



Material Sustainability Information and Stock Price Informativeness

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Abstract

As part of the Securities and Exchange Commission's revision of Regulation S-K, which lays out reporting requirements for publicly-listed companies, many investors proposed the mandatory disclosure of sustainability information in the form of environmental, social and governance data. However, progress is contingent on collecting evidence regarding which sustainability disclosures are financially material. To inform this issue, we examine materiality standards developed by the Sustainability Accounting Standards Board (SASB). Firms voluntarily disclosing more SASB-identified sustainability information exhibit greater price informativeness, while the disclosure of non-SASB information does not relate to informativeness. The results are robust to a changes analysis and a difference-in-differences analysis that exploits the staggered release of SASB standards across different industries over time. We also document stronger results for firms with higher exposure to sustainability issues, poorer sustainability ratings, greater institutional and socially responsible investment fund ownership, and coverage from analysts with lower portfolio complexity.

Keywords Voluntary disclosure · Disclosure standards · Sustainability information · Stock price informativeness

Introduction

A guiding principle behind financial accounting standards is financial materiality, which the Securities and Exchange Commission (SEC) defines in accordance with the interpretation of the U.S. Supreme Court as information presenting a substantial likelihood that the disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the total mix of information

made available.¹ Although financial reporting is driven by requirements set in financial accounting standards, disclosure relating to environmental (i.e., carbon emissions, water consumption, waste generation, etc.), social (i.e., employee, product, customer related, etc.), and governance (i.e., political lobbying, anti-corruption, board diversity, etc.) information—collectively ESG or sustainability information—is not yet guided by a set of accounting standards that define financially material sustainability disclosure requirements.²

Despite a marked increase in investor interest and exponential growth in voluntary reporting, the SEC has not followed in the footsteps of other regulators that increasingly mandate ESG disclosures (e.g., Directive 2014/95/EU in the European Union).³ One reason for this is the SEC's hesitation regarding “which, if any, sustainability disclosures are

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¹ TSC Industries v. Northway, Inc., 426 U.S. 438, 449 (1976). See also Basic, Inc. v. Levinson, 485 U.S. 224 (1988).

² Though the SEC mandates governance disclosures such as executive compensation and pay ratios, the G (governance) portion of ESG disclosures typically does not cover these topics, but rather includes issues such as business ethics and transparency of payments or political lobbying. We provide more detail on this and on the validity of our measures in later sections.

³ In the U.S., 81% of firms on the S&P 500 Index reported on sustainability in 2015, up from 20% in 2011. Globally, close to 9000 firms disclosed ESG information in 2016, up from fewer than 20 companies in 1992.

important to an understanding of a registrant's business and financial condition", a sentiment expressed in the 2016 Concept Release in which the SEC solicited input on disclosure requirements in Regulation S-K.⁴ Without an understanding of which sustainability metrics are investor-relevant and financially material, the SEC lacks justification for imposing additional reporting requirements on U.S. firms. Although the SEC's Investor Advisory Committee recently called for Regulation S-K to be modified such that ESG issues are subject to the same materiality standards as other sources of business risks, progress is contingent on obtaining an understanding of which ESG issues are material.⁵

We use the Sustainability Accounting Standards Board's (SASB's) materiality classifications of sustainability disclosures—which are voluntary and not mandated by the SEC—to examine if, and under which conditions, voluntarily disclosed sustainability information deemed as material by SASB increases stock price informativeness.⁶ SASB's stated mission is to help businesses identify, manage and disclose the sustainability topics that matter most to their investors.⁷ Large asset managers, such as BlackRock, participate in the investor advisory group of SASB, while SASB's board of directors comprise a group of individuals with accounting and capital markets expertise, including former Financial Accounting Standards Board (FASB) members and SEC commissioners.

According to SASB, the financial materiality of specific sustainability issues depends on a company's industry and, as a result, accounting standards are industry-specific. To construct a measure of SASB-identified sustainability disclosure, we create a disclosure score using Bloomberg data items that have been mapped to the SASB issues for each industry. Each firm receives a score according to its disclosure practices in relation to metrics deemed financially material for its industry.⁸

Our primary measure of stock price informativeness is the measure of stock price synchronicity that has been used extensively in prior research (Morck et al. 2000; Chen et al. 2007; Fernandes and Ferreira 2009; Eun et al. 2015). This measure extracts the portion of stock price movement that is specific to the firm and not driven by either market or industry returns. It therefore aligns well with our focus on SASB standards, which aim to increase the availability of firm-specific information, enabling investors to compare companies *within* the same industry. As Roll (1988) suggests, the extent to which stocks move together depends on the relative amounts of firm-level, industry-level and market-level information capitalized into stock prices.⁹ To assess the robustness of our analysis to the use of our measure of informativeness, we complement synchronicity with other measures that have been used in prior studies as proxies for stock price informativeness (Muller and Riedl 2002; Cheng et al. 2013), such as illiquidity, the volatility of liquidity, bid-ask spread, and zero return days (Copeland and Galai 1983; Amihud 2002; Pereira and Zhang 2010).

Using sustainability data between 2007 and 2015 for a sample of 1291 US-listed companies, we find a negative and significant association between our measure of SASB-identified sustainability information and stock price informativeness. Our result is robust to controlling for a firm's ESG performance rating, a firm's level of non-SASB-identified ESG disclosure, voluntary issuance of management forecasts, a measure of earnings quality, and whether a firm issues a sustainability report. This suggests that our results are not simply reflecting differences in ESG performance or voluntary disclosure of financial and other ESG information.

To mitigate concerns that unobservable firm-specific variables or reverse causality might be driving our findings, we also examine changes in SASB-identified sustainability disclosure and show that increases (decreases) in SASB disclosure are followed by increases (decreases) in informativeness. In contrast, we do not find that changes in non-SASB-identified sustainability disclosures are associated with changes in stock price informativeness.

⁴ Concept Release on Business and Financial Disclosures Required by Regulation S-K Release Number 33-10064; 34-775599. Accessed from: <https://www.sec.gov/rules/concept/2016/33-10064.pdf>.

⁵ Letter from SEC Investor Advisory Committee, to SEC Division of Corporation Finance (June 15, 2016). Accessed from: <https://www.sec.gov/spotlight/investor-advisory-committee-2012/iac-approved-letter-reg-sk-comment-letter-062016.pdf>.

⁶ We use 'ESG' and 'sustainability' interchangeably, and we use 'material sustainability' in reference to SASB's classification of investor-relevant sustainability issues. For an overview of the debate on the concepts and definitions of Corporate Social Responsibility, please see Van Marrewijk (2003).

⁷ See <https://www.sasb.org/>.

⁸ Though SASB did not release its standards until 2013, our ESG disclosure data dates back to 2007, and we use the standards to construct SASB disclosure scores from 2007 onwards in order to assess whether investors integrate this information into their valuation of firms that disclose even prior to the release of the standards.

⁹ Following the recommendations of Li et al. (2014), we conduct additional analyses to examine whether the association with stock price synchronicity is indicative of news or noise in stock prices. Li et al. (2014) recommend controlling for beta in regressions that use stock price synchronicity as the dependent variable to assess whether the documented relation changes sign or disappears. In our case, we find that there is still a negative and significant association when controlling for both market and industry beta suggesting the association between material sustainability disclosures and both synchronicity and idiosyncratic volatility yields consistent results.

In our analyses, we seek to provide insights into *how* ESG disclosures are used by investors in their assessments of firm value.¹⁰ Specifically, we document that the positive association between SASB-identified sustainability information and stock price informativeness is stronger for firms with higher business exposure to sustainability issues and poor sustainability ratings, and when the firms' investors and information intermediaries have higher information processing capabilities.

Moreover, we exploit the staggered release of SASB standards across different industries over time to understand how firms' disclosure decisions change and the impact of those changes on stock price informativeness. Using a difference-in-differences specification, we find that treatment firms in industries with newly-released SASB standards increase SASB-identified disclosure significantly compared to matched control firms, and that the affected firms exhibit increases in stock price informativeness.

This study makes several contributions. First, it contributes to the call for evidence on the financial materiality of sustainability disclosures, especially in the context of US securities law and SEC's Regulation S-K. Our findings suggest that SASB-identified sustainability information provides investors with firm-specific information aiding in the price discovery process. While a developing literature shows that sustainability disclosures are associated with economic effects (Dhaliwal et al. 2011; Cheng et al. 2014), these studies do not provide evidence on *which* sustainability disclosures are informative since the disclosure constructs either proxy for the presence of a sustainability report or cover all sustainability metrics without making the distinction between investor-relevant disclosures and disclosures made for non-equity stakeholders. In this paper, we separate a firm's overall ESG disclosure score—which has been the focus of prior literature—into investor- and non-investor-relevant disclosure scores according to SASB—and examine the economic consequences of this distinction. Our results suggest that only a subset of ESG disclosure accounts for the systematic association between ESG disclosure and informativeness, a finding that increases our understanding of how sustainability information is incorporated into prices.

Moreover, we find that this relationship is a function of a firm's business strategy, ownership structure, underlying ESG performance and information intermediation. In addition, our result that firms respond to the release of SASB standards and

that this response is associated with improved stock price informativeness, contributes to research examining the effect of standards on economic outcomes (see for example, Barth et al. 2008) and a literature that seeks to understand how firms adopt sustainability standards (Ioannou and Serafeim 2019). Our paper also contributes to a literature that seeks to understand innovations in accounting practices because of standards developed by market, rather than regulatory forces (Allee and Yohn 2009; Serafeim 2011) and to the literature studying the development of market institutions, such as insider trading laws (Edmans et al. 2017) or corporate governance networks (Khanna and Thomas 2009) that affect stock price informativeness.

Motivation and Literature Review

The number of companies disclosing sustainability information has grown exponentially over the past years.¹¹ While only a few companies disclosed such information in the early 2000s, it has now become common practice for companies to communicate the relevance of such information for their business strategy and operations. Much of this has been driven by pressure from stakeholder groups, in particular non-governmental organizations (Delmas and Toffel 2008; Reid and Toffel 2009), heightened government regulation (Barth et al. 1997; Neu et al. 1998), and increased investor interest in ESG data (Eccles et al. 2011).¹²

Demand for integration of sustainability or environmental, social and governance (ESG) data in investment management has also increased exponentially over the past decade (Amel-Zadeh and Serafeim 2018). According to most recent estimates, more than \$22 trillion in assets under management (AuM) use sustainability data in portfolio construction.¹³ What started as a socially responsible investing movement in a handful of funds has moved to the mainstream, with investors seeking to

¹⁰ According to the CFA Institute: "...there remains a gap regarding how to consider ESG issues in practice. Perhaps expanding on the 'how to' should now rank higher on the ESG research agenda". See p. 38 of Environmental, Social, and Governance Issues in Investing: A Guide for Investment Professionals: <https://cfainstitute.org/advocacy/policy-positions/environmental-social-and-governance-issues-in-investing-a-guide-for-investment-professionals>.

¹¹ Average national reporting rates for sustainability information increased from 47% in 2011 to 72% in 2017. See 'The KPMG Survey of Corporate Responsibility Reporting 2017': <https://assets.kpmg/content/dam/kpmg/xx/pdf/2017/10/kpmg-survey-of-corporate-responsibility-reporting-2017.pdf>. Moreover, in our sample, the fraction of firms issuing standalone sustainability reports tripled from 8.3% to 25.3% over the period 2007 to 2015.

¹² Signatories to the UN Principles for Responsible Investment (PRI), launched in 2006, commit to incorporate ESG issues into their investment analysis and ownership policies and practices. As of 2016, the principles had about 1400 signatories with total assets under management of about \$60 trillion. As a further sign of the institutionalization of ESG data, Bloomberg terminals integrated ESG data in 2010, dramatically increasing the diffusion of ESG information. As of 2016, more than 100 rating agencies provided ESG data, including large data providers such as Thomson Reuters and MSCI.

¹³ See the 'Global Sustainable Investment Alliance 2016 Report': <http://www.gsi-alliance.org/members-resources/trends-report-2016/>.

integrate sustainability data that helps with the identification of business risks and opportunities (see Appendix 1 for examples of ESG integration in practice).¹⁴

However, in the United States such disclosures are not yet guided by a set of accounting standards. This stands in contrast to financial reporting, which is largely driven by requirements set in financial accounting standards. The formation of financial accounting standards is considered an important element of the development of capital markets and the efficient allocation of capital in an economy (Levitt 1998; Healy and Palepu 2001) and a long line of research examines the effect of standards on economic outcomes (see for example, Barth et al. 2008).

Although there is no current regulatory requirement for ESG disclosure in the U.S., the SEC's attention to ESG matters has grown in recent years. The SEC issued Interpretive Guidance on the disclosure of climate change risks and opportunities in 2010, and the Dodd–Frank Act required the SEC to adopt rules regulating disclosures of conflict minerals, health and safety violations at mine sites, and payments to governments for the extraction of natural resources. The SEC's Investor Advisory Committee has recently called for Regulation S–K to be modified such that ESG issues are subject to the same materiality standards as other sources of business risks; however, a first step in this process is obtaining an understanding of *which* ESG issues are financially material.

Prior research analyzes ESG disclosures without distinguishing which sustainability disclosures are likely to be financially material. These studies document that voluntary issuance of a sustainability report leads to a reduction in the firm's cost of capital, while attracting dedicated institutional investors and analyst coverage (Dhaliwal et al. 2011); that firms with better ESG performance ratings face significantly lower capital constraints (Cheng et al. 2014; Hauptmann 2017); and that stock price reactions to mandated ESG disclosure regulation vary predictably based on ex-ante ESG performance ratings (Grewal et al. 2018). Lee (2017) documents a positive association between ESG performance ratings and the accuracy of management forecasts following the introduction of disclosure regulations intended to mitigate managers' opportunistic behavior. However, prior work also documents insignificant market reactions to news about firms being added, deleted, or retained on the Dow Jones Sustainability Index World (Hawn et al. 2017), and researchers have documented an insignificant investor response to the release of sustainability reports by US firms (Guidry and Patten 2010).¹⁵ We build on this literature by distinguishing

ESG disclosure intended for investors from other ESG disclosure and examining whether this distinction has economic consequences.

A related study by Khan et al. (2016) finds that firms with better performance ratings on SASB-identified sustainability issues outperform firms with poor ratings on these issues in terms of long-term stock returns.¹⁶ Khan et al. (2016) speculate that the predictive ability of ratings for returns arises because of the lack of relevant sustainability disclosure; in our study we examine this assertion by investigating whether material sustainability disclosure increases firm-specific information in stock prices. Moreover, we study variation in SASB-identified sustainability *disclosure* across firms and whether this variation affects price discovery, whereas Khan et al. (2016) focus on *ratings* of ESG performance. Disclosure and ratings of performance are different theoretical constructs, as data providers interpret a wide array of information (not only disclosures) to evaluate a company's ESG performance, but are also empirically distinct, as evidenced by their low correlation.¹⁷ In our sample, for example, Exxon Mobil consistently has high ESG disclosure scores (in the top-decile) and yet also has poor (bottom-decile) ESG performance ratings in the same years. On the other hand, the cosmetics manufacturer Estée Lauder consistently has high ESG performance ratings and, at the same time, has low ESG disclosure scores.

