Material ESG Alpha:
A Fundamentals-Based Perspective

ABSTRACT

Using SASB's materiality framework, prior research finds alpha for the portfolio of firms with improving ratings on material ESG issues. We replicate this finding and provide a fundamentals-based perspective on *why* the materiality portfolio outperforms. More financially established firms, identified as firms with larger size, lower growth, and higher profitability relative to their sector, are more likely to create material strengths and address material weaknesses in their ESG scoring. This link dictates that one should comprehensively control for fundamental determinants of expected returns before attributing stock outperformance to improving material ESG scores. We find that the materiality portfolio does not generate alpha after we explicitly account for exposure to profitability and growth factors. Our evidence underscores the issue of correlated omitted fundamental factors in the debate of ESG alpha and has direct implications for the development and marketing of financial products powered by sustainability reporting frameworks.

KEYWORDS: ESG; SASB; Materiality; Alpha; Fundamentals.

DATA AVAILABILITY: Data are available from the sources cited in the text.

1. INTRODUCTION

What is the link between changes in ESG scores and future stock performance? The question is a critical one as investors and companies are increasingly mindful that environmental, social, and governance (ESG) issues can have a material impact on corporate value creation. The need to identify material ESG issues has fostered an ecosystem of standard-setting organizations, rating agencies, and index providers. The materiality framework and industry-specific disclosure standards developed by the Sustainability Accounting Standards Board (SASB) are part of the foundation of this ecosystem.

In an influential study, Khan, Serafeim, and Yoon (2016), hereafter KSY, apply SASB's framework to distinguish financially material from immaterial ESG issues in the MSCI/KLD data and find that the portfolio of firms with improving ratings on material issues outperforms against a set of selected pricing factors. With respect to the source of portfolio outperformance, or alpha, they argue that changes in a firm's material ESG score contain "hidden" information about future firm performance that has not already been priced. The hidden information embedded in material ESG scores, the argument goes, is drowned out by noise when pooling material and immaterial issues. Naturally, evidence of material ESG alpha has generated interest in financial products that integrate the SASB framework.

In this paper, we provide a fundamentals-based explanation of *why* firms with improving ratings on material ESG issues outperform. We hypothesize that more financially established firms are also more likely to allocate available resources to create material strengths and address material weaknesses in their ESG scoring. This link dictates that one should comprehensively account for exposure to fundamental determinants of expected returns before attributing stock outperformance to improving material ESG scores.

To probe the economic forces at play, we start with the MSCI/KLD annual dataset of environmental (E), social (S), and governance (G) indicators for U.S. listed companies. Initiated in 1991, the MSCI/KLD dataset has been extensively used in academic studies, including KSY. We classify MSCI/KLD indicators into material and immaterial using SASB's industry-specific materiality taxonomy. We measure the total ESG score for each firm-year observation as the sum of all strength indicators minus the sum of all concern indicators.

Then, we break down the year-over-year change in a company's total ESG score into the material and immaterial components.

The first set of results shows that there is a fundamental link between firm characteristics and subsequent changes in material ESG scores. More financially established firms, identified as firms with larger size, lower growth, and higher profitability relative to their sector, are associated with subsequent improvements in their material ESG score. Probing the sources of variation, we find that more established firms are more likely to not only create material strengths but also address material weaknesses in their ESG scores. Our evidence is in line with the "slack resource" theory according to which more established firms are more visible to external stakeholders and can allocate more resources to ESG activities (e.g., Waddock and Graves 1997). Also, more financially established companies have more resources for the preparation and communication of ESG reports to stakeholders and rating agencies (e.g., Baumann-Pauly et al. 2013). Consistent with the idea that fundamental performance and ESG performance are jointly impacted by managerial actions (e.g., Friedman et al. 2021), more established firms may also be run by higher quality managers who are better at managing the company's ESG score.

Our second set of results offers a fundamentals-based explanation of why the materiality portfolio outperforms. KSY estimate alpha from portfolio return regressions on the market, size, book-to-market, momentum, and liquidity pricing factors. In the context of KSY's benchmark factor model, we independently replicate that the portfolio of stocks with increasing material ESG scores is associated with a significant alpha of 22 bps per month. The fundamental link to subsequent increases in material ESG scores, however, dictates that the benchmark model of normal performance should also account for portfolio exposures to fundamental determinants of expected returns. In two closely related studies, Fama-French (2015), within the context of a standard valuation framework, and Hou et al (2015), within the context of the neoclassical q-theory of investment, identify profitability and growth as fundamental determinants of expected returns. Both studies predict that high profitability stocks earn higher expected returns than low profitability stocks and that high investment stocks should earn lower expected returns than low investment stocks.

Our evidence shows that the estimated alpha of the materiality portfolio becomes indistinguishable from zero after we explicitly account for exposure to profitability and growth factors. Put differently, the materiality portfolio does not generate abnormal returns against the more comprehensive benchmark factor model that accounts for the effect of profitability and growth factors on expected returns. Our evidence offers an alternative view of the argument that changes in material ESG score contain hidden information about future firm performance that has not already been priced.

