.074*
		(4.95)		(-1.96)
S_Rating		1.776***		0.057***
		(8.58)		(4.37)
S_Rating × S_Diverg				-0.081**
				(-2.16)
Control Variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
ESG Rater FE	Yes	Yes	Yes	Yes
N	13,482	12,630	11,335	11,464
Adj. R^2	0.387	0.210	0.205	0.153

TABLE 9
Results for High and Low ESG Disclosure Subsamples

This table reports the regression results separately for the high and low ESG disclosure subsamples. The high (low) ESG disclosure subsample includes firm-years with *ESG Disclosure* above (below) the sample median. Columns (1) and (2) present the regression results for the effect of ESG reporting divergence on ESG rating disagreement for the high and low ESG disclosure subsamples, respectively. Columns (3) and (4) present the regression results for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund holdings for the high and low ESG disclosure subsamples, respectively. 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, based on two-sided tests.

Dependent Variable	*ESG Rating Disagreement*		*ESG Fund Holding*	
	High ESG Disclosure	*Low ESG Disclosure*	*High ESG Disclosure*	*Low ESG Disclosure*
	(1)	(2)	(3)	(4)
ESG_Diverg	3.896***	4.489***	0.250**	0.360***
	(2.77)	(2.78)	(2.04)	(3.35)
ESG_Rating			0.132***	0.066***
			(9.86)	(5.05)
ESG_Rating × ESG_Diverg			-0.398***	-0.104
			(-4.40)	(-0.87)
Control Variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
ESG Rater FE	Yes	Yes	Yes	Yes
N	7,684	7,243	6,287	6,286
Adj. R^2	0.178	0.176	0.236	0.141
P-value for the difference in the coefficient on				
ESG_Diverg		0.849		
ESG_Rating × ESG_Diverg				0.163

TABLE 10
Regression Results based on Firm Fixed Effects

This table reports the regression results using firm fixed effects instead of industry fixed effects. Column (1) reports the result for the effect of ESG reporting divergence on ESG rating disagreement. Column (2) reports the result for the effect of ESG reporting divergence on the association between ESG ratings and ESG fund holdings. The sample consists of firm-year observations with data on regression variables over the period of 2006-2020. Firms with only one observation during the sample period are excluded from the analyses. 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, based on two-sided tests.

Dependent Variable	*ESG Rating Disagreement*	*ESG Fund Holding*
	(1)	(2)
ESG_Diverg	4.191***	0.079
	(2.72)	(0.77)
ESG_Rating		0.031**
		(2.28)
ESG_Rating × ESG_Diverg		-0.139*
		(-1.80)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
ESG Rater FE	Yes	Yes
N	14,813	12,468
Adj. R^2	0.482	0.613

TABLE 11

ESG Reporting Divergence and ESG Rating Informativeness

This table reports the regression results for the effect of ESG reporting divergence on ESG ratings' informativeness of future news-based ESG performance. *Future ESG Insight Score* is the one-year-ahead ESG insight score from Truvalue Labs. The sample consists of 12,476 firm-year observations with data on regression variables over the period of 2006-2020. Please see Appendix B for definitions of other variables. Firm-clustered heteroskedasticity-robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, based on two-sided tests.

Dependent Variable	Future ESG Insight Score	
	(1)	(2)
ESG_Rating	2.557***	2.673***
	(7.91)	(7.92)
ESG_Diverg		0.486
		(0.19)
ESG_Rating × ESG_Diverg		-5.465***
		(-2.72)
ESG Disclosure	-0.026	0.007
	(-0.91)	(0.22)
Firm Size	-1.028***	-1.034***
	(-4.87)	(-4.84)
ROA	0.097	0.246
	(0.05)	(0.13)
MTB	-0.007	-0.007
	(-0.36)	(-0.37)
Leverage	-1.651	-1.667
	(-1.41)	(-1.42)
Analysts	0.277	0.245
	(0.70)	(0.61)
Institutional Ownership	0.722	0.579
	(0.75)	(0.60)
Year FE	Yes	Yes
Industry FE	Yes	Yes
ESG Rater FE	Yes	Yes
N	12,476	12,476
Adj. R^2	0.165	0.166

TABLE 12
The Spillover Effect of the EU's 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. The pre-regulation period includes 2011-2013 and the post-regulation period includes 2018-2020. Please see Appendix B for the definitions of other variables. Firm-clustered heteroskedasticity-robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, based on two-sided tests.

Panel A: The Effect of the EU's 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 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's ESG Reporting Regulation on E Rating Disagreement and the association between environmental ratings and ESG fund holdings

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)
E_Rating × Treat_ Post		0.134*
		(1.69)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
ESG Rater FE	Yes	Yes
N	6,471	5,618
Adj. R^2	0.586	0.202