Prior research has also examined the development of market institutions that increase stock price informativeness. For example, Edmans et al. (2017) show that enforcement of insider trading laws shapes informativeness, while Khanna and Thomas (2009) find that the structure of corporate governance and in particular interlocking directorships affect informativeness. Gul et al. (2010) find that foreign ownership and auditor quality are inversely related to informativeness. Eun et al. (2015) find that national culture also shapes stock price informativeness. In our paper,

¹⁶ Khan et al. (2016) measure sustainability *outcomes* such as environmental performance (e.g., level and intensity of greenhouse gas emissions), social performance (e.g., employee satisfaction and human rights scandals) and governance performance (e.g., corruption charges), whereas we measure the level of sustainability *disclosure* (e.g., transparency around emissions, employment practices, human rights policies, and anti-corruption metrics).

¹⁷ The correlation between our disclosure score and the performance rating used in Khan et al. (2016) is approximately 0.1. To alleviate concerns that increases in SASB-identified sustainability performance ratings are driving our results, we document that firms with higher SASB-identified sustainability disclosures have more informative stock prices, even after controlling for SASB-identified sustainability performance ratings.

¹⁴ See for example, Goldman Sachs, The Metrics that Matter. A Mainstream Approach to ESG: <http://www.goldmansachs.com/our-thinking/podcasts/episodes/05-08-2017-derek-bingham.html>.

¹⁵ Corporate social responsibility measures are also likely to be discounted by evaluators when making appraisal and bonus decisions (e.g., Bento et al. 2016).

we seek to understand how market-driven innovations in standard-setting for sustainability information affect stock price informativeness.

Hypotheses

The disclosure of SASB-identified sustainability information will improve stock price informativeness if these disclosures provide value-relevant firm-specific information and investors can analyze the implications of these disclosures for firm value. However, a number of reasons suggest that the disclosure of SASB-identified information will have no effect on stock price informativeness. For one, sustainability disclosures are made on a voluntary basis and are not mandated by the SEC during our sample period; the resulting lack of comparability in reported information across firms and time increases investors' costs of gathering and analyzing sustainability information and increases the probability of general and boilerplate disclosures (Amel-Zadeh and Serafeim 2018).

In addition to these limitations that investors face in using ESG disclosures, prior research has documented the influence of political and professional characteristics of standard setters on accounting standards (e.g., Allen and Ramanna 2013). Given the lengthy, negotiated and multi-stakeholder process that SASB standards evolved from, it is uncertain as to whether SASB achieved its objective of developing metrics that provide value-relevant firm-specific information, as opposed to being influenced by the objectives of participants in the standard-setting process. Another reason why SASB-identified information may not relate to price informativeness is that SASB standards could identify sustainability information that is harmful to a firm's competitiveness. If so, firms may withhold SASB disclosure, provide limited disclosure, or disclose in a manner that is boilerplate and uninformative in order to reduce the expected proprietary costs associated with the disclosure of SASB-identified information.

Nevertheless, if SASB standards identify value-relevant and firm-specific information, and firms perceive the expected benefits of disclosing to exceed the expected costs, this would generate the prediction that disclosure of SASB-identified information improves price informativeness. Consistent with this perspective, we make the following hypothesis:

H₁ The disclosure of SASB-identified sustainability information is positively associated with stock price informativeness.

How ESG disclosures are used to assess firm value and the conditions under which such information is useful to investors, are relatively unexplored (CFA Institute 2015). We hypothesize that certain firm and capital market factors will moderate the relation between SASB-identified sustainability disclosures and price informativeness.

Firm Characteristics

We expect the relation between material sustainability disclosure and stock price informativeness, if any, to be moderated by the importance of sustainability issues for a given firm. Firms for which sustainability matters more for operating performance and valuation should experience a stronger association between SASB-identified sustainability disclosure and the firm-specific information content of the stock market, as investors will utilize this information to a greater degree in assessments of firm value. While SASB defines sustainability issues that are material at the industry level, different companies within the same industry have varying degrees of exposure to the same issues. For example, a real estate company with properties in Miami Beach is more exposed to climate change and rising sea levels compared to a real estate company with properties in a non-coastal US city. We expect firms with greater exposure to, and integration of, sustainability issues will experience a stronger firm-specific information effect in returns as disclosure of SASB-identified sustainability information increases.

We also hypothesize that SASB-identified ESG disclosure will be relatively more informative for price discovery when ESG ratings are poor. Risk management is the primary reason why portfolio managers and analysts take ESG issues into consideration in investment analysis and decisions.¹⁸ Thus, we hypothesize that when ESG ratings are poor, investors will seek to bridge the gap between an aggregated ESG rating and the valuation implications of this rating, and will do so through a careful consideration of the information conveyed by the firm in its SASB-identified sustainability disclosures.

¹⁸ 63% of respondents cited management of investment risk as the reason why they incorporate ESG into investment and analysis according to the CFA Institute's (2015) survey of its members. See here.

H₂ Greater firm exposure to sustainability issues and poorer sustainability performance ratings moderate the relation between SASB-identified sustainability disclosure and stock price informativeness.

Capital Market Participant Characteristics

We expect that capital market participants who are more adept at processing information will moderate a stronger effect of SASB-identified sustainability disclosure on stock price informativeness. For instance, institutional investors are expected to be more proficient at integrating sustainability disclosures into stock prices compared to retail investors. Institutional investors tend to have more resources to process complex information due to the scale of their operations and expertise, e.g., through specialized equity analysts and research teams with extensive knowledge on specific industries and firms. We also conjecture that socially responsible investment (SRI) funds will be more adept at processing sustainability information. SRI funds have a history of integrating sustainability information in their investment decisions and consequently are expected to exhibit higher information processing skills and focus on information of this nature.

We also hypothesize that characteristics of sell-side analyst will moderate the relationship between SASB-identified sustainability information and informativeness. Past literature has studied the relation between sustainability disclosures and ratings, and analyst recommendations (Ioannou and Serafeim 2015) or forecasts (Dhaliwal et al. 2012). Prior research has also examined the relation between synchronicity and analyst forecasting intensity (which we control for in all our models), documenting a positive relationship between the two (Piotroski and Roulstone 2004). Consistent with our previous argument, we expect that analysts with lower information processing costs, due to lower portfolio complexity, will exhibit a stronger positive relationship between SASB-identified sustainability information and stock price informativeness.

H₃ Greater institutional and SRI ownership and sell-side analysts with lower portfolio complexity moderate the relation between SASB-identified sustainability disclosure and stock price informativeness.

Data and Sample

Materiality Data

Our data collection is driven by the availability of materiality guidance from SASB, which is an independent 501(c)3 non-profit whose mission is to develop and disseminate sustainability accounting standards that help publicly-listed corporations voluntarily disclose material factors in compliance with

SEC requirements. SASB is accredited to establish sustainability accounting standards by the American National Standards Institute (ANSI), and such accreditation is intended to signify that SASB's procedures to develop sustainability accounting standards meet the Institute's requirements for openness, balance, consensus, and due process. SASB's board comprises a mix of regulators, academics, lawyers, and investors, including two former Chairwomen of the SEC and a former Chairman of the FASB.

SASB adopts an investor viewpoint and, as a result, a topic might be classified as immaterial from an investor standpoint, although such a topic could be important for other stakeholders. The investor focus of SASB is different from that of other organizations such as the Global Reporting Initiative (GRI), which has a multi-stakeholder focus. In a joint op-ed, the Chief Executives of GRI and SASB explained how the two are complements rather than substitutes. They suggest that "rather than being in competition, GRI and SASB are designed to fulfill different purposes for different audiences (...) The GRI standards are designed to provide information to a wide variety of stakeholders and consequently, include a very broad array of topics. SASB's are designed to provide information to investors and consequently, focus on the subset of sustainability issues that are financially material."¹⁹

SASB's voluntary standards are developed via a process consisting of research, data and analytical tools; balanced, multi-stakeholder industry working groups; a public comment period; and review by an independent Standards Council comprised of experts in standards development, securities law, environmental law, metrics and accounting.²⁰ SASB convenes industry working groups—consisting of 1/3 corporations, 1/3 market participants, and 1/3 other stakeholders—to provide feedback on SASB's draft sustainability accounting standards. More than 3000 experts representing more than \$30 trillion in assets under management and \$15 trillion in company market capitalization participated in SASB's industry working groups between 2013 and 2016. Importantly, although the standards include a crowdsourcing of industry expert opinions, a scanning of regulated filings for mentions of different sustainability issues and documentation of cases of impacts on revenues, costs, assets and liabilities, the standard-setting process involves no large scale empirical evidence.²¹ Thereby,

¹⁹ Tim Mohin and Jean Rogers. How to approach corporate sustainability reporting in 2017. Accessed: www.greenbiz.com/article/how-approach-corporate-sustainability-reporting-2017.

²⁰ See www.sasb.org.

²¹ For more information on the concepts, principles and objectives that guide SASB in setting standards for investor-relevant sustainability accounting, see SASB's Conceptual Framework (<https://www.sasb.org/standard-setting-process/conceptual-framework/>). Although SASB does not state whether its standards are "principles-based" or "rules-based", we assess the standards as being rules-based given that SASB standards provide material sustainability disclosure topics on an industry-by-industry basis.

there is a need to examine the characteristics of these standards and their association with market outcomes.

Sustainability Data

We retrieve data on sustainability disclosure practices from Bloomberg. Bloomberg is the leading source of corporate and financial data on public companies tracking more than 300 different metrics and covering all aspects of ESG, from political donations to number of environmental spills.²² Bloomberg has recently integrated a transparent mapping of its ESG disclosure metrics to SASB voluntary reporting standards. Given that SASB standards differ across industries, we manually collect, for each industry, all Bloomberg ESG data items that were mapped to SASB topics. We then construct disclosure scores taking into account these industry-specific Bloomberg ESG data items.²³ An important feature of our setting is that SASB is a fairly young organization (established in 2011) and the first set of standards were released in 2013. Since Bloomberg sustainability disclosure data are available from 2007 onwards, this allows us to assess its association with informativeness even prior to the development of the standards and also to conduct analysis about how the release of the standards affects informativeness.

We compute the SASB material sustainability disclosure score for each firm-year combination (*MaterialDisc*) as the ratio of number of disclosed SASB ESG metrics to total number of metrics identified by SASB and available in Bloomberg.²⁴ We note that not all SASB metrics have corresponding Bloomberg ESG metrics. For example, in the Automobiles industry, SASB has proposed “Number and duration of strikes and lockouts” as a material sustainability metric, but Bloomberg does not collect data pertaining to this metric. Data coverage differs across industries, as SASB standards are industry-specific. For the different sectors, we document on average SASB data coverage of 80% for Renewables, 78% for Non-Renewables, 75% for Transportation, 61% for Consumption, 61% for Resource Transformation, 54% for Technology and Communications, 52% for Services, and 45% for Health Care. Industry-by-industry statistics are reported in Table 2, Panel B. While incomplete

coverage could create noise in our estimates thereby biasing them towards zero, it is not clear that it will introduce bias in a positive or negative direction.²⁵ Our estimates are within a SASB Sustainable Industry Classification System (SICS) industry and therefore differential data coverage across SICS industries should not affect our results.

Moreover, it is unlikely that firms are disclosing a significant amount of SASB metrics that are not available in Bloomberg. Per our discussion with an ESG analyst at Bloomberg, the reason why Bloomberg does not collect data points for all SASB metrics is that some SASB metrics constitute innovations in sustainability reporting and are not yet being disclosed by firms. Therefore, we view the relative scores of each company within its industry as a fairly accurate rating of its disclosure practices.²⁶ However, in subsequent analysis we construct an alternative measure of SASB-identified disclosure that does not rely on Bloomberg data and find that our results are robust to this alternative measure.

We observe that the SASB metrics not covered by Bloomberg are more granular—but very similar in scope—as other SASB metrics that are covered by Bloomberg. For example, in Oil & Gas, “Gross global Scope 1 emissions” is a SASB metric covered by Bloomberg, while “Global Scope 1 emissions from (1) combustion, (2) flared hydrocarbons, (3) process emissions, (4) directly vented releases, and (4) fugitive emissions” is a SASB metric *not* covered by Bloomberg. Clearly, the second metric is much more detailed than the first, while they both relate to the same disclosure topic (greenhouse gas emissions) that is financially relevant in this industry.

As SASB does not recommend weights for metrics within an industry, we adjust for double-counting of metrics that fall into several topics. For example, within the SASB SICS industry “Containers and Packaging”, the metric “Human Rights Policy” belongs to two disclosure topics: “Security, Human Rights, and Rights of Indigenous Peoples” and “Community Relations”. For our total disclosure score, we only account for “Human Rights Policy” once. Our resulting material sustainability disclosure ratio reflects ESG disclosure according to SASB standards and can range from 0 to 100%.²⁷

²² See Framework, Behind the Terminal: Understanding the Bloomberg ESG Numbers, <https://frameworkesg.com/wp-content/uploads/2019/07/Bloomberg-ESG-Infographic.pdf>.

²³ A concern when measuring disclosure levels is that not all disclosures are applicable to all firms (e.g., only if a firm chooses to have operating leases does it need to disclose future cash payments relating to those leases). A nice feature of our setting, however, is that SASB has identified sustainability topics that are relevant across *all* firms in a given industry; as a result, our measure reflects disclosure levels across these relevant topics and is comparable across firms.

²⁴ Please see Appendix 4 for step-by-step instructions on constructing *MaterialDisc*, as well as an example.

²⁵ We replicate all our analyses excluding industries where Bloomberg has data for fewer than 60% of the SASB issues and we find similar results.

²⁶ It could, however, be the case that only the SASB metrics available in Bloomberg are financially material, while the ones that are not available (and that firms do not disclose) are immaterial. This would mean that our inferences are not generalizable to all SASB disclosures.