Though we do not find evidence of alpha after accounting for fundamental factor exposures, one could argue that ESG-motivated investors may still prefer the materiality portfolio if it has a higher ESG score relative to the benchmark portfolio (e.g., Pástor et al. 2021; Pedersen et al. 2021). To evaluate this argument, we construct a fundamental benchmark portfolio of more established firms in their respective sector—firms with larger size, lower asset growth, and higher operating profitability. The benchmark portfolio is constructed exclusively based on fundamental characteristics without regard to ESG scores. The evidence shows that the fundamental benchmark portfolio and the materiality portfolio are indistinguishable from each other in terms of both their stock return performance and their overall ESG score. It follows that one could use a simple stock screen based on fundamental characteristics—firm size, profitability, and growth—to track not only the stock return performance but also the overall ESG score of the materiality portfolio. The tracking ability of the fundamental portfolio further challenges the argument that changes in material ESG score contain hidden information that has not already been priced.

Our findings have direct implications for the development and marketing of financial products based on ESG scoring models. Notably, State Street has developed the "Responsibility Factor" or R-Factor, which scores companies on their performance relative to industry peers on material ESG issues within the context of the SASB materiality framework (State Street Global Advisors 2020). A premise of State Street's R-Factor is that companies that score higher on material ESG metrics outperform. In turn, State Street's R-Factor is the ESG scoring model powering the Bloomberg/SASB ESG index family. The Bloomberg/SASB indices are offered as socially responsible benchmarks that create value for investors by tracking companies on financially material ESG issues.

Our final set of results evaluates the performance of the Bloomberg/SASB ESG index family, including the total market index and carve-out indices with value, growth, and dividend tilts. We document that the correlation between our self-constructed materiality portfolio and the Bloomberg/SASB market index is as high as 95%. We then show that the Bloomberg/SASB indices do not generate abnormal returns relative to the benchmark factor model that accounts for exposure to fundamental determinants of expected returns.

To further investigate the incremental value of scoring stocks on material ESG issues, we compare each Bloomberg/SASB index to a style-matched passive index that does *not* incorporate ESG considerations, including the S&P 500 market index, the U.S. CRSP Large Growth, the U.S. CRSP Large Value, and the FTSE High Dividend Yield index. Different from non-traded research factors, these style-matched base indices have investable representations in low-cost ETFs accessible to investors. We find that the Bloomberg/SASB indices are indistinguishable from the base indices in terms of stock returns. This finding corroborates our evidence that the Bloomberg/SASB indices do not generate alpha. It is also consistent with our evidence that the materiality portfolio, which is based on changes in material ESG scores, and the fundamental portfolio, which is exclusively based on firm characteristics without regard to ESG scores, are indistinguishable from each other.

The performance evaluation of the Bloomberg/SASB index family serves as an external validity test for two related reasons. First, while our analysis of the materiality portfolio focuses on the MSCI/KLD scores to enable comparisons to prior research, the ESG scoring model powering the Bloomberg/SASB index family draws metrics from four different data providers that are widely used by the investment community, including Sustainalytics, ISS-ESG (formerly Oekom Research), ISS-Governance, and Moody's ESG (formerly Vigeo-Eiris). Since ESG data providers often disagree with one another, the idea behind including a blend of ESG data providers is to reduce potential biases that may be built into a provider's methodology and measure consensus ESG performance (Berg et al. 2022).

Second, while our identification of material ESG issues follows the SASB standards, the mapping to particular ESG issues can vary across coders. The large overlap between our self-constructed materiality portfolio and the Bloomberg/SASB market index implies that our identification of companies with improving material ESG scores hews closely to State

Street's ESG scoring model. This large overlap further implies that changes in material MSCI/KLD scores share a significant common component with changes in material ESG scores across the data providers used in State Street's ESG scoring model. Thus, our results are not exclusively tied to the MSCI/KLD scores or to our mapping of material ESG issues.

Our paper delivers a simple, fundamentals-based message with broad implications for research on ESG investing. Embracing ESG as an endogenous construct, we argue that one should comprehensively control for correlated fundamental determinants of expected returns before attributing outperformance to improving material ESG scores. Our paper does not question the validity of the KSY study since we independently replicate their key finding. Also, our evidence does not preclude the possibility that changes in material ESG issues can impact firm fundamentals. Instead, our paper underscores the issue of correlated omitted fundamental factors in the debate surrounding ESG alpha and highlights the importance of the benchmark model selection when evaluating portfolio performance.

Our paper is *not* a takedown of research on ESG investing. Rather, our paper underscores the need for a deeper understanding of the overlap between fundamental performance and ESG performance. More broadly, our paper does not refute prior evidence on the explanatory power of alternative ESG metrics, such as measures of carbon intensity (e.g., Bolton and Kacperczyk 2021), climate risks (e.g., Hong et al. 2019; Faccini et al. 2021), board diversity (e.g., Bernile et al. 2018), corporate culture (e.g., Guiso et al. 2015), employee satisfaction (e.g., Edmans 2011), and corporate sinfulness (e.g., Hong and Kacperczyk 2009).

The idea that material ESG scores embed hidden information that could help investors select alpha generating stocks has been a compelling narrative for the marketing of new ESG scoring models and indices. Our paper raises questions about the incremental relevance of commercially available ESG scoring models in terms of uncovering hidden information that is not captured by simple fundamentals-based stock screens. The evidence indicates the need for caution on the part of ESG index providers, fund managers, and advisers when marketing scoring models and indices to the general investment community. At a higher level, our findings imply that there is an opportunity to develop alternative ESG scoring models that would allow investors to access decision-useful information that goes beyond what is already reflected in financial data.

With respect to sustainability reporting, we hasten to note that our paper does not invalidate SASB's framework. As we explain in Section 2, the standard of materiality underpinning the SASB standards does not require a link between material ESG issues and alpha generation. A reasonable investor might consider a signal as material information in their deliberations even if the signal does not generate alpha. Moreover, the absence of alpha does not negate the role of SASB standards as a coordinating mechanism that facilitates comparisons of companies on key dimensions of ESG performance. In fact, one can view the evolution of SASB itself as a response to the market need for a framework of corporate sustainability disclosures, and the SASB standards as a catalyst for market participants to develop a common language around ESG performance measurement and disclosure. In this regard, Bochkay et al. (2021) find that the development of the SASB standards has led to an increase in voluntary ESG disclosures in earnings calls, which they interpret as consistent with the coordinating role of SASB standards.

With the SEC's renewed focus on climate-related disclosures, the demand for a generally accepted set of sustainability reporting standards is poised to grow. Existing frameworks, such as SASB standards, can help establish a global baseline of corporate sustainability disclosures.[1]

2. BACKGROUND

2.1 SASB's ESG materiality framework

The Sustainability Accounting Standards Board (SASB) was established in 2011 as a 501(c)(3) nonprofit organization. SASB's public launch in October 2012 was enabled by Bloomberg Philanthropies among other lead funders and Bloomberg is cited a founding partner of SASB (2018 SASB Symposium). SASB's mission is to develop and disseminate industry-specific sustainability accounting standards that help businesses "*disclose material, decision-useful information to investors*."

[1] On March 21, 2022, the SEC proposed new rules that would require companies to disclose information about climate-related risks that are reasonably likely to have a material impact on their business (Release 33-11042). The proposed rules are intended to standardize ESG reports and address investors' need for more consistent, comparable and decision-useful information.

SASB published its codified standards across sectors on November 7, 2018. Since June 9, 2021, the SASB standards are maintained under the auspices of the Value Reporting Foundation, a nonprofit organization that was created after the merger of the SASB Foundation with the International Integrated Reporting Council (IIRC). Effective August 1, 2022, the Value Reporting Foundation consolidated into the IFRS Foundation, which established the International Sustainability Standards Board (ISSB) as a global standard-setter for sustainability disclosures. SASB Standards are now under the oversight of the ISSB.

SASB takes an evidence-based approach to assess whether sustainability topics are likely to be of interest to the reasonable investor, and whether they are reasonably likely to have financial impact. The conceptual framework of SASB utilizes the standard of materiality articulated by the U.S. Supreme Court in its landmark decision on TSC Industries versus Northway Inc. 426 U.S. 438 (1976). The Court defines that "*an omitted fact is material if there is a substantial likelihood that a reasonable shareholder would consider it important in deciding how to vote*." The Court explains that "*there must be 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*." The Court expressly adopted this definition of materiality for the Rule 10b-5 securities fraud context in Basic, Inc. v. Levinson 485 U.S. 224 (1988). [2]

SASB's focus on the convergence of financial reporting and ESG reporting has attracted considerable attention within the investing community (e.g., Jebe 2019). By March 2022, more than 258 institutional investors, representing $76 trillion in AUM, support SASB or use SASB standards to inform their investment processes (see Global Use of SASB Standards). The number of companies reporting SASB metrics has increased from 117 in 2019 to 1,325 by the end of 2021. The Investment Company Institute, a global association of

[2] In its formulation of the definition of materiality, the Court borrowed the conventional tort test of materiality; that is, whether "*a reasonable man would attach importance to the fact misrepresented or omitted in determining his course of action*." In the context of U.S. securities laws, the definition of materiality is also grounded on the expectations of the reasonable investor. SEC Rule 405 of the Securities Act of 1933 states that "*…the term material, when used to qualify a requirement for the furnishing of information as to any subject, limits the information required to those matters to which there is a substantial likelihood that a reasonable investor would attach importance in determining whether to purchase the security registered*."