²⁷ Bloomberg metrics in some cases are not the exact measure that SASB specifies in its standards but a proxy for that measure. We recalculate our measuring excluding all Bloomberg data items that are proxies. We find that this new disclosure metric is very highly

Measurement of Stock Price Informativeness

A long line of literature in both accounting and finance examines the relation between firm-specific variation in stock returns and several aspects of the firm's information or governance environment (e.g., Piotroski and Roulstone 2004; Ferreira et al. 2011; Crawford et al. 2012). These studies proxy for the mix of firm-specific and industry- and market-wide information available about the firm using stock return synchronicity (measured as the R^2 value from a regression of firm returns on market and industry returns) where lower R^2 reflects stock prices with greater firm-specific information. In this paper, we assess whether firms that voluntarily disclose more information, as later prescribed by SASB standards, have lower stock price synchronicity. This measure is well suited for the purposes of this study as it aligns well with SASB's intention to provide firm-specific information that allows investors to compare companies within the same industry.

We compute stock return synchronicity consistent with previous literature (Roll 1988; Piotroski and Roulstone 2004; Crawford et al. 2012; Li et al. 2014). We collect daily firm stock returns, value-weighted industry returns, and market returns for our sample from CRSP. We winsorize the returns at the 1 and 99 level to remove potential outliers. Following Crawford et al. (2012) we require a minimum of 50 daily observations. We exclude firm-year combinations that have less than 12 trading days for each month, as in Li et al. (2014). For each year, we then estimate firm-specific regressions using market and industry returns. We extract the R^2 from each of these regressions to compute firm-year synchronicity, defined as follows:

$$\text{Synchronicity}_{i,t} = \log \left(\frac{R^2}{1 - R^2} \right)$$

A higher synchronicity value indicates a stronger explanatory power of industry and market returns on firm returns. Conversely, a lower synchronicity value reflects lower stock co-movements with industry and market, revealing a higher firm-specific information content of stock returns.

As alternative proxies for the firm's stock price informativeness we employ four measures: illiquidity of stocks (*Illiq*), liquidity risk (*LiqVol*), bid-ask spread (*Spread*), and zero return days (*ZeroDays*) (Amihud 2002; Copeland and Galai 1983; Pereira and Zhang 2010; Lang and Maffett 2011; Li et al. 2014).²⁸ We employ these alternative measures of

stock price informativeness to ensure robustness of results. Li et al. (2014) postulate that to ensure that lower synchronicity is capturing firm-specific information rather than noise, results should be similar using alternative measures.

We select stock price synchronicity as our main dependent variable of interest, as the alternative measures discussed are less precise and fitted to the setting we are exploring.²⁹ The advantage of using stock price synchronicity in our setting, is that we are more precisely able to disentangle market and industry information in stock prices from the firm-specific information content. This is important, as SASB standards are developed at the industry level, yet we are interested in whether greater material sustainability disclosure at the firm-level enables investors to more efficiently price stocks. In other words, SASB standards aim to provide investors with information about how Chevron vs. Exxon Mobil manage climate risk or how Coca Cola vs. Pepsico manage water risk, thereby allowing for more efficient pricing of individual firm stocks.

Footnote 28 (continued)

daily trading volume. Amihud (2002) shows that this measure is strongly related to other illiquidity measures, such as microstructure estimates of illiquidity and the Amihud measure. Our second alternative dependent variable is *LiqVol* and it is measured as the annual standard deviation of the daily *Illiq* measure. A high *LiqVol* reflects an additional level of uncertainty and lack of information on the company. Lang and Maffett (2011) show that *LiqVol* is related to lower transparency and Pereira and Zhang (2010) discuss that a higher value provides more opportunity for investors to time trades, reflecting less informativeness. The third alternative dependent variable, *Spread*, is the yearly average of the daily bid-ask spread. A greater *Spread* reflects less informativeness and greater uncertainty around the underlying value. *ZeroDays* captures the number of zero return days in a year to the total number of trading days and provides indication on the information environment. A stock with strong information availability should experience few days without stock price movements, as investors react to information changes in the market.

²⁹ Amihud (2002) states in his study that *Illiq* is a practical measure for informativeness as it is widely available, but acknowledges its coarse and often less accurate nature. *Illiq* incorporates not only firm-specific information, but also incorporates market frictions that may impact the amount traded and reflects different types of risk. Similarly, *Spread* not only captures informativeness for investors, but is also driven by factors such as the financial intermediaries that moderate buying and selling between transaction parties. *ZeroDays* is also a cruder measure for informativeness, as it does not consider the magnitude of stock price movements, but only the extent to which stock prices move at all. This binary definition neglects companies that trade actively on the market, but with little firm-specific information.

Footnote 27 (continued)

correlated with our overall measure (0.88) and that all our results are similar to the ones we report in the paper.

²⁸ *Illiq* reflects the average daily price impact of a trade, measured as the absolute value of returns relative to the daily value traded. A higher value of *Illiq* reflects a greater price change per dollar of

Table 1 Sample selection

	Unique firms
Bloomberg ESG coverage with available ESG data	2365
Less: Financial and utility companies	(563)
Less: Missing required financial information	(511)
Total number of unique firms in sample	1291
	Firm years
Unique firms \times number of years	11,619
Less: missing year-specific financial information	(285)
Total number of firm-year observations in sample	11,334

Sample Selection

We begin our data-collection process by identifying US-listed firms included in the Bloomberg ESG coverage index with available ESG disclosure information from 2007 to 2015, which encompasses 2365 firms. The Bloomberg ESG coverage index includes large and liquid stocks of interest to institutional investors and represents more than 90% of the total global market capitalization of all equity stocks. Our focus is on US firms, as SASB standards use the SEC's definition of materiality and are tailored toward companies traded on U.S. exchanges.³⁰ Table 1 shows how we arrive at our final sample of firm-year observations. Following prior literature in synchronicity, we remove financial institutions and utility companies from our sample, leaving us with 1802 firms.³¹ We collect financial information for the remaining firms from Bloomberg. 511 firms are missing required financial information and information such as insider trading, leaving us with a final sample of 1291 unique US companies. This translates into 11,619 firm-year observations over our period of 9 years. Required financial information for 285 firm-year observations is missing, resulting in our final sample comprising 11,334 observations. This sample represents about 60% of the market capitalization value of US firms and more than 80% of the market capitalization of US firms, excluding financial institutions and utilities, in Bloomberg's ESG coverage index.

Table 2 presents the frequency distributions of observations in our sample. In Panel A, we provide an overview of the distribution across years. In Panel B, we show the

distribution across industries. Industry is defined according to SASB's Sustainable Industry Classification System (SICS), which categorizes companies not only based on their sources of revenue, as typically is the case, but also considers intangibles such as shared resource intensity, and sustainability risks and opportunities.³² Our sample covers 62 industries in 8 major SICS sectors: Health Care, Technology & Communications, Non-renewable Resources, Transportation, Services, Resource Transformation, Consumption, and Renewable Resources & Alternative Energy. The table reveals that our sample is not heavily tilted toward any specific industry, with the most frequently represented industry being "Industrial Machinery & Goods", comprising 7% of the sample. Panel B also reports for each industry the number of data items from Bloomberg that are mapped to the SASB industry-specific standard and the percentage of SASB issues that have data coverage in Bloomberg. Given that the standards are industry-specific and that we have differential data coverage across industries, we include industry fixed effects in all our specifications to account for those differences.³³

Results

Summary Statistics

Table 3 shows the summary statistics for the variables we employ in this study. Our synchronicity measure has a mean of -0.58 and standard deviation of 1.12 , comparable to Piotroski and Roulstone (2004). A negative average synchronicity measure is representative of the existing literature and reveals that, on average, firm-specific variation accounts for more than half of the variation in stock returns.

³⁰ In addition, SASB has kindly provided us with a mapping between its proprietary Sustainable Industry Classification System (SICS) and U.S. exchange-traded securities, allowing us to determine with precision which sustainability issues are material, per SASB, for each firm.

³¹ We note that stock returns of financial institutions in our period of study are heavily influenced by the financial crisis.

³² See www.sasb.org/sics.

³³ We included time-varying industry effects and all our results were unchanged.

Table 2 Panel A: frequency by year. Panel B: Frequency by Industry

A									
Year	<i>N</i>				Percent				
2007	1222				10.78				
2008	1263				11.14				
2009	1266				11.17				
2010	1272				11.22				
2011	1282				11.31				
2012	1283				11.32				
2013	1281				11.30				
2014	1182				10.43				
2015	1283				11.32				
Total	11,334				100				
B									
Industry	<i>N</i>	%	# discl. items	% SASB covered by bloomberg (%)	Industry	<i>N</i>	%	# discl. items	% SASB covered by bloomberg (%)
Advertising & Marketing	54	0.48	9	25	Household & Personal Product	150	1.32	19	55
Aerospace & Defense	241	2.13	15	44	Industrial Machinery & Goods	851	7.51	20	67
Agricultural Products	90	0.79	54	73	Internet Media & Services	113	1	25	40
Air Freight & Logistics	88	0.78	40	83	Iron & Steel Producers	125	1.1	46	100
Airlines	70	0.62	30	94	Leisure Facilities	126	1.11	9	67
Alcoholic Beverages	36	0.32	37	73	Managed Care	104	0.92	30	40
Apparel & Footwear	477	4.21	20	70	Marine Transportation	36	0.32	32	71
Appliance Manufacturing	44	0.39	4	33	Meat, Poultry & Dairy	59	0.52	53	71
Auto Parts	140	1.24	15	57	Media Prod. & Distribution	190	1.68	11	27
Automobiles	68	0.6	17	73	Medical Equipment	576	5.08	36	50
Biofuels	26	0.23	39	88	Metals & Mining	133	1.17	49	71
Biotechnology	330	2.91	31	47	Multiline & Specialty Retail	646	5.7	21	64
Building Products & Furnishing	185	1.63	12	50	Non-Alcoholic Beverages	51	0.45	39	50
Cable & Satellite	26	0.23	24	40	Oil & Gas-Expl. & Production	480	4.24	54	55
Car Rental & Leasing	9	0.08	2	43	Oil & Gas-Midstream	60	0.53	18	92
Casinos & Gaming	81	0.71	9	54	Oil & Gas-Refining	93	0.82	42	70
Chemicals	406	3.58	40	57	Oil & Gas-Services	327	2.89	33	74
Coal Operations	24	0.21	46	70	Pharmaceuticals	282	2.49	21	47
Construction Materials	89	0.79	51	93	Processed Foods	168	1.48	46	60
Containers & Packaging	152	1.34	38	82	Professional Services	474	4.18	20	70
Cruise Lines	9	0.08	33	56	Pulp & Paper Products	34	0.3	33	100
Drug Retailers	35	0.31	16	44	Rail Transportation	45	0.4	39	87
E-Commerce	72	0.64	32	53	Restaurants	222	1.96	26	61
Education	94	0.83	12	38	Road Transportation	106	0.94	36	92
Electrical Equipment	305	2.69	16	53	Semiconductors	550	4.85	31	61
Electronic Manuf. Services	71	0.63	27	57	Software & IT Services	770	6.79	41	55

Table 2 (continued)

B									
Industry	<i>N</i>	%	# discl. items	% SASB covered by bloomberg (%)	Industry	<i>N</i>	%	# discl. items	% SASB covered by bloomberg (%)
Food Retailers & Distributors	97	0.86	24	46	Solar Energy	26	0.23	46	90
Fuel Cells & Ind. Batteries	35	0.31	18	41	Telecommunications	208	1.84	18	59
Hardware	502	4.43	17	50	Tobacco	52	0.46	3	43
Health Care Delivery	260	2.29	13	29	Toys & Sporting Goods	44	0.39	4	25
Health Care Distributors	81	0.71	14	55					
Hotels & Lodging	36	0.32	26	75	Total 11,334		100		

Table 3 Summary statistics

Variable	<i>N</i>	Mean	SD	Median
(1) Synchronicity	11,334	-0.583	1.122	-0.518
(2) MaterialDisc	11,334	0.176	0.185	0.130
(3) NonMaterialDisc	11,334	0.163	0.122	0.129
(4) ESGExposure	11,334	0.512	0.500	1.000
(5) Integrated	11,334	0.402	0.240	1.000
(6) SRIOwn	11,334	0.112%	0.454%	0.001%
(7) NumComp	10,366	16.668	3.366	16.667
(8) MarketBeta	11,334	0.434	0.420	0.316
(9) IndustryBeta	11,334	0.423	0.426	0.291
(10) MarketCap	11,334	21.238	1.734	21.068
(11) GRICmpl	11,334	0.089	0.285	0.000
(12) SustReport	11,334	0.190	0.392	0.000
(13) InstOwn	11,334	0.786	0.232	0.840
(14) AnalystRev	11,334	0.857	1.016	0.693
(15) MTB	11,334	3.613	5.650	2.239
(16) StdDevROA	11,334	0.052	0.072	0.027
(17) InsiderTrades	11,334	0.100	0.265	0.017
(18) PoorEQ	11,334	0.080	0.131	0.055
(19) MgmtGuide	4645	1.517	0.857	1.609
(20) ConfCalls	4645	1.789	0.949	1.946
(21) Illiq	11,334	0.002	0.007	0.000
(22) LiqVol	11,334	0.003	0.015	0.000
(23) Spread	11,334	0.002	0.003	0.001
(24) ZeroDays	11,334	0.018	0.017	0.012
(25) ESGPerf	11,334	1.774	2.358	0.000
(26) ESGPerfMaterial	4905	-0.061	1.170	0.000

We find that SASB-identified sustainability disclosure (*MaterialDisc*) is on average 17.6% with a standard deviation of similar magnitude, indicating considerable variation in SASB-identified sustainability disclosure scores in our data. Non-SASB-identified sustainability disclosure (*Non-MaterialDisc*), computed as the ratio of the number of disclosed non-SASB ESG metrics to total number of non-SASB metrics in Bloomberg, has a mean of 16.3% and a standard

deviation of 12.2%. Following the literature, we account for potential correlated omitted factors with an array of control variables. Firm size is measured as the natural logarithm of market value of equity (*MarketCap*). GRI compliance (*GRI-Compl*) is an indicator variable that equals one if the firm is following GRI reporting guidelines; it is zero otherwise. In our sample, approximately 8.9% of firms are GRI compliant. In a similar manner, we report that 19% of our sample provides a separate sustainability report (*SustReport*).³⁴ We find that on average 78.6% of the shares are held by institutional investors (*InstOwn*) within our sample, while on average 0.112% are held by socially responsible investment funds (*SRIOwn*). Further, we account for analyst forecast revisions measured as the natural logarithm of number of forecast revisions (*AnalystRev*). Our measure is similar to the one used by Piotroski and Roulstone (2004), who advocate the consideration of analyst revisions as relevant factors to the information environment, in particular synchronicity. Additionally, we control for the price to book ratio (*MTB*), standard deviation of return on assets (*StdDevROA*), and insider trading (*InsiderTrades*), measured as the natural logarithm of the absolute value of net trading by insiders scaled by annual trading volume. Our summary statistics are all broadly in line with the existing literature, supporting the representativeness of our sample for the US market.