regulated funds, as well as State Street Global Advisors, and Blackrock have made public calls for broader adoption of SASB standards (see Larry Fink's 2021 letter to CEOs).[3]

2.2 ESG materiality and stock returns

Over the last half century, researchers have searched for a link between ESG metrics and stock returns (see, e.g., Friede et al. 2015; Matos 2020; Gillan et al. 2021). A focal point in this search is the idea that stocks with higher ESG scores outperform. Notwithstanding numerous attempts to find ESG alpha, there was no conclusive evidence that portfolio strategies based on the raw ESG metrics deliver alpha. A critique of this literature is that ESG scores were used without regard to the materiality of the underlying issues (e.g., Porter et al. 2019). By pooling material and immaterial issues, any predictive content of aggregate ESG scores could be drowned out by noise.

The development of SASB's materiality framework allowed the disaggregation of ESG scores into material and immaterial issues. Working with industry representatives, SASB has developed standards to identify the metrics that are considered material to a particular industry. KSY apply the SASB framework to break down the MSCI/KLD ESG scores into material and immaterial components. The premise of the decomposition is that when ESG issues are considered through the lens of materiality, they can influence stock returns. Consistent with this premise, KSY find that the portfolio of companies with improving material ESG scores significantly outperforms.

Evidence of material ESG alpha implies that one could overlay the SASB framework on commercially available ESG scores to uncover "hidden" information about future firm

[3] Index fund managers and index providers, like State Street Global Advisers and Bloomberg, often cite material ESG alpha as evidence of the value of SASB's materiality framework. Responding to the SEC's request for public input on climate change disclosures issued on March 15, 2021, SASB's CEO also cites KSY's evidence of material ESG alpha and states that "*…the effectiveness of SASB's process has been validated by independent research from Harvard Business School…*" SASB's CEO cites two other studies on material ESG alpha as more evidence of independent validation. The first study is a 2018 white paper by Russell Investments that provides evidence of material ESG alpha against the market, size, book-to-market, and momentum factors (available from the Russell Investments website). The second study is a 2019 report initiated by the Global Alliance for Banking on Values with the support of Deloitte and the European Investment Bank. The report was authored by KKS advisors, an ESG advisory firm cofounded by one of the authors of the KSY study. This report (available from the KKS Advisors website) also provides evidence of material ESG alpha against the market, size, book-to-market, momentum, and liquidity factors. However, neither study accounts for portfolio exposures to the profitability and growth factors. For more information, see the response letter on Climate Change Disclosures by Janine Guillot, CEO of SASB, May 19, 2021, available from the SEC website (p. 9 and footnote 60).

performance that has not already been priced and formulate alpha-generating portfolio strategies. The idea of hidden information has also proven to be a compelling narrative for the marketing of a host of ESG scoring models and indices.

2.3 Fundamental link to changes in material ESG scores

Identifying the fundamental determinants of changes in ESG scores is a critical issue in the ongoing debate surrounding ESG alpha. Simply put, the issue is that companies with improving material ESG scores may differ in terms of fundamental characteristics that are related to future stock return performance. A basic premise of our paper is that changes in material ESG scores occur in the context of fundamental firm characteristics.

We argue that more financially established firms are more likely to create material strengths and address material weaknesses in their ESG scoring. This argument is in line with the slack resource theory according to which more established firms are more visible to external stakeholders and can allocate more resources to ESG activities (e.g., Ullmann 1985; McGuire et al. 1988, 1990; Waddock and Graves 1997). Also, more established companies have more available resources for ESG management tools and reporting structures that enable them to prepare multidimensional ESG reports and address the ESG data requirements of stakeholders and rating agencies (e.g., Baumann-Pauly et al. 2013; Wickert et al. 2016; Drempetic et al. 2020). Consistent with the idea that fundamental performance and ESG performance are jointly impacted by managerial actions (e.g., Friedman et al. 2021), more financially established firms may also be run by higher quality managers who are more responsive to ESG-motivated investors by creating material strengths and addressing material weaknesses.

Following, this discussion we predict that more financially established firms are more likely to experience a subsequent improvement in their material ESG score.

Prediction 1: More financially established firms, identified as firms with larger size, lower growth, and higher profitability relative to their sector, are associated with subsequent improvements in their material ESG score.

Our prediction of a fundamental link to subsequent changes in material ESG scores does not preclude the reverse direction whereby changes in material ESG scores can impact firm fundamentals (for a review see Gillan et al. 2021). Notwithstanding the possibility of a

bi-directional association, a link between fundamental characteristics and subsequent changes in material ESG scores would present the challenge of correlated omitted fundamental factors when testing for alpha. Importantly, such a fundamental link would underscore the need to evaluate ESG alpha against a benchmark portfolio that accounts for fundamental factor exposures. KSY estimate alpha from portfolio return regressions on the market, size, book-to-market, momentum, and liquidity pricing factors. However, their benchmark factor model does not consider portfolio exposures to profitability and growth as determinants of expected stock returns. In this regard, the two most relevant studies are Fama-French (2015), henceforth FF, and Hou, Xue, and Zhang (2015), henceforth HXZ.

FF start with the dividend discounting model and under clean surplus accounting show that a stock's expected return is determined by expectations about future profitability and investment. Within this standard valuation framework, FF predict that higher profitability implies a higher expected return and higher growth implies a lower expected return. These theoretical predictions are consistent with prior empirical evidence of profitability and growth patterns in stock returns (e.g., Titman et al. 2004; Novy-Marx 2013). Motivated by prior empirical evidence, FF add profitability and asset growth factors to the well-known Fama-French (1993) three-factor model (market, size, and book-to-market factors). FF's key contribution is that the five-factor model provides a better description of the cross-section of stock returns.

HXZ also add profitability and growth factors to the market and size factors and focus on explaining a comprehensive set of known anomalies in the cross-section. While the profitability and investment effects are not new to their work, HXZ empirically show that many of the anomalies that prove challenging for the Fama-French (1993) three-factor model are manifestations of profitability and growth patterns in returns. HXZ's key theoretical contribution is the derivation of expected returns as a function of profitability and investment within the context of the investment CAPM. The investment CAPM is built on the neoclassical q-theory of investment and prices risky assets from the perspective of firms (supply side). In contrast, the consumption CAPM prices risky assets from the perspective of investors (demand side). Within the context of the investment CAPM, HXZ interpret fundamental characteristics as determinants of expected returns.

Consistent with FF, the q-theory model of HXZ predicts that, all else equal, high profitability stocks should earn higher expected returns than low profitability stocks and that high investment stocks should earn lower expected returns than low investment stocks.[4] Following this discussion, we predict that evidence of material ESG alpha is confounded by correlated fundamental determinants of expected returns that are omitted from KSY's benchmark factor model.

Prediction 2: The portfolio of stocks with increasing material ESG scores does not generate abnormal returns relative to a benchmark model that accounts for exposure to profitability and growth factors.

Our predictions are broadly consistent with the ESG reporting framework of Friedman et al. (2021). In the context of their model, fundamental performance and ESG performance are jointly impacted by managerial actions. While all investors value cash flows, a λ-fraction of investors also derive non-pecuniary benefits from ESG holdings (warm-glow utility). The equilibrium price reflects the risk-adjusted expected value of cash flows plus the expected ESG output weighted by the λ-fraction of ESG-motivated investors and it is impacted by the correlation between fundamentals and ESG. The joint determination of fundamental performance and ESG performance highlights the importance of accounting for the correlation between fundamental firm characteristics and ESG scores when searching for a link between stock returns and ESG performance.[5]

2.4 Related work on ESG materiality

Khan (2019) examines the link between corporate governance and stock returns in a cross-country setting. He constructs a composite governance score based on ownership dispersion, country-level shareholder orientation, and political risk. A hedge portfolio formed from the top minus the bottom quartile of the composite score is associated with alpha of 31 bps per month. Expanding the composite governance score to include material

[4] Subsequent research confirms that profitability and growth factors have incremental explanatory power for stock returns relative to known determinants (e.g., Gagliardini et al. 2019; Feng et al. 2020).

[5] We note that asset pricing models with ESG-motivated investors predict that stock returns capture not only news about fundamentals but also changes in the fraction of ESG-motivated investors and their tastes (e.g., Friedman et al. 2021; Pástor et al. 2021). In settings with an increasing share of ESG-motivated investors, a stronger association between stock returns and ESG performance could be a weaker indicator of cash-flow materiality for fundamentals-based investors.

environmental and social issues, the strategy is associated with a marginally higher alpha of 32 bps per month.

Berchicci and King (2021) argue that the empirical link between material ESG scores and stock returns should be evaluated within the context of alternative choices that give rise to model uncertainty. They consider model uncertainty with respect to the mapping of SASB materiality to KLD scores, the mapping of firms to SASB sectors, the definition of material ESG signals, sample selection, and statistical model selection to create a model space of close to 450 models. Their estimates show that KSY's finding of a positive association between material ESG scores and future stock returns does not uniformly extend to their selected model space. A drawback of their model uncertainty analysis is that it relies heavily on the authors' subjective choices when defining the model space.

Other related studies include Serafeim and Yoon (2022a, 2022b), who find evidence that stock prices increase in response to positive news about material ESG issues; Grewal et al. (2021), who find that firms disclosing more SASB-identified ESG topics are associated with higher stock price informativeness; Burzillo et al. (2021), who find only limited evidence of abnormal returns and trading volume in response to the disclosure of sustainability reports of companies using SASB standards.[6] Different from prior studies, our paper provides a fundamentals-based explanation of *why* firms with improving ratings on material ESG issues outperform.