We also tabulate statistics for other variables that we use in our analyses. We follow Dechow and Dichev (2002), using the residuals from estimating a model of working capital accruals on lagged, current and future cash flows to estimate poor earnings quality (*PoorEQ*). Although not assessing disclosures, Kim et al. (2012) find that firms with good performance ratings on sustainability issues have higher earnings quality. Earnings quality could be a correlated omitted

³⁴ Dhaliwal et al. (2011) use a sample of U.S. firms from 1993 to 2007 and document that 9.14% of their sample provides a separate sustainability report. Given our sample period of 2007 to 2015 and the significant increase in ESG disclosure during this period our percentage is higher.

variable if material sustainability disclosure is related to earnings quality. Prior literature is inconclusive on the relation between earnings quality and synchronicity. Ferreira and Laux (2007) and Hutton et al. (2009) document that poor earnings quality is associated with lower firm-specific return variation, while Fernandes and Ferreira (2009) and Gul et al. (2011) find no relation between earnings quality and synchronicity. *MgmtGuide* is the natural logarithm of one plus all guidance events during the year as measured by Capital IQ. *ConfCalls* is the natural logarithm of one plus all conference calls during the year as measured by Capital IQ. *NumComp* is the average number of companies covered by all analysts that follow a focal firm in any given year. *ESGExposure* is a measure of a company's exposure to sustainability issues, obtained from MSCI Intangible Value Assessment (IVA) product, which identifies key ESG-driven risk and opportunity exposures relevant to a firm. It takes the value of one if the firm has above-average exposure to ESG issues. *Integrated* is a measure collected from Asset4, Thomson Reuters' principal product for sustainability information. It is an indicator variable that reflects whether sustainability issues are highly integrated in management discussions and reviewed in the annual report. *MarketBeta* and *IndustryBeta* are the estimated coefficients from the firm-specific regressions that we use to calculate synchronicity. As expected, *MarketBeta* is on average significantly lower than when estimated in a market model setting that excludes industry returns.

Appendix 3 shows the univariate pairwise correlations between our variables. The highest correlation at 0.72 is between the sustainability report indicator variable and market capitalization. This is expected, and consistent with prior literature, as larger firms tend to issue sustainability reports (e.g., Dhaliwal et al. 2011).³⁵ We note that correlations between our synchronicity measure and the control variables are consistent with prior literature (e.g., Piotroski and Roulstone 2004; Crawford et al. 2012; Peterson et al. 2015). *MaterialDisc* exhibits positive correlation with *ESGExposure* but a negative with *Integrated*, although those correlations could arise primarily because of the structure of the correlation that those variables have with firm size.³⁶

MaterialDisc also exhibits a moderate positive association with earnings quality and moderate negative associations with management earnings forecasts and conference calls.

Sustainability Information and Stock Price Informativeness

We model 1-year ahead stock price synchronicity on sustainability disclosure according to SASB standards and relevant control variables. The lag ensures that the sustainability information is disseminated in the market. Our regression model is set up as follows:³⁷

$$\begin{aligned} \text{Synchronicity}_{i,t+1} &= \alpha_0 + \beta_1 \text{MaterialDisc}_{i,t} + \beta_2 \text{NonMaterialDisc}_{i,t} \\ &+ \beta_3 \ln(\text{MarketCap}_{i,t}) + \beta_4 \text{InstOwn}_{i,t} + \beta_5 \ln(\text{AnalystRev}_{i,t}) \\ &+ \beta_6 \text{MTB}_{i,t} + \beta_7 \text{SD}(\text{ROA}_{i,t}) + \beta_8 \ln(\text{InsiderTrade}_{i,t}) \\ &+ \sum_{k=1}^{62} \gamma_k \text{Industry}_{i,t} + \sum_{l=1}^8 \delta_l \text{year}_{i,t} + \varepsilon_{i,t} \end{aligned}$$

The results, presented in Table 4, reveal that SASB-identified sustainability disclosure is negatively associated with stock price synchronicity (or, in other words, positively associated with stock price informativeness). Column (1) shows the baseline result. Material sustainability disclosure produces a statistically significant coefficient of -0.48 . Economically, this result indicates that an increase in material sustainability disclosure by one standard deviation, i.e., 0.18 units, translates into a decrease in synchronicity of 0.86, or approximately 8% of the standard deviation of synchronicity. To ensure that this result is driven by sustainability disclosures identified by the SASB standard-setting process, and not by general ESG disclosure, we control for *NonMaterialDisc*. Across all specifications in columns (1) through (6), *NonMaterialDisc* exhibits an insignificant association with synchronicity. We also control for GRI compliance in column (2) and the issuance of a sustainability report in column (3). GRI compliance signifies disclosure of broad, multi-stakeholder focused sustainability information according to GRI guidelines. We note that neither GRI compliance nor the sustainability reporting controls are significant and controlling for them does not alter the result.

A potential correlated omitted variable is the level of ESG performance of a company. The literature on financial disclosures suggests that companies with better performance have stronger incentives to disclose (Dye 1990). In the case of sustainability disclosures, it is not clear that the same

³⁵ There are other large correlations among the variables (e.g., 0.67 between *MaterialDisc* and *NonMaterialDisc*); however, VIFs are all below 2.46, suggesting multicollinearity is not a major concern.

³⁶ We note that the correlation between *MaterialDisc* and *Integrated* is difficult to predict ex-ante. Although it may seem that higher disclosure of material sustainability information will be accompanied by more integrated discussions of financial and sustainability issues, there reasons why this may not be the case. For one, high disclosure of material sustainability information does not necessarily mean that such information is provided within management discussions or disclosed within financial reports. Moreover, firms may have integrated discussions and reporting of financial and sustainability information, but the sustainability information may not be material according to SASB.

³⁷ We also estimated this model separately each year and averaged across years to calculate coefficients and t-stats as in Fama and MacBeth (1973). Our results were qualitatively similar.

Table 4 Main effect estimation of material sustainability disclosure on stock price informativeness

Variable	(1)		(2)		(3)		(4)		(5)		(6)	
	Dependent variable: Synchronicity		Dependent variable: Synchronicity		Dependent variable: Synchronicity		Dependent variable: Synchronicity		Dependent variable: Synchronicity		Dependent variable: Synchronicity	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
MaterialDisc	-0.483	-4.05	-0.483	-4.05	-0.472	-3.96	-0.472	-3.96	-0.416	-2.52	-0.621	-3.57
NonMaterialDisc	-0.146	-0.89	-0.163	-0.98	-0.061	-0.35	-0.062	-0.36	0.230	1.12	0.091	0.32
GRICompl			0.011	0.23								
SustReport					-0.047	-1.18	-0.047	-1.18	-0.018	-0.41	-0.030	-0.40
ESGPerf							0.001	0.13				
ESGPerfMaterial									-0.004	-0.30		
MgmtGuide											0.060	3.24
ConfCalls											0.016	0.93
PoorEQ	-0.052	-0.83	-0.052	-0.83	-0.052	-0.83	-0.052	-0.83	0.003	0.07	-0.025	-0.38
MarketCap	0.363	23.29	0.363	23.29	0.365	23.08	0.364	22.91	0.304	19.31	0.354	16.87
InstOwn	0.645	7.17	0.646	7.17	0.641	7.18	0.641	7.18	0.192	2.70	0.588	5.38
AnalystRev	-0.015	-1.44	-0.015	-1.44	-0.015	-1.45	-0.015	-1.45	-0.027	-2.32	-0.016	-1.07
MTB	0.001	0.32	0.001	0.32	0.001	0.28	0.001	0.28	0.000	-0.04	0.000	0.00
StdDevROA	-0.930	-3.52	-0.930	-3.52	-0.924	-3.50	-0.924	-3.50	-0.412	-1.80	-1.211	-3.63
InsiderTrades	-0.090	-2.33	-0.090	-2.32	-0.093	-2.40	-0.092	-2.39	-0.110	-2.33	-0.067	-1.56
Intercept	-8.274	-23.31	-8.271	-23.33	-8.323	-22.98	-8.318	-22.94	-6.763	-20.66	-8.022	-19.63
N	11,334		11,334		11,334		11,334		4905		4645	
Adjusted-R ²	0.56		0.56		0.56		0.56		0.60		0.57	
Fixed effects	Year, Industry		Year, Industry		Year, Industry		Year, Industry		Year, Industry		Year, Industry	

This table presents results of multivariate analyses of stock return synchronicity regressed on material sustainability disclosure and other control variables. All variables are winsorized at the 1- and 99-percent levels, and defined in Appendix 2. Regressions include year and industry fixed effects, with standard errors clustered by firm

is true. In many cases, firms with weak ESG performance exhibit high voluntary disclosure as a result of normative and institutional pressures (Ioannou and Serafeim 2019). Moreover, it is not clear why ESG performance would be related to stock price informativeness. One possibility is that firms with better ESG performance exhibit different organizational processes and activities leading to differential risk profiles or economic activities. We present analyses in columns (4) and (5) that control for the level of ESG performance, as measured by rating providers. We control for a firm's ESG rating provided by MSCI (*ESGPerf*) in column (4) as well as the SASB-identified ESG performance rating constructed in Khan et al. (2016) using KLD data (*ESGPerfMaterial*) in column (5). The first measure captures ESG ratings more broadly, while the second reflects specifically the material ESG performance component according to SASB standards. We find a negative and significant association between SASB-identified sustainability disclosure and synchronicity, while there is no relationship between ESG performance metrics and synchronicity.³⁸

Firms that disclose more SASB-identified sustainability information could also have different voluntary disclosure practices. If voluntary disclosure practices, such as conference calls and management forecasts, are correlated with both synchronicity and our material sustainability disclosure measure then this could lead to biased estimates. In column (6) we find that our results are unchanged when we control for other voluntary disclosure practices and earnings quality. Given that our sample is significantly smaller because of missing observations for those variables, we do not include them in subsequent analyses.³⁹ However, all our results remain unchanged if we control for them. The results in Table 4 are consistent with the hypothesis that disclosure of SASB-identified sustainability information is associated with stock prices reflecting more firm-specific information.⁴⁰

³⁸ To further address the concern that companies with strong sustainability performance ratings may be more willing to disclose more, thereby generating a spurious relation between disclosure and stock price informativeness, we consider whether increased disclosure reduces stock price informativeness for companies with weak sustainability ratings. In untabulated tests, we also find a positive relation between material sustainability disclosure and informativeness for the subset of companies in the lowest tercile of sustainability performance ratings.

³⁹ As another proxy for earnings quality, we compute the absolute value of firm accruals scaled by the absolute value of cash flow from operations (*ABS_ACCR*). All our aforementioned results are robust to controlling for *ABS_ACCR*.

⁴⁰ In untabulated results, we also control for industry concentration (log of a revenue-based Herfindahl index of industry-level concentration). Consistent with Fernandes and Ferreira (2009), the coefficient on industry concentration is negative but insignificant, and our main results remain unchanged.

Changes Model

To mitigate concerns about correlated omitted variables and reverse causality we also estimate changes specifications. In Table 5, we examine the change in informativeness subsequent to a change in SASB-identified sustainability disclosure. To do so, we follow the methodology in Gul et al. (2011) and split our sample into two subsamples of firm-years with year-over-year increasing and decreasing *MaterialDisc*, which we identify as material disclosure 'increase events' and material disclosure 'decrease events', respectively. Then, for the increase and decrease subsamples, we keep firm-years 1 year before to 1 year after the first change in *MaterialDisc* for a given firm (i.e., $t-1$ to $t+1$).⁴¹ We generate event indicator variables that are coded 1 in the year on, and after, an increase or decrease in *MaterialDisc*, respectively, and 0 otherwise. In particular, the event indicator variable for the increase (decrease) sample, *PosChangeYrs* (*NegChangeYrs*) takes the value of one in the year of, and directly following (i.e., in year t and $t+1$) an increase (decrease) in material sustainability disclosure from year $t-1$ to year t , and takes the value of 0 in year $t-1$. Finally, we regress synchronicity on the event indicator variables *PosChangeYrs* and *NegChangeYrs*. The coefficients on *PosChangeYrs* and *NegChangeYrs* capture the difference in informativeness 1 year before to 1 year after the change in SASB-identified disclosure.⁴²

Consistent with sustainability disclosure generally increasing over time, the "increase" subsample is nearly double that of the "decrease" subsample. We find a significant increase in informativeness for the sample that increased SASB-identified sustainability disclosure (column 1 of Table 5) and a significant decrease in informativeness in the sample that decreased SASB-identified sustainability disclosure (column 2 of Table 5). In particular, the coefficient estimate on *PosChangeYrs* is negative and statistically significant (coef. = -0.10 , t -stat = -3.43) while the estimate on *NegChangeYrs* is positive and significant (coef. = 0.072 ,

⁴¹ Only the first increase or decrease 'event' is kept for a particular firm, so as to ensure our post event indicator variable consists of unique binary values. In untabulated results, we find that our inferences are unchanged if we keep multiple increase and decrease events for a given firm so long as these events are separated by at least 2 years.

⁴² This test is well suited to the phenomenon we study given the persistence over time in material sustainability disclosure score. The first-order autocorrelation coefficient is 0.968 for the whole sample. Similarly, the first-order autocorrelation coefficient for synchronicity is also very high at 0.714. Given such time-series persistence in our dependent and independent variables, including firm-fixed effects would not lead to precise estimation.

Table 5 Changes in disclosure and stock price informativeness

Sample	Material disclosure increase events		Material disclosure decrease events		Non-Material disclosure increase events only		Non-Material disclosure decrease events only	
	(1)		(2)		(3)		(4)	
	Dep. var: Synchronicity		Dep. var: Synchronicity		Dep. var: Synchronicity		Dep. var: Synchronicity	
Variable	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat
PosChangeYrs	−0.100	−3.43			−0.003	−0.43		
NegChangeYrs			0.072	2.24			0.038	1.22
NonMaterialDisc	−0.180	−1.01	−0.111	−0.59				
MaterialDisc					−0.323	−2.28	−0.498	−2.34
SustReport	−0.085	−1.69	−0.116	−1.93	−0.084	−1.23	−0.129	−1.14
PoorEQ	0.069	0.46	−0.033	−0.34	0.045	0.22	−0.038	−0.83
MarketCap	0.311	13.96	0.349	15.79	0.294	14.32	0.313	15.38
InstOwn	0.563	4.09	0.573	5.09	0.549	4.65	0.512	5.54
AnalystRev	−0.017	−1.15	−0.037	−2.16	−0.027	−1.83	−0.255	−2.04
MTB	0.001	0.03	−0.001	−0.42	−0.001	−0.58	0.000	0.05
StdDevROA	−1.117	−2.34	−1.009	−2.09	−1.184	−2.11	−1.283	−2.44
InsiderTrades	−0.086	−1.82	−0.092	−1.52	−0.087	−1.85	−0.071	−1.67
Intercept	−7.372	−13.66	−7.841	−15.34	−6.938	−13.66	−6.124	−14.45
<i>N</i>	2673		1689		2508		1752	
Number of events	891		563		836		584	
Adjusted- <i>R</i> ²	0.592		0.591		0.589		0.590	
Fixed effects	Year, Industry		Year, Industry		Year, Industry		Year, Industry	

This table presents results of multivariate analyses of changes in stock return synchronicity regressed on an indicator equal to 1 in years on, and after, an increase (in column 1) or a decrease (in column 2) in material sustainability disclosure for a given firm. Only the first increase or decrease ‘event’ is kept for a particular firm. Column 3 (4) repeats the analyses for an increase (decrease) in non-material sustainability disclosure *only*, i.e., not accompanied by an increase (decrease) in material sustainability disclosure. All variables are winsorized at the 1- and 99-percent levels, and defined in Appendix 2. Regressions include year and industry fixed effects, with standard errors clustered by firm

t-stat = 2.23). Both results are consistent with *MaterialDisc* revealing investor-relevant firm-specific information.

A concern is that these results are driven not by *MaterialDisc* but by contemporaneous changes in non-SASB-identified sustainability disclosure (*NonMaterialDisc*). To address this, we repeat the analyses on two subsamples of firm-years with increasing and decreasing *NonMaterialDisc* only, such that these subsamples do not also include increases and decreases in *MaterialDisc*. We do not observe a significant increase in informativeness for the sample that increased non-SASB-identified sustainability disclosure (column 3 of Table 6) or a significant decrease in informativeness in the sample that decreased non-SASB-identified sustainability disclosure (column 4 of Table 5).⁴³

⁴³ These results suggest that by increasing SASB-identified sustainability disclosure, managers may increase the firm-specific information content in stock prices; moreover, decreases in SASB-identified disclosure are accompanied by decreases price informativeness. Given that we do not find analogous results when we examine positive and negative changes in non-SASB-identified sustainability disclosure, this indicates that changes in price informativeness, as they relate to sustainability reporting, are limited to changes in SASB-identified information.

Moderating Effects

How investors use ESG disclosures—and the conditions under which ESG information is useful for assessments of firm value—remain open questions. To help inform these questions, we examine firm and capital market factors that we hypothesized would moderate the association between ESG disclosure and price informativeness.

Firm Characteristics

In H2, we hypothesize that the relation between SASB-identified sustainability disclosure and stock price informativeness will be moderated by the importance of sustainability issues. To measure firm sustainability importance, we employ two proxies. The first is a measure of a company’s exposure to sustainability issues, obtained from MSCI Intangible Value Assessment (IVA) product. Firms receive an annually updated, firm-specific rating that allows for a direct comparison between firms on their exposure to ESG-driven risks and opportunities. The second proxy is from Asset4, Thomson Reuters’ principal product for sustainability

Table 6 Moderating variables

Variable	Firm mod.: exposure to ESG issues, integrated financial and ESG issues		Firm mod.: poor ESG performance rating		CM mod.: institutional and SRI fund ownership		Analyst mod.: analyst attention		All moderators together	
	(1)		(2)		(3)		(4)		(5)	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
MaterialDisc	-0.025	-0.15	-0.286	-2.17	0.868	1.95	-0.952	-2.68	0.741	1.48
MaterialDisc × ESGExposure	-0.452	-2.61							-0.538	-3.37
MaterialDisc × Integrated	-0.262	-2.55							-0.150	-1.47
MaterialDisc × PoorESGPerf			-0.451	-3.42					-0.595	-4.58
MaterialDisc × InstOwn					-1.634	-3.15			-1.482	-3.37
MaterialDisc × SRIOwn					-1.085	-1.92			-1.402	-1.86
MaterialDisc × NumComp							0.035	1.74	0.047	2.21
NumComp							-0.004	-0.70	-0.005	-1.01
SRIOwn					0.042	1.87			0.034	1.72
Integrated	-0.003	-0.08							-0.029	-0.76
ESGExposure	0.081	2.15							0.070	2.05
PoorESGPerf			0.009	0.23					0.038	0.92
NonMaterialDisc	0.040	0.23	-0.041	-0.24	-0.148	-0.83	-0.074	-0.45	-0.012	-0.07
SustReport	-0.053	-1.34	-0.062	-1.57	-0.036	-0.90	-0.027	-0.72	-0.040	-1.11
PoorEQ	-0.063	-1.00	-0.051	-0.81	-0.052	-0.83	-0.071	-1.00	-0.077	-1.13
MarketCap	0.361	21.16	0.360	23.04	0.360	23.29	0.343	24.01	0.334	23.31
InstOwn	0.626	7.09	0.648	7.36	0.838	7.22	0.390	5.47	0.575	6.73
AnalystRev	-0.014	-1.37	-0.017	-1.65	-0.015	-1.49	-0.029	-3.02	-0.027	-2.87
MTB	0.001	0.34	0.000	0.26	0.001	0.31	0.001	0.52	0.001	0.62
StdDevROA	-0.930	-3.55	-0.923	-3.49	-0.872	-3.34	-0.576	-2.55	-0.534	-2.39
InsiderTrades	-0.097	-2.52	-0.087	-2.25	-0.094	-2.42	-0.120	-3.12	-0.115	-3.03
Intercept	-8.298	-20.38	-8.225	-23.03	-8.363	-23.25	-7.626	-25.66	-7.599	-22.79
N	11,334		11,334		11,334		10,366		10,366	
Adjusted-R	0.562		0.565		0.563		0.575		0.581	
Fixed effects	Year, Industry		Year, Industry		Year, Industry		Year, Industry		Year, Industry	

This table presents results of multivariate analyses of stock return synchronicity regressed on material sustainability disclosure interacted with firm-level variables of exposure to ESG issues, ESG performance ratings, institutional and SRI fund ownership and analyst coverage. Variables are winsorized at the 1- and 99-percent levels and defined in Appendix 2. Regressions include year and industry fixed effects, with standard errors clustered by firm

information. It captures how well sustainability issues are integrated with financial issues as well as in a company's procedures. More specifically, the measure reflects whether sustainability issues are integrated in management discussions and reviewed in the annual report. We expect firms with greater exposure to, and integration of, sustainability issues will experience a stronger firm-specific information effect in returns as disclosure of material sustainability information increases.

The results are presented in Table 6. In column (1) we include the interaction between *ESGExposure* (mean = 0.51, standard deviation = 0.50), a dummy variable equal to one if a firm has above-average sustainability exposure in year t , and SASB disclosure. The coefficient estimate on the interaction term is negative and significant. Interpreting the coefficients in column (1), we find that SASB-identified sustainability disclosure increases stock price informativeness more when the firm exposure to ESG risks and opportunities according to MSCI IVA is above average. The economic effect is substantial for firms with high exposure to ESG risks and opportunities explaining 8% of one standard deviation of variation in synchronicity. Column (1) also provides the result for the interaction with our second measure, *Integrated* (mean = 0.40, standard deviation = 0.24), a dummy variable equal to one if a firm has high integration of sustainability issues in year t , which again reveals a negative significant coefficient. We find that firms that integrate financial and ESG issues in their business experience a stronger effect of SASB-identified sustainability disclosure on stock price informativeness; this effect is approximately 5% of a standard deviation in synchronicity. Both effects are significant suggesting that the effects are more pronounced for firms that are more economically exposed to sustainability issues and for firms that have integrated sustainability issues more into their business. The joint economic effect for the sample of firms that score one for both indicators is almost 16% of one standard deviation change in synchronicity.

Next, we examine whether material sustainability disclosures are relatively more informative when ESG performance ratings are poor. We add the interaction effect between an indicator variable equal to one if a firm has below-average sustainability performance in year t , *PoorESGPerf* (mean = 0.41, standard deviation = 0.49), and material ESG disclosure, in column (2). Interpreting the coefficients in column (2), we find that SASB-identified sustainability disclosure increases stock price informativeness more when the firm ESG performance

rating is below-average.⁴⁴ This effect explains 12% of one standard deviation of variation in synchronicity.⁴⁵

Capital Market Participant Characteristics

In H3, we hypothesize that capital market participants who are more adept at processing information will moderate a stronger effect of SASB-identified sustainability disclosure on stock price informativeness. Our first variable, *InstOwn* (mean = 0.786, standard deviation = 0.232), measures institutional ownership percentage on a firm-year basis, measured as the sum of shares held by institutional investors and divided by total number of shares outstanding, calculated using data from Thomson Reuters 13F database. Our second measure, *SRIOwn* (mean = 0.00112, standard deviation = 0.00454) reflects the socially responsible investment (SRI) ownership percentage, calculated using SRI holdings data from Bloomberg. The results are provided in Table 6. Column (3) shows the results using institutional ownership and SRI fund ownership as the moderators. We find that an increase in institutional ownership by one standard deviation, or 0.23, is associated with a larger magnitude in informativeness increase for firms with higher SASB-identified sustainability disclosure; 13% of a standard deviation of informativeness. We also find a negative significant interaction effect for SRI fund ownership. Our results support our hypothesis that the relationship between SASB-identified sustainability disclosure and stock price informativeness is stronger when capital market participants are more proficient at processing sustainability information.

For the role of sell-side analysts in moderating the relationship between SASB-identified sustainability information and informativeness we follow Clement (1999) and use data from I/B/E/S to proxy for portfolio complexity using the number of stocks an analyst covers within a year. Analysts who cover many stocks may not be able to invest the same amount of research into any individual stock as compared to analysts who cover few stocks. To construct a firm-year measure of information processing costs, *NumComp* (mean = 16.7, standard deviation = 3.4), we average the number of stocks across all analysts covering a firm-year. In column (4), the positive

⁴⁴ In untabulated analysis we do not find evidence consistent with this result being driven by asymmetric timeliness of good versus bad news being reflected in stock returns.

⁴⁵ In untabulated analysis we examine whether proprietary cost concerns positively moderate the relation between SASB disclosure and price informativeness, indicating that these firms provide less informative or more boilerplate disclosure. The results of this analysis suggest that firms with higher proprietary costs, proxied by research and development expenditures scaled by total sales and revenues from the sale of low-carbon products (using data from FTSE Russell), do not, on average, have less informative ESG disclosures.

coefficient on $MaterialDisc \times NumComp$ confirms that the relationship between material sustainability information and informativeness is moderated for firms with higher analyst portfolio complexity, suggesting that analysts are intermediaries of sustainability information. Finally, column (5) models all variables together and shows that all moderating variables are individually significant in the same specification.

Effect of Standards Release

Our results so far suggest a robust relation between the disclosure of SASB-identified sustainability information and stock price informativeness. However, in the absence of a natural experiment we cannot conclude that this relation is causal. To help address this concern, we use the staggered release of SASB standards across different industries over time and estimate a difference-in-differences specification, where we are interested in firms' adoption or non-adoption of the standards, as well as any associated changes in stock price informativeness.⁴⁶ We surmise that if firms, on average, increase material sustainability disclosure upon learning about SASB standards (i.e., the release of SASB standards changes managers' information set), this is evidence consistent with SASB having identified investor-relevant metrics, otherwise firms would be less likely to adopt SASB standards for disclosure.⁴⁷

Moreover, if disclosure changes prompted by SASB standards releases are accompanied by changes in stock price informativeness, this is suggestive of a robust relation between SASB disclosure and stock price informativeness that is less susceptible to omitted variable concerns, given that such omitted variables would have to coincide with the 'as-if' random timing of the standards releases.

In 2013, SASB released the provisional standard for the healthcare sector and all the industries within the sector.

In 2014, SASB released the provisional standards for the non-renewable resources, technology, transportation and services sectors.⁴⁸ The release of these standards, the timing of which was pre-determined in 2011 shortly after the creation of SASB and was independent of companies' existing disclosure policies, provides a plausibly exogenous shock to firms' awareness of material sustainability metrics that allows us to estimate the effect of such standards releases on disclosure practices, and on stock price informativeness.⁴⁹

We match firms in industries that have had a SASB standards release in our sample period (*Treat*) with firms in industries that have not (*Control*), using coarsened exact matching (Iacus et al. 2012) on covariates measured in 2012 (the year before SASB began releasing its provisional standards): SASB-identified sustainability disclosure (*MaterialDisc*), non-SASB-identified sustainability disclosure (*NonMaterialDisc*), ESG performance (*ESGperf*), return on assets (*ROA*) and market capitalization (*MarketCap*). Panel A of Table 7 shows the construction of the matched sample. In Panel B, the *t*-statistics from mean difference *t*-tests across the matching covariates suggests insignificant differences after matching.

We estimate a difference-in-differences specification on the matched sample using CEM-weighted OLS, including firm-fixed effects and year fixed effects. *Post* takes the value of one for the years following the release of SASB standards and it varies based on the timing of the release of standards for the different industries. We validate the parallel trends assumption between our treated and control samples, observing similar trends in material ESG disclosure up until 2013 (the year of the first SASB standards release), followed by a larger increase in material disclosure for treated firms relative to control firms in years 2014 and 2015. Table 7 Panel C tabulates the results. The estimated coefficient on $Treat \times Post$ in the first stage of the instrumental variables regression is positive and significant, suggesting that the treatment firms increase SASB-identified sustainability disclosure

⁴⁶ We believe that the release of SASB standards across different industries over time is a valid instrument for the following reasons. First, the timing of the release of SASB standards across industries was pre-determined in 2011, shortly after the creation of SASB and independent of companies' existing disclosure policies. This lends plausibility to the exogeneity criterion, given that omitted variables that could also drive changes in SASB-identified disclosures (apart from the release of SASB standards) would have to coincide with the 'as-if' random timing of the standards releases. Second, as will be described in this section, we document a strong, positive association between our instrument (i.e., the release of SASB standards) and SASB-identified sustainability disclosure, suggesting that the instrument is relevant (Angrist and Pischke 2009).

⁴⁷ We note that firms often discuss their use of SASB standards in sustainability reports. For example, JetBlue stated in its 2019 Environmental Social Governance Report 2019 that "JetBlue reports on ESG using recommendations from the Sustainability Accounting Standards Board (SASB)..." (see here).

⁴⁸ See <https://www.sasb.org/wp-content/uploads/2017/08/SASB-Timeline.pdf>.

⁴⁹ While SASB defines sustainability issues that are material at the industry level, different companies within the same industry have varying degrees of disclosure of the same issues. Therefore, in this test, in this test, we examine whether firms within industries that have a SASB standards release increase (on average) the disclosure of firm-specific SASB-identified information.