3. DATA AND MEASUREMENT

3.1 MSCI/KLD ESG indicators

MSCI is the dominant producer of ESG scores and indices. According to Bloomberg Intelligence, MSCI earns almost 40 cents out of every dollar the investment industry spends on ESG data. BlackRock—the world's biggest asset manager by AUM—is MSCI's biggest

[6] While Burzillo et al. (2021) find that on average the announcement of a sustainability report containing SASB metrics does not generate a significant stock price reaction, analytical models predict cross-sectional variation in the stock price reaction to ESG reports. Friedman and Heinle (2016) predict that the market reaction to corporate social responsibility (CSR) disclosures will be higher when CSR-motivated investors account for a larger fraction of the firm's shareholder base and the CSR disclosure is more precise. Friedman et al. (2021) predict that an ESG report that weights manager's efforts by their impact on the firm's cash flows will generate a stronger stock price reaction than an ESG report that focuses on ESG performance alone.

customer. MSCI's growth in the ESG business was accelerated with the acquisition of RiskMetrics in June 2010. Prior to this deal, RiskMetrics had already acquired KLD Research & Analytics in November 2009 and Innovest Strategic Value Advisors in February 2009. According to the company's website, MSCI is now the world's largest provider of ESG indices with over 1,500 equity and fixed income ESG Indexes. When MSCI acquired RiskMetrics, MSCI kept Innovest's Intangible Value Assessment (IVA) model as the core methodology to build the MSCI ESG Ratings and phased out the KLD assessment framework. From 2010 onward, MSCI provides KLD assessments of strengths and weaknesses from data collected for the MSCI ESG ratings (Eccles et al. 2020). As an empirical matter, Berg et al. (2022) report that the MSCI ESG ratings are highly correlated with the MSCI/KLD scores across SASB's taxonomy of sustainability dimensions.

To construct our sample, we start with the MSCI/KLD annual dataset of Environmental, Social (including community, diversity, employee relations, human rights, and product), and Governance performance indicators for publicly traded U.S. companies. Each of these quantitative issue areas includes multiple binary indicators of strengths and concerns. The strength indicators are intended to capture management best practices concerning ESG risks and opportunities. The concern indicators provide an assessment of ESG controversies involving the impact of company operations. Each indicator takes the value of 1 (0) to indicate the presence (absence) of a particular strength or concern.

The sample spans the period between 1991, the first year with MSCI/KLD coverage, and 2016, the last year for which we have access to the MSCI/KLD database. We merge the MSCI/KLD data with financial accounting data from Compustat and stock return data from CRSP. We require two years of consecutive MSCI/KLD coverage to compute the year-over-year (YoY) changes in ESG scores. We further require non-missing information about firm characteristics, including market cap (SIZE), operating profitability (OP), and YoY growth in total assets (ΔTA).

The MSCI/KLD stock universe has changed over time but throughout it has continued to include the top-500 largest U.S. firms by market cap. We start with the top-500 firms by market cap to ensure that our results are not sensitive to changes in the MSCI/KLD coverage. This choice is also consistent with the stock universe underlying the Bloomberg/SASB

indices. The Bloomberg/SASB index family includes the market index of the 500 largest U.S. companies by market cap and carve-out indices with growth, value, and dividend tilts. We use the Bloomberg/SASB index family in our external validity tests (Section 4.5). Across years, the largest 500 U.S. firms account for 91% of the aggregate market cap of the MSCI/KLD stock universe. Next, we expand the sample to include smaller firms with MSCI/KLD coverage and report consistent results using the top-500, top1000, and top-2000 firms by market cap, as well as the entire MSCI/KLD stock universe.

The annual MSCI/KLD scores are released to the public within 2-3 months after the calendar year-end. Following KSY, we form portfolios at the beginning of April of each year to account for this disclosure gap. Since we are focusing on the association of YoY changes in ESG scores and twelve-month ahead stock returns, our portfolio tests cover the period from April 1993 to March 2018. For our tests, we obtain the Fama and French factors (1993, 2015) and Carhart's (1997) momentum factor from Kenneth French's website. We obtain Pástor and Stambaugh's (2003) liquidity factor from Robert Stambaugh's website. Appendix 1 provides key variable definitions.

3.2 Mapping of SASB topics to MSCI/KLD ESG indicators

SASB's industry-specific standards identify material disclosure topics organized across five broad sustainability dimensions: (1) Environment, (2) Social Capital, (3) Human Capital, (4) Business Model & Innovation, and (5) Leadership & Governance. The sustainability dimensions include 26 general issue categories. SASB warns that while the industry standards are designed to identify material issues for the typical company in an industry, each individual company may choose to report on different sustainability issues based on their unique business model. Appendix 2 reports the general issues across SASB's five sustainability dimensions.