Table 7 Changes following release of SASB standards

Panel A: Matched sample

	Treat	Control	Total
Starting sample	837	454	1291
Less: unmatched from coarsened exact matching	579	245	824
Matched sample	258	209	467

Panel B: Matching covariates mean difference *t* test after CEM matching

	Treat	Control	<i>t</i> -stat
MaterialDisc_2012	0.185	0.191	1.12
NonMaterialDisc_2012	0.178	0.184	1.04
ESGPerf_2012	3.465	3.543	1.33
ROA_2012	0.024	0.029	1.62
MarketCap_2012	21.126	21.216	1.44

Panel C: Effect of SASB standards on material sustainability disclosure for matched sample

Variable	First stage: effect on material discl.		Second stage: effect on synchronicity	
	(1)		(2)	
	Dep. var.: MaterialDisc		Dep. var.: Synchronicity	
	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat
Treat × Post	0.024	3.61		
Predicted MaterialDisc			−2.370	−2.68
NonMaterialDisc	0.569	13.93	3.293	1.49
ESGPerf	0.000	0.69	0.070	1.33
SustReport	0.028	4.94	2.556	2.52
PoorEQ	−0.014	−2.14	−1.067	−1.56
Leverage	−0.003	−0.34	0.467	0.47
Financing	0.000	0.06	−0.503	−0.94
Turnover	0.001	1.40	0.078	1.26
ROA	0.004	0.76	0.424	0.95
MarketCap	−0.003	−1.55	0.119	0.77
InstOwn	−0.010	−0.86	−0.591	−0.65
AnalystRev	−0.001	−0.45	−0.025	−0.26
MTB	0.000	1.43	0.028	1.33
StdDevROA	0.023	0.97	3.161	1.46
InsiderTrades	0.003	1.08	−0.076	−0.28
Intercept	0.127	2.85	−2.384	−12.29
<i>N</i>	4088		4088	
Adjusted- <i>R</i> ²	0.890		0.538	
Fixed effects	Year, Firm		Year, Firm	

Panel D: Falsification tests for matched sample

Variable	Pseudo event date: effect on material disclosure		First stage of IV: effect on ESGPerf		First stage of IV: effect on ESGPerfMaterial		First stage of IV: effect on NonMaterialDisc	
	(1)		(2)		(3)		(4)	
	Dep. var: MaterialDisc		Dep. var: ESGPerf		Dep. var: ESGPerfMaterial		Dep. var: NonMaterialDisc	
	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat
PseudoPost	0.001	0.40						
Treat × Post			0.072	0.90	0.242	0.59	−0.002	−0.68

Table 7 (continued)

Panel D: Falsification tests for matched sample

Variable	Pseudo event date: effect on material disclosure		First stage of IV: effect on ESGPerf		First stage of IV: effect on ESGPerfMaterial		First stage of IV: effect on NonMaterialDisc	
	(1)		(2)		(3)		(4)	
	Dep. var: MaterialDisc		Dep. var: ESGPerf		Dep. var: ESGPerfMaterial		Dep. var: NonMaterialDisc	
	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat
NonMaterialDisc	0.569	13.92	− 1.599	− 3.77	0.178	0.62		
ESGPerf	0.000	0.65			− 0.025	− 2.06	− 0.002	− 4.07
SustReport	0.028	4.92	− 0.325	− 2.91	0.037	0.32	0.070	12.79
PoorEQ	− 0.014	− 2.11	− 0.079	− 0.76	− 0.023	− 0.22	− 0.002	− 0.35
Leverage	− 0.004	− 0.37	− 0.166	− 0.86	0.299	1.74	− 0.012	− 1.43
Financing	0.000	0.06	− 0.265	− 2.11	0.005	0.06	0.011	1.54
Turnover	0.001	1.31	0.039	2.52	0.021	1.71	− 0.001	− 1.29
ROA	0.004	0.77	− 0.210	− 1.99	0.015	0.15	− 0.001	− 0.22
MarketCap	− 0.003	− 1.52	0.210	4.96	− 0.056	− 1.52	− 0.001	− 0.80
InstOwn	− 0.010	− 0.90	0.318	1.67	− 0.274	− 1.76	0.017	1.84
AnalystRev	0.000	− 0.44	− 0.018	− 0.71	− 0.001	− 0.06	0.001	1.26
MTB	0.000	1.42	0.001	0.11	0.000	0.11	0.000	0.54
StdDevROA	0.025	1.05	− 0.655	− 1.47	− 0.347	− 0.76	− 0.020	− 1.13
InsiderTrades	0.003	1.00	− 0.012	− 0.21	0.009	0.13	0.002	0.83
Intercep	0.127	2.83	− 3.335	− 3.81	1.128	1.47	0.118	3.42
<i>N</i>	3020		4088		1074		4088	
Adjusted- <i>R</i> ²	0.890		0.598		0.539		0.823	
Fixed effects	Year, Firm		Year, Firm		Year, Firm		Year, Firm	

Panel A presents the matched sample of firms in industries that had SASB standards releases in the sample period (*Treat*) and firms in industries that did not have standards releases in the sample period (*Control*). Panel B shows means of covariates after matching. Panel C of this table presents results of the effect of SASB standards releases on material ESG disclosure (column 1) and the effect of (instrumented) material ESG disclosure on stock return synchronicity (column 2). *Post* takes the value of one for the years following the release of SASB standards and varies based on the staggered release of standards across industries. *Treat* takes the value of one for firms belonging to industries that had SASB standards releases in the sample period. Panel D of this table presents falsification tests of the effect of SASB standards releases on material ESG disclosure if a pseudo year is chosen for the *Post* (column 1) and if alternative dependent variables are used, namely *ESGPerf* (column 2), *ESGPerfMaterial* (column 3) and *SustReport* (column 4). All variables are winsorized at the 1- and 99-percent levels, and defined in Appendix 2. Regressions include year and firm-fixed effects, with standard errors clustered by firm

following release of SASB standards.⁵⁰ In the second stage, we find that the estimated coefficient on the predicted value of SASB-identified sustainability disclosure is negative and significant, i.e., increasing informativeness. This test provides supporting evidence on the relation between

SASB-identified sustainability disclosures, and stock price informativeness.⁵¹

We perform several variations of the difference-in-differences specification. In column (1) of Panel D, we estimate similar models using pseudo-events 3 years before the release of the standards and we find no effect on disclosure. We also test whether the release of SASB standards leads

⁵⁰ In the first stage we include additional variables that have been shown to be related to ESG disclosure (e.g., Dhaliwal et al. 2011): *Leverage* (mean=0.19, SD=0.22) measured as the ratio of total debt to total assets; *Financing* (mean=0.01, SD=0.13) measured as the issuance of common and preferred stock minus the purchase of common and preferred stock, plus the long-term debt issuance minus the long-term debt reduction; *Turnover* (mean=2.36, SD=2.02) measured as the ratio of the number of shares traded to the total shares outstanding; and *ROA* (mean=0.26, SD=0.16) measured as the ratio of income before extraordinary items over total assets.

⁵¹ An alternative explanation for the observed increase in SASB-identified disclosures is that Bloomberg increases its coverage and/or data-collection efforts relating to SASB-identified sustainability issues following the release of SASB standards. First, we note that this would likely bias *against* detecting an increase in price informativeness in the second stage. Second, we examine the number of SASB-identified sustainability metrics covered by Bloomberg surrounding the release of SASB standards; we observe an increase of four metrics (from 437 to 441) over this period, suggesting that coverage remained stable over this period.

Table 8 Alternative measures of information content

Variable	(1)		(2)		(3)		(4)	
	Dep. var: Illiq		Dep. var: LiqVol		Dep. var: Spread		Dep. Var: ZeroDays	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
MaterialDisc	−0.159	−6.37	−0.279	−7.05	−0.144	−8.54	−0.330	−7.77
SustReport	−0.004	−0.51	0.013	1.02	−0.012	−2.03	−0.029	−1.77
ReturnVariability	−0.076	−5.76	−0.097	−5.43	−0.056	−6.61	−0.174	−8.54
ShareTurnover	−0.059	−7.68	−0.082	−8.14	−0.035	−8.23	−0.032	−4.42
PoorEQ	0.051	1.53	0.080	2.30	0.048	3.18	0.105	3.09
MarketCap	−0.051	−5.99	−0.016	−1.68	−0.039	−7.32	−0.020	−1.89
InstOwn	−0.437	−12.58	−0.702	−11.86	−0.303	−15.29	−0.606	−17.58
AnalystRev	−0.021	−6.93	−0.037	−7.44	−0.016	−7.46	−0.042	−8.53
MTB	−0.002	−3.39	−0.002	−1.73	−0.001	−2.19	−0.005	−4.09
StdDevROA	0.409	3.94	0.660	3.96	0.403	7.38	1.154	8.97
InsiderTrades	0.012	0.52	0.034	0.86	0.027	2.07	−0.139	−5.69
Intercept	1.903	0.21	1.375	5.50	1.536	11.50	2.785	10.45
N	11,334		11,334		11,334		11,334	
Adjusted- R^2	0.28		0.35		0.37		0.32	
Fixed effects	Year, Industry		Year, Industry		Year, Industry		Year, Industry	

This table presents results of multivariate analyses of our alternative measures of stock price informativeness (IlliQ, LiqVol, Spread, ZeroDays) regressed on material sustainability disclosure and other control variables. All variables are winsorized at the 1- and 99-percent levels, and defined in Appendix 2. Regressions include year and industry fixed effects, with standard errors clustered by firm

firms to increase their overall ESG performance (column 2 of Panel D), their material ESG performance (column 3 of Panel D), and their general sustainability reporting (column 4 of Panel D) and whether such increases could be driving our results. We do not find that firms immediately improve their material ESG performance ratings following SASB standards releases, consistent with ESG disclosure being easier to adjust relative to ESG performance.⁵² Moreover, we do not find that firms are more likely to release a sustainability report following SASB standards releases.⁵³

We acknowledge that, since SASB standards are not mandatory, their release does not exogenously impose increased disclosure. As a result, selection by the ‘treated’ firms to disclose more in accordance with SASB standards could be endogenous to other factors that also affects stock price informativeness. However, we argue that this is less of a

concern given that the random timing of the SASB standards releases across industries would have to coincide with the occurrence of, or change in, another endogenous factor that also affects stock price synchronicity.

Additional Analyses

Alternative Dependent Variables

In Table 8 we present estimates using alternative dependent variables. Specifically, we use Amihud’s (2002) illiquidity measure, the volatility of liquidity, the bid-ask spread, and the number of zero return days as measures of a firm’s stock price informativeness. The literature suggests that higher price impact from a given trading volume, higher volatility of liquidity and higher information asymmetry are characteristics of lower stock price informativeness (Amihud 2002; Copeland and Galai 1983; Pereira and Zhang 2010; Muller and Riedl 2002; Serafeim 2011; Cheng et al. 2013). In addition to the control variables we have used so far, we introduce a set of variables that the literature has found to be related to the dependent variables. These include stock return variability (*ReturnVariability*) and share turnover (*Turnover*) (Muller and Riedl 2002). Table 5 shows the results. Across all specifications the estimated coefficient on *MaterialDisc* is negative and significant suggesting that our results are robust to the use of alternative measures of informativeness.

⁵² For example, firms could improve their material ESG disclosure scores by disclosing a greater amount of SASB-prescribed metrics following release of the standards, while actually *improving* performance along these metrics would likely be more difficult and would require greater investments (e.g., Eccles et al. 2014; Ioannou et al. 2016).

⁵³ Since we do not find a strong relationship between our instrument and the alternative dependent variables of ESG performance, material ESG performance and non-material sustainability disclosure, this suggests that the instrument lacks relevance (Angrist and Pischke 2009), which is why we do not show the second stage of the IV in Panel D of Table 7.

Validity of Disclosure Measure

Our disclosure metric relies on data from Bloomberg and the mapping of that data to SASB standards. First, as we report in Table 2 Panel B, Bloomberg does not provide data on all SASB issues. It is not clear whether and how incomplete coverage could affect our analyses. To understand whether our results hold for samples with close to complete data coverage, we restrict the sample to industries where data coverage is more than 60% or 75%. We find strong associations between disclosure and synchronicity, and we find that all the moderating analyses hold. A second concern with our measure is that some of the Bloomberg data items are only proxies for the key performance indicators identified in SASB standards and not the exact measure. Excluding all these proxy measures and recalculating the disclosure metrics, we find a correlation of 0.88 between the disclosure metric used throughout the paper and this adjusted disclosure metric. All results are very similar when we use this adjusted disclosure metric instead. A third concern is that only G (governance) is driving our results. However, this is likely not the case for multiple reasons. First, SASB standards generally do not include governance indicators, such as board independence or executive compensation metrics, as key performance indicators. Governance issues identified by SASB as material include business ethics and transparency of payments or political lobbying. Indeed, in none of the industries do we include executive compensation metrics in our disclosure ratios. Moreover, we find that governance data are not included at all in 53 out of 65 industries we examine. Advertising and marketing is the industry that has the highest percentage of governance data included in the disclosure score at 22% of the data being governance data, with media and production second at 18% and casinos and gaming third at 11%.

Last, to assess the validity of our disclosure measure, we construct an alternative measure of material sustainability disclosure that does not rely on Bloomberg data.⁵⁴ To construct this alternative measure, we use data from SASB's Navigator database which tracks corporate disclosure based on the analysis of corporate public filings of U.S. companies to identify how well companies are disclosing on SASB material sustainability topics.⁵⁵ The data we have from SASB include around 1600 U.S. securities for years 2014 and 2015. For each firm-year observation, there are four pieces of information: the percentage of SASB topics that were *not* disclosed by the firm ("No Disclosure"), the percentage of SASB topics that were disclosed in a *boilerplate* manner ("Boilerplate"), the

percentage of SASB topics that had company-specific *narrative* information ("Narrative") and the percentage of SASB topics that had *metrics* reported ("Metrics"). We construct a weighted-SASB disclosure score that takes into account both the percentage of items disclosed and the quality of the disclosure (see Appendix 2 for more detail). In Column (1) of Table 9 we re-estimate model (1) substituting this alternative measure, *AltMaterialDisc*, for *MaterialDisc*. We observe that *AltMaterialDisc* is negatively and significantly related to stock price synchronicity at the 1% level. Moreover, we continue to find that ESG disclosure not identified by SASB (*NonMaterialDisc*) is not related to price informativeness. This suggests that our results are not sensitive to the use of Bloomberg data to construct our measure of material sustainability disclosure.

Validity of Synchronicity Measure

Li et al. (2014) suggest that lower synchronicity could be either a proxy for firm-specific information or noise in stock prices. Motivated by the fact that examining stock price synchronicity and idiosyncratic volatility sometimes produce different inferences, they suggest that researchers should understand if their results are robust when controlling for betas, and test if the hypothesized relation between the independent variable of interest and synchronicity changes sign or remains the same. This is because a decrease in synchronicity could be driven by a decrease in beta and/or an increase in idiosyncratic volatility. If the coefficient changes sign, then this would be inconsistent with the proposed theory, as it would provide evidence that the relation between the independent variable of interest and idiosyncratic volatility is opposite to what is being predicted. In Table 9 we control for the market and industry betas in our regression model. We find that even when we control for market beta in column (2), the relationship between material sustainability disclosure and synchronicity is negative and significant, suggesting that firms with higher material sustainability disclosure exhibit higher idiosyncratic volatility. In column (3) we control for industry beta, and finally in column (4) we control for both market and industry beta together. Across all specifications, the coefficient on material sustainability disclosure remains negative and significant.

Discussion and Conclusion

Our paper seeks to provide evidence on emerging accounting standards for the disclosure of sustainability information. In particular, we examine whether companies that voluntarily disclose information identified as financially material by the Sustainability Accounting Standards Board (SASB) have higher stock price informativeness. This is an important and timely issue given that the SEC's Investor Advisory Committee recently called for the modification of Regulation S-K to include financially material sustainability information and also

⁵⁴ We thank an anonymous reviewer for this suggestion.

⁵⁵ SASB's Navigator Research Platform (accessible on a trial basis and by subscription from: www.navigator.sasb.org) contains company-by-company information on disclosure quality for SASB's material topics; this product is called SASB's Disclosure Intelligence Data.

Table 9 Validity of synchronicity and disclosure measures

Variable	(1)		(2)		(3)		(4)	
	Dependent variable: Synchronicity		Dependent variable: Synchronicity		Dependent variable: Synchronicity		Dependent variable: Synchronicity	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
MaterialDisc			−0.399	−3.37	−0.436	−3.75	−0.321	−2.80
AltMaterialDisc	−0.003	−5.13						
MarketBeta			0.331	8.73			0.482	11.08
IndustryBeta					0.555	16.46	0.684	16.29
NonMaterialDisc	−0.134	−1.06	−0.101	−0.58	−0.033	−0.19	−0.085	−0.50
SustReport	−0.037	−0.66	−0.064	−1.59	−0.036	−0.92	−0.058	−1.49
PoorEQ	0.106	0.43	−0.058	−0.93	−0.052	−0.77	−0.059	−0.89
MarketCap	0.392	18.53	0.384	22.97	0.336	21.91	0.357	22.31
InstOwn	0.784	6.61	0.633	7.19	0.597	6.9	0.576	6.84
AnalystRev	−0.045	−2.16	−0.014	−1.34	−0.034	−3.39	−0.037	−3.68
MTB	−0.007	−2.54	0.000	0.28	0.000	−0.02	0.000	−0.11
StdDevROA	−0.693	−1.50	−0.997	−3.82	−1.039	−4.00	−1.172	−4.59
InsiderTrades	−0.008	−0.08	−0.095	−2.51	−0.069	−1.86	−0.068	−1.91
Intercept	−9.629	−18.96	−8.972	−22.35	−7.733	−22.38	−8.544	−22.36
N	2301		11,334		11,334		11,334	
Adjusted- R^2	0.488		0.572		0.586		0.609	
Fixed effects	Year, Industry		Year, Industry		Year, Industry		Year, Industry	

This table presents robustness results of stock return synchronicity regressed on material sustainability disclosure and other control variables. In Column (1) we use an alternative measure of material disclosure, *AltMaterialDisc*. In Columns (2), (3) and (4) we control for the market and industry betas in our regression model. All variables are winsorized at the 1- and 99-percent levels, and defined in Appendix 2. Regressions include year and industry fixed effects, with standard errors clustered by firm

given the SEC's recent solicitation of input regarding which sustainability disclosures are important to understanding a firm's business and financial condition. As such, we contribute to the call for evidence on the financial materiality of sustainability disclosures. In contrast to prior literature which does not distinguish between investor and noninvestor-relevant sustainability information, our findings should be of interest to the SEC regarding which, if any, sustainability information should be considered in revisions of Regulation S-K.

We document that firms providing more SASB-identified sustainability disclosure have higher stock price informativeness, suggesting that these disclosures contain financially-relevant, firm-specific information. Our result is robust to alternative measures of price informativeness and is robust to including controls for sustainability performance ratings, non-SASB sustainability reporting, analyst forecasts, insider trading, institutional ownership, earnings quality and other voluntary disclosure activity. In a changes analysis in which we identify changes in SASB-identified disclosure, we document that increases (decreases) in SASB disclosure are accompanied by increases (decreases) in price informativeness. Importantly, we do not find analogous results when we examine changes in non-SASB sustainability disclosure, suggesting that price informativeness, as it relates to sustainability reporting, is limited to SASB sustainability information.

Importantly, we find that the relation between SASB-identified sustainability disclosure and stock price informativeness is moderated in predictable ways. The association is stronger for firms that are more exposed to sustainability issues and for firms that have integrated sustainability issues more into their business operations and strategy. We also find that the association is stronger when investors with higher sustainability information processing capabilities hold shares of the firm. These results not only increase our confidence that SASB-identified sustainability information, rather than a correlated omitted variable drive the association, but also shed light on firm and capital market characteristics that accentuate the integration of material sustainability information. Moreover, we test whether the release of SASB standards led to increases in SASB-identified sustainability disclosure that caused increases in stock price informativeness. We find strong evidence that this is the case.

Our results have several implications for scholars and practitioners. First, failing to differentiate on disclosures that are likely to be financially material for a given industry from disclosures that are not might lead researchers to misleading conclusions about the nature of these disclosures and their effects. Scholars that are interested in understanding how sustainability information impacts economic value and stock prices need to incorporate a materiality lens into their analysis. Second,

our study highlights *which* sustainability disclosures managers may want to focus on in order to improve price informativeness. In particular, our findings imply that managers can increase the firm-specific information content in stock prices by increasing SASB-identified sustainability disclosure; in contrast, we do not find that increasing non-SASB disclosure improves stock price informativeness. Therefore, price informativeness, as it relates to sustainability information, is limited to material sustainability information identified by SASB. Third, our results suggest that even within an industry, disclosure of sustainability information might not affect stock prices of industry participants in the same way. Companies with higher exposure to ESG issues and especially to ESG risks as well as those that have an investor and analyst base with higher information processing capabilities may experience a stronger effect of material sustainability disclosure on price informativeness. These results are relevant to companies that are considering the implications of sustainability disclosure on their information environment, investor base and stock prices. Finally, we document that even in the absence of regulation mandating SASB standards, their release appears to have a meaningful effect on companies' disclosure choices and, in turn, these disclosure choices affect stock price informativeness. Therefore, our results imply that the release of these accounting standards might be related to more information being impounded in stock prices, a finding of direct relevance to securities regulators.

Limitations

Several caveats apply to our results and inferences. First, as we have described above, not all SASB data items have coverage in the Bloomberg dataset, although for most industries we have coverage of 70% of all SASB data items. Whether these missing data items have fundamentally different capital market implications and whether the results documented in this paper generalize to these data items are questions for future research. As with any non-experimental research design, we are also worried about correlated omitted variables. We take several steps to mitigate the likelihood of spurious correlations due to omitted variable bias by controlling for a number of alternative explanations, by using the release of SASB standards to directly tie the release of the standards to disclosure practices and then to informativeness, by supplementing our results using a changes specification and by using multiple moderator variables to examine whether our results are stronger in settings that theory would predict.

Opportunities for Future Research

Our paper is a first attempt to understand how the development of disclosure standards for sustainability information influences capital markets. Although SASB standards are still new, preventing researchers from documenting widespread consequences from these standards, there will be exciting opportunities for research in the future. First, there is a need to develop theory and empirically examine which SASB-identified disclosure topics—within an industry—matter more for price informativeness.⁵⁶ Second, there is a need for field research that examines how companies react to and use the standards in managing and reporting performance on different sustainability issues. Which companies adopt the standards first and why? What drives diffusion of standards across companies? Third, there is a need for empirical work that examines the consequences that standards have on the comparability of reported information. Do disclosures converge within an industry and diverge across industries? Fourth, how do standards drive change inside organizations? Do they elevate the importance of sustainability issues by assigning responsibility at the board level, or using these metrics in executive compensation plans, thereby affecting corporate governance? These and other questions represent fruitful avenues for future research.

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Compliance with Ethical Standards

Conflict of interest The authors have no current involvement in any organization or entity with any financial or non-financial interest in the matter discussed in this manuscript. Jody Grewal and Clarissa Hauptmann declare that they have no conflicts of interest.

⁵⁶ We thank an anonymous reviewer for this suggestion.

Appendix 1: Examples of ESG Integration

Source: CFA Institute, Environmental, Social, and Governance Issues in Investing [URL: cfainstitute.org/advocacy/policy-positions/environmental-social-and-governance-issues-in-investing-a-guide-for-investment-professionals].

Example 1: Valuation of ESG Risks of Mining Companies

When valuing stocks in the mining sector, analysts at Citi Research analyze the management of the relevant ESG issues by the mining companies. In particular, analysts carry out environmental and social impact assessments and closure planning to gauge the quality of the process that mining companies use to assess and manage the environmental and social impacts of a mine throughout its life and beyond. As part of these assessments, analysts use environmental indicators (e.g., the ISO 14001, a family of standards that provide practical tools to manage environmental responsibilities) as well as health and safety indicators (e.g., lost production time due to labor injury frequency), along with an analysis of government relations and local economic and community engagement. These analysts are of the view that effective management of ESG risks can significantly reduce mine development lead times, which they see as critical to future earnings capacity. Exercising their judgment, the analysts appropriately adjust the discount rate for mining companies that have lower ESG risks. For example, in one case, the discount rate of a mining company with better ESG management was adjusted from 10.7 to 7.5%, which increased the estimated intrinsic value of its stock by 29%.

Example 2: Valuation of ESG Risks and Opportunities of Utilities

In the United States, the Environmental Protection Agency's emission and carbon regulations are expected to have a material impact on valuing the power sector. Analysts at ClearBridge Investments believe that these regulations will increase the operational costs of the power plants with higher emissions levels (e.g., older, less efficient coal plants) and require additional environmental spending. According to these analysts, incremental expenditures on environmental retrofits should make smaller, older coal plans uncompetitive and lead to their retirement. Implementation of mercury regulation alone could lead to retirement of an estimated 17% of the country's coal-fired capacity. Thus, the companies owning newer plants with lower emissions (consisting of renewables, efficient coal, combined cycle gas plants, and

nuclear plants) will be relative winners. The increasing penetration of distributed solar power generation and utility-scale energy storage will have a disruptive effect on utilities over the longer term. For example, NextEra Energy (NEE), the largest wind and solar energy producer in the United States, will see a higher output growth and a more efficient cost structure than some of its peers as it drives earnings growth with these low-carbon energy sources. ClearBridge analysts believe that NEE has an attractive above-average earnings growth rate of 6–8% and an attractive relative valuation.

Appendix 2: Variable Definitions

Variable	Description
$AltMaterialDisc_{i,t}$	Alternative disclosure score for firm i in year t that takes into account the percentage of disclosed items and the quality of the disclosures. Calculated as: $(\%NoDisclosureItems*0) + (\%BoilerplateItems*1) + (\%NarrativeItems*2) + (\%Metrics*3)$ where $\%NoDisclosure$, $\%BoilerplateItems$, $\%NarrativeItems$ and $\%Metrics$ are obtained from SASB's Disclosure Intelligence Data.
$AnalystRev_{i,t}$	Natural log of number of analyst revisions for firm i in year t from I/B/E/S
$ConfCalls_{i,t}$	The natural logarithm of one plus all conference calls during the year as measured by Capital IQ
$Control_i$	An indicator variable equal to one for firms in the industries that did not have SASB standards released in the sample period
$ESGExposure_{i,t}$	A variable equal to 1 if firm i has above-average exposure to ESG-driven risks and opportunities in year t , as defined by MSCI IVA, 0 otherwise
$ESGPerf_{i,t}$	The ESG performance score of firm i in year t from MSCI IVA that captures the weighted average score on the environment, social, and governance dimensions
$ESGPerfMaterial_{i,t}$	The difference between the sum of KLD strengths and KLD concerns for items that are material according to SASB standards, defined in Khan et al. (2016)
$Financing_{i,t}$	Issuance of common and preferred stock minus the purchase of common and preferred stock, plus long-term debt issuance minus long-term debt reduction, in year t , computed using CRSP
$GRICompl_{i,t}$	Bloomberg variable equal to 1 if firm i complies with GRI guidelines in year t , 0 otherwise