As illustrative examples of SASB's materiality framework, we consider the Software & IT Services industry and the Coal Operations industry. Focusing on the environmental dimension, the SASB framework identifies GHG Emissions, Water & Wastewater Management, Waste & Hazardous Materials Management, as well as Ecological Impacts as material issues for Coal Operations but not for Software & IT Services. Under the environmental dimension, the SASB framework identifies Energy Management as a material

issue for Software & IT Services but not for Coal Operations. With respect to the social and human capital dimensions, the SASB framework identifies Human Rights & Community Relations, Labor Practices, and Employee Health & Safety as material issues for Coal Operations but not for Software & IT Services. It also identifies Customer Privacy and Data Security as well as Employee Engagement Diversity & Inclusion as material issues for Software & IT Services but not as likely to impact enterprise value for the typical company within the Coal Operations industry. For more information, see the materiality finder tool available from SASB's website.

Next, we describe how we overlay the SASB material disclosure topics on the underlying indicators across MSCI/KLD quantitative issue areas. The first step is to group firms in industries. SASB groups firms in 11 sectors and 77 industries using a proprietary industry classification system known as the Sustainable Industry Classification System (SICS). SICS groups firms based on SASB's assessment of shared sustainability risks and opportunities. Due to the proprietary nature of the SICS taxonomy, we create a bridge connecting SICS to a commercially available taxonomy. We use the Global Industry Classification System (GICS) as one of the most widely used industry taxonomies. The GICS was developed by MSCI and S&P and it is used as the primary classification system in MSCI's ESG ratings methodology. We match each GICS industry to the closest SICS industry and retrieve the GICS membership of individual firms from Compustat.

The second step is to assign the general issue categories across SASB's five sustainability dimensions to the MSCI/KLD environment, social, and corporate governance areas. Appendix 3 presents the assignment of SASB general issue categories to the MSCI/KLD issue areas. The third step identifies material ESG issues for each industry using information from the corresponding SASB standards. This process separates material from immaterial MSCI/KLD strength and concern indicators by overlaying the industry-specific SASB standards. We classify MSCI/KLD issues into material and immaterial issues in consultation with the former Director of Research Projects at SASB.

Following KSY, we measure the total ESG score (TOT) for each firm-year as the sum of all strength (STR) indicators minus the sum of all concern (CON) indicators:

$$\mathrm{TOT}_{it} = \sum \mathrm{STR}_{it} - \sum \mathrm{CON}_{it}. \quad (1)$$

We then use the mapping of SASB material topics to MSCI/KLD indicators to decompose the total ESG score into material (MAT) and immaterial (IMM) components:

$$\mathrm{MAT}_{it} = \sum \mathrm{MAT}_{it}^{\mathrm{STR}} - \sum \mathrm{MAT}_{it}^{\mathrm{CON}}, \quad \text{and} \quad (2)$$

$$\mathrm{IMM}_{it} = \sum \mathrm{IMM}_{it}^{\mathrm{STR}} - \sum \mathrm{IMM}_{it}^{\mathrm{CON}}. \quad (3)$$

3.3 Frequency of ESG score changes

Table 1 provides evidence on the sources of YoY changes in the total ESG score (ΔTOT). We observe that variation in ΔTOT primarily originates from changes in the immaterial score (ΔIMM) rather than changes in the material score (ΔMAT). Table 1, Panel A, shows that while both ΔMAT and ΔIMM are centered at the median value of zero, the standard deviation of ΔIMM is 2.4 times higher than that of ΔMAT.

Table 1, Panel B, reports the frequency of positive, negative and zero score changes. Since the ESG scores only take integer values, we examine positive and negative changes in increments of one unit. The frequency of non-zero changes in the material score is 26.5%, whereas the frequency of non-zero changes in the immaterial score is nearly 2.3 times higher at 60%. The frequency of increasing (decreasing) material ESG scores is 14.4% (12.1%), whereas the frequency of increasing (decreasing) immaterial ESG scores is 31.8% (28.2%). We further observe that nearly 82% of all non-zero changes in the material ESG score are single unit changes.

Table 1, Panel C, reports the frequency of positive, negative, and zero changes across SASB sectors. Across sectors, we find consistent evidence that changes in the total ESG score are primarily due to changes in immaterial issues rather than changes in material issues. The frequencies of $\Delta\mathrm{MAT} = 0$ observations range between 62% for the Extractives sector and 85% for the Renewables & Alternative Energy sector. Table 1, Panel D, presents the scatterplots and fitted lines from regressions of ΔTOT on the ΔIMM and ΔMAT components. Whereas ΔMAT accounts for 20.3% of the variation in ΔTOT, we observe that ΔIMM explains

as much as 86.3% of the variation in ΔTOT. The evidence also shows that ΔIMM explains less than 1% of the variation in ΔMAT.