Variable	Description	Variable	Description
$Illiq_{i,t}$	Natural logarithm of the yearly average daily price impact of a trade, measured as the absolute value of stock price returns times 100 relative to the stock price times trading volume scaled by 1000: $ Return \times 100 /(Price \times Volume/1000)$	$PoorESGPerf_{i,t}$	An indicator variable taking the value of one for firms with below-average <i>ESGPerf</i> in year t
$IndustryBeta_{i,t}$	Coefficient estimate of industry returns from the regression of daily firm returns on value-weighted market and industry returns, for firm i in year t	$PosChangeYrs_{i,t}$	An indicator variable taking the value of one in the year of, and directly after, (i.e., year t and $t+1$) an increase in material sustainability disclosure (<i>MaterialDisc</i>) from year $t-1$ to year t for firm i , 0 otherwise
$InsiderTrades_{i,t}$	Natural logarithm of the absolute value of net trading by insiders scaled by annual trading volume for firm i in year t , computed using CRSP	$Post_{i,t}$	An indicator variable equal to one in the years following the release of SASB standards. Varies depending on the year of the release of the standards for a given industry
$InstOwn_{i,t}$	The percentage of firm i 's ownership by institutional shareholders in year t , from Thomson Reuters Ownership	$PseudoPost_{i,t}$	An indicator variable equal to one in the three years before SASB standards were released for the treated firm
$Integrated_{i,t}$	A variable equal to 1 if firm i has high integration of sustainability across core business in year t , from Thomson Reuters Asset4, 0 otherwise	$ReturnVariability_{i,t}$	The natural logarithm of the standard deviation of daily returns over year t
$LiqVol_{i,t}$	Natural logarithm of the annual standard deviation of daily illiquidity, $Illiq_{i,t}$	$ROA_{i,t}$	Ratio of income before extraordinary items over total assets in year t , computed using Compustat
$MarketBeta_{i,t}$	Coefficient estimate of market returns from the regression of daily firm returns on value-weighted market and industry returns, for firm i in year t	$Spread_{i,t}$	The natural logarithm of the annual average of the daily absolute difference between bid and ask spread, scaled by the stock price
$MarketCap_{i,t}$	Natural logarithm of market capitalization for firm i in year t , from Compustat	$SRIOwn_{i,t}$	The percentage of firm i 's ownership by socially responsible investment funds in year t , calculated using Thomson Reuters Ownership data and Bloomberg
$MaterialDisc_{i,t}$	Ratio of the number of disclosed SASB ESG metrics to the total number of SASB ESG metrics available in Bloomberg, for firm i in year t	$StdDevROA_{i,t}$	Standard deviation of quarterly ROA, measured over the three years preceding and including t for firm i , computed using Compustat
$MTB_{i,t}$	Market to book value for firm i in year t , computed using Compustat	$SustReport_{i,t}$	A variable equal to 1 if firm i issues a sustainability report in year t , otherwise, from Thomson Reuters Asset4, CorporateRegister and Bloomberg
$MgmtGuide_{i,t}$	The natural logarithm of one plus all guidance events during the year as measured by Capital IQ	$Synchronicity_{i,t}$	Firm i 's stock price synchronicity in year t , as $\log\left(\frac{R^2}{1-R^2}\right)$ from annual regression of daily firm returns on value-weighted market and industry returns
$NegChangeYrs_{i,t}$	An indicator variable taking the value of one in the year of, and directly after, (i.e., year t and $t+1$) a decrease in material sustainability disclosure (<i>MaterialDisc</i>) from year $t-1$ to year t for firm i , 0 otherwise	$Treat_i$	An indicator variable equal to one for firms in the industries that had SASB standards released in the sample period, i.e., firms in the healthcare, non-renewable resources, technology, transportation and services sectors
$NonMaterialDisc_{i,t}$	Ratio of the number of disclosed non-SASB ESG metrics to the total number of non-SASB ESG metrics in Bloomberg, for firm i in year t	$Turnover_{i,t}$	The natural logarithm of the average of daily trading volume divided by shares outstanding over year t , computed using CRSP
$NumComp_{i,t}$	The average number of companies in analyst coverage across all analysts covering firm i in year t , computed using I/B/E/S	$ZeroDays_{i,t}$	Natural log of ratio of zero return days to total trading days within a year
$PoorEQ_{i,t}$	Absolute value of firm-specific residual from cross-sectional annual industry regression of working capital accruals on lagged, contemporaneous, and leading cash flows, scaled by lagged total assets (Dechow and Dichev 2002)		

Appendix 3: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Synchronicity	1.00											
(2) MaterialDisc	0.24	1.00										
(3) NonMaterialDisc	0.24	0.67	1.00									
(4) ESGExposure	0.26	0.29	0.35	1.00								
(5) Integrated	-0.02	-0.33	-0.33	-0.18	1.00							
(6) SRIOwn	0.08	0.00	0.01	0.03	-0.01	1.00						
(7) NumComp	-0.01	0.04	0.07	0.07	-0.19	0.03	1.00					
(8) MarketBeta	-0.01	-0.17	-0.16	-0.15	0.14	0.00	-0.07	1.00				
(9) IndustryBeta	0.13	0.07	0.12	0.18	-0.20	-0.02	0.17	-0.32	1.00			
(10) MarketCap	0.50	0.60	0.64	0.46	-0.43	0.03	0.10	-0.30	0.23	1.00		
(11) GRICompl	0.16	0.46	0.69	0.24	-0.22	0.01	0.03	-0.10	0.09	0.43	1.00	
(12) SustReport	0.22	0.55	0.72	0.31	-0.29	0.01	0.03	-0.12	0.08	0.55	0.65	1.00
(13) InstOwn	0.28	0.11	0.07	0.07	-0.15	0.07	0.10	-0.09	0.11	0.28	0.00	0.03
(14) AnalystRev	0.20	0.21	0.23	0.27	-0.12	0.05	0.04	-0.11	0.17	0.32	0.14	0.18
(15) MTB	0.02	0.04	0.05	0.03	-0.05	-0.01	-0.02	-0.04	0.04	0.11	0.04	0.03
(16) StdDevROA	-0.25	-0.19	-0.17	-0.04	0.13	-0.03	0.06	0.11	0.07	-0.31	-0.09	-0.14
(17) InsiderTrades	-0.03	-0.03	-0.07	-0.06	0.03	0.00	-0.06	0.01	-0.10	-0.02	-0.06	-0.07
(18) PoorEQ	-0.09	-0.10	-0.09	-0.01	0.08	-0.02	0.03	0.04	0.02	-0.16	-0.06	-0.08
(19) MgmtGuide	0.04	-0.03	0.00	0.02	0.03	0.03	-0.01	-0.01	-0.02	-0.04	0.00	-0.01
(20) ConfCalls	0.05	-0.06	0.03	0.04	0.05	0.03	0.00	0.01	0.02	0.01	0.07	0.01
(21) Illiq	-0.41	-0.14	-0.15	-0.16	0.12	-0.04	-0.01	0.05	-0.10	-0.36	-0.08	-0.10
(22) LiqVol	-0.44	-0.12	-0.14	-0.15	0.11	-0.04	0.01	0.03	-0.10	-0.35	-0.07	-0.09
(23) Spread	-0.41	-0.22	-0.24	-0.18	0.22	-0.04	-0.06	0.11	-0.11	-0.47	-0.13	-0.17
(24) ZeroDays	-0.44	-0.18	-0.18	-0.17	0.15	-0.05	0.03	0.09	-0.08	-0.46	-0.11	-0.15
(25) ESGPerf	0.13	0.33	0.38	0.21	-0.23	0.04	0.05	-0.14	-0.01	0.43	0.25	0.31
(26) ESGPerfMaterial	-0.11	0.09	0.15	0.03	-0.25	0.00	-0.05	-0.06	0.01	0.07	0.17	0.17
(13) InstOwn	1.00											
(14) AnalystRev	0.13	1.00										
(15) MTB	-0.02	-0.03	1.00									
(16) StdDevROA	-0.23	-0.03	0.10	1.00								
(17) InsiderTrades	-0.08	-0.02	0.04	-0.05	1.00							
(18) PoorEQ	-0.11	0.00	0.10	0.41	0.00	1.00						
(19) MgmtGuide	0.07	0.02	0.01	-0.07	0.00	-0.04	1.00					

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
(20) ConfCalls	0.04	0.07	0.02	-0.01	-0.01	-0.01	0.39	1.00					
(21) Illiq	-0.38	-0.13	-0.02	0.19	0.04	0.11	-0.04	-0.04	1.00				
(22) LiqVol	-0.39	-0.14	-0.01	0.20	0.05	0.10	-0.04	-0.05	0.72	1.00			
(23) Spread	-0.44	-0.16	-0.01	0.28	0.07	0.16	-0.08	-0.05	0.63	0.66	1.00		
(24) ZeroDays	-0.40	-0.18	0.00	0.35	-0.05	0.17	-0.08	-0.06	0.38	0.41	0.46	1.00	
(25) ESGPerf	0.14	0.19	0.05	-0.14	0.03	-0.09	0.07	0.06	-0.15	-0.15	0.24	0.14	1.00
(26) ESGPerfMaterial	0.01	-0.05	0.08	-0.03	0.01	-0.02	0.00	0.05	-0.01	-0.01	-0.04	0.00	0.19

This table presents the pairwise correlations between the variables used in the study. Correlation coefficients that are statistically significant at the 90% confidence level or greater are marked in bold

Appendix 4: Steps to construct material sustainability disclosure variable (*MaterialDisc*)

- Step 1 Enter “XLTP XESG” in Bloomberg. An excel worksheet will open on the screen
- Step 2 Select “SASB” from the drop-down menu under Ticker
- Step 3 Select the Sector and Industry from the drop-down menu under SASB SICS Sector and SASB SICS Industry to obtain the corresponding SASB topics
- Step 4 Under “View”, check “Headings” and unhide the columns in the worksheet to the right of the SASB topics
- Step 5 The columns to the right of the SASB topics will display the Bloomberg ESG fields that correspond to SASB metrics. These fields represent the Bloomberg ESG data items that were mapped to SASB topics
- Step 6 Copy these Bloomberg fields and paste them as column headers into an excel worksheet that is linked to Bloomberg (i.e., on the Bloomberg terminal). Download data for these fields for the firm-years in your sample that are in the relevant Sector and Industry (from Step 3) using unique identifiers (e.g., ISIN). Follow the instructions in “Formulas → Insert Formula” to construct the download formula
- Step 7 Compute firm-year material sustainability disclosure (*MaterialDisc*) as the number of non-missing fields as a fraction of the total number Bloomberg fields that correspond to SASB metrics

Example: SASB SICS Sector: Non-Renewable Resources; SASB SICS Industry: Oil & Gas – Exploration & Production

Ticker				
SASB				
SASB SICS Sector		SASB SICS Industry		
Non-Renewable Resources		Oil & Gas - Exploration & Production		
Sustainability Accounting Metrics				
Sustainability Dimension: Environment				
Disclosure Topic: Greenhouse Gas Emissions				
NR0101-01: Gross global Scope 1 emissions, percentage covered under a regulatory program, percentage by hydrocarbon resource				
GHG Scope 1				XXXXX
CDP: Scope 1 Activity Emissions Global				XXXXX
EU Emissions Trading Emissions				XXXXX
NR0101-02: Amount of gross global Scope 1 emissions from: (1) combustion, (2) flared hydrocarbons, (3) process emissions, (4) directly vented releases, and (5) fugitive emissions/leaks				
NR0101-03: Description of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets				
Emissions Reduction Initiatives				XXXXX
CDP: Emissions/Energy Reduction Target				XXXXX
Disclosure Topic: Air Quality				
NR0101-04: Air emissions for the following pollutants: NOx (excluding N2O), SOx, volatile organic compounds (VOCs), and particulate matter (PM)				
Nitrogen Oxide Emissions				XXXXX
Sulfur Oxide Emissions				XXXXX
VOC Emissions				XXXXX
Particulate Emissions				XXXXX
Disclosure Topic: Water Management				
NR0101-05: Total fresh water withdrawn, percentage recycled, percentage in regions with High or Extremely High Baseline Water Stress				
Total Water Withdrawal				XXXXX
Surface Water Withdrawals				XXXXX
Groundwater Water Withdrawals				XXXXX
Salt Water Withdrawals				XXXXX
Municipal Water Use				XXXXX
Reclaimed Water Use				XXXXX
% Water Recycled				XXXXX
Total Water Recycled				XXXXX
Water Policy				XXXXX
NR0101-06: Volume of produced water and flowback generated; percentage (1) discharged, (2) injected, (3) recycled; hydrocarbon content in discharged water				
Discharges to Water				XXXXX
Total Water Discharged				XXXXX
% Water Discharged				XXXXX
Water Usage Efficiency Rate				XXXXX
NR0101-07: Percentage of hydraulically fractured wells for which there is public disclosure of all fracturing fluid chemicals used				

Bloomberg field corresponding to SASB metric

Disclosure Topic: Biodiversity Impacts				
NR0101-09: Description of environmental management policies and practices for active sites				
Environmental Quality Management Policy				XXXXX
Biodiversity Policy				XXXXX
NR0101-10: Number and aggregate volume of hydrocarbon spills, volume in Arctic, volume near shorelines with ESI rankings 8-10, and volume recovered				
Number of Spills				XXXXX
Amount of Spills				XXXXX
NR0101-11: (1) Proved and (2) probable reserves in or near sites with protected conservation status or endangered species habitat				
Environmental Accounting Cost				XXXXX
Sustainability Dimension: Social Capital				
Disclosure Topic: Security, Human Rights, and Rights of Indigenous Peoples				
NR0101-12: (1) Proved and (2) probable reserves in or near areas of conflict				
NR0101-13: (1) Proved and (2) probable reserves in or near indigenous land				
NR0101-14: Discussion of engagement processes and due diligence practices with respect to human rights, indigenous rights, and operation in areas of conflict				
Community Spending				XXXXX
Human Rights Policy				XXXXX
Disclosure Topic: Community Relations				
NR0101-15: Discussion of process to manage risks and opportunities associated with community rights and interests				
Community Spending				XXXXX
Human Rights Policy				XXXXX
NR0101-16: Number and duration of non-technical delays				
Sustainability Dimension: Leadership & Governance				
Disclosure Topic: Health, Safety, and Emergency Management				
NR0101-17: (1) Total Recordable Injury Rate (TRIR), (2) Fatality Rate, and (3) Near Miss Frequency Rate for (a) full-time employees, (b) contract employees, and (c) short-service employees				
Lost Time Incident Rate				XXXXX
Total Recordable Incident Rate				XXXXX
Lost Time Incident Rate - Contractors				XXXXX
Total Recordable Incident Rate - Contractors				XXXXX
Fatalities - Total				XXXXX
Fatalities - Employees				XXXXX
Fatalities per 1000 Employees				XXXXX
Total Accidents - Contractors				XXXXX
Fatalities - Contractors				XXXXX
Number of Contractors				XXXXX
NR0101-18: Process Safety Event (PSE) rates for Loss of Primary Containment (LOPC) of greater consequence (Tier 1)				
NR0101-19: Discussion of management systems used to integrate a culture of safety and emergency preparedness throughout the value chain and throughout the exploration and production lifecycle				
Health and Safety Policy				XXXXX
Disclosure Topic: Business Ethics & Payments Transparency				
NR0101-20: (1) Proved and (2) probable reserves in countries that have the 20 lowest rankings in Transparency International's Corruption Perception Index				
NR0101-21: Description of the management system for prevention of corruption and bribery throughout the value chain				
Anti-bribery Ethics Policy				XXXXX
Disclosure Topic: Reserves Valuation & Capital Expenditures				
NR0101-22: Sensitivity of hydrocarbon reserve levels to future price projection scenarios that account for a price on carbon emissions				
NR0101-23: Estimated carbon dioxide emissions embedded in proved hydrocarbon reserves				
NR0101-24: Discussion of how price and demand for hydrocarbons and/or climate regulation influence the capital expenditure strategy for exploration, acquisition, and development of assets				
CDP Regulatory Risk Exposure				XXXXX
CDP Regulatory Risk Exposure Description				XXXXX
CDP Physical Risk Exposure				XXXXX
CDP Physical Risk Exposure Description				XXXXX
CDP Other Risk Exposure				XXXXX
CDP Other Risk Exposure Description				XXXXX
CDP Regulatory Opportunities Present				XXXXX
CDP Regulatory Opportunities Description				XXXXX
CDP Physical Opportunities Present				XXXXX
CDP Physical Opportunities Description				XXXXX
CDP Other Opportunities Present				XXXXX
CDP Other Opportunities Description				XXXXX
Disclosure Topic: Management of the Legal & Regulatory Environment				
NR0101-25: Amount of political campaign spending, lobbying expenditures, and contributions to tax-exempt groups including trade associations				
Political Donations				XXXXX

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