Table 1, Panel E, decomposes the frequency distribution of ΔMAT into changes in material environmental and social issues (ΔE&S), plus changes in material governance issues (ΔGOV). The evidence shows that the YoY changes in the material ESG score are almost entirely attributed to changes in material E&S issues. On a YoY basis, the frequency of zero changes in the material governance score is 97.8%. It follows that the distinction between material ESG issues and material E&S issues is inconsequential in this setting. Across material ESG issues, the most variable indicators are Climate Change, Product Quality, Employee Health & Safety, and Board of Directors-Gender Diversity.

In sum, the descriptive statistics show that variation in the total ESG score primarily originates from variation in immaterial issues rather than variation in material issues. The evidence also shows that the cross-sectional distribution of material ESG score changes is lumpy with the majority of the YoY changes falling within the $+/-1$ range.

4. EMPIRICAL TESTS AND RESULTS

4.1 Fundamental link to changes in the material ESG score

Table 2 explores the association of fundamental characteristics with subsequent increases in the material ESG score. To identify more financially established firms, we sort companies every year into portfolios based on market cap (SIZE), total asset growth (ΔTA), and operating profitability (OP), separately as well as jointly. Firms that are more established in their sector are expected to have larger size, lower asset growth, and higher operating profitability. We focus on size, growth, and profitability as key fundamental characteristics derived from standard valuation theory (Fama and French 2015) and the q-theory of investment (Hou et al. 2015). We measure characteristics at the end of year $t-1$ and examine the frequency of increases in the material ESG score from year $t-1$ to year t across portfolios.

Table 2, Panel A, reports the frequency of $\Delta MAT > 0$ across portfolios. The top (bottom) portfolio includes firms with above (below) average values of market cap, operating profitability, or asset growth in their respective sector. Consistent with our

prediction, the first three columns provide evidence that the frequency of increases in the material ESG score is higher for firms with larger size, lower asset growth, and higher operating profitability relative to their sector. The last column combines the three fundamental characteristics and separates *more financially established* companies (top portfolio), identified as companies with a *combination* of above average values of market cap and operating profitability and below average values of asset growth, from *less financially established* companies (bottom portfolio), identified as companies with a combination of below average values of market cap and operating profitability and above average values of asset growth. Examples of firms in the portfolio of more financially established companies include Apple Inc., Microsoft Corporation, Johnson & Johnson, Pfizer, Procter & Gamble, among others.

The evidence shows that the frequency of increasing material ESG scores is 1.65 times higher for more established firms (17.69%) relative to less established firms (10.71%). This frequency spread for the combination is greater than each univariate comparison. Next, we trace increases in the material ESG score back to increases in material strengths ($\Delta \text{MAT}^{\text{STR}} > 0$) and decreases in material concerns ($\Delta \text{MAT}^{\text{CON}} < 0$). Table 2, Panel B, shows that the frequency of increases in material ESG strengths is higher for firms with larger size, lower growth, and higher profitability relative to their sector. Combining characteristics, the evidence also shows that the frequency of increasing material ESG strengths is 1.6 times higher for more established firms (12.69%) relative to less established firms (7.95%). Table 2, Panel C, further shows that the frequency of decreases in material ESG concerns is 1.9 times higher for more established firms (9.71%) relative to less established firms (5.12%).

Together, the evidence shows there is a link between fundamental characteristics and subsequent changes in material ESG scores. More established firms are more likely to create material strengths and address material weaknesses in their ESG scores. To be clear, our evidence does not preclude the reverse direction whereby changes in material ESG issues can impact firm fundamentals. Notwithstanding the possibility of a bi-directional link, our evidence underscores the need to account for correlated fundamental factors before attributing stock outperformance to improving material ESG scores.

4.2 Stock performance following changes in the material ESG score

Next, we probe the link between YoY changes in material ESG scores and subsequent stock performance. Due to the lumpy distribution of ESG score changes, we form portfolios of companies with increasing material ESG scores ($\Delta MAT > 0$) and decreasing material ESG scores ($\Delta MAT < 0$). This choice ensures that the materiality portfolios are sufficiently populated. The portfolios are formed at the end of March of each year to account for the disclosure delay of the annual MSCI/KLD scores. We calculate monthly portfolio returns over the twelve-month window following the annual change in the material ESG score.

With respect to portfolio returns, KSY estimate abnormal performance as the alpha from portfolio return regressions on the market, size, book-to-market, momentum, and liquidity pricing factors. Following KSY's benchmark factor model, Table 3 reports results from the following time-series regression model:

$$R_t^p - R_t^f = \alpha + \sum \beta_\kappa F_t^k + \varepsilon_t. \qquad (4)$$

The dependent variable is the monthly return of the materiality portfolio in excess of the one-month T-bill rate ($R_t^p - R_t^f$). The vector of factors (F_t^k) includes the Fama-French (1993) market ($R_t^m - R_t^f$), size (SMB_t), and book-to-market (BTM_t) factors, the Carhart (1997) momentum factor (UMD_t), and the Pástor-Stambaugh (2003) liquidity factor (LIQ_t). With respect to the regression alpha, positive (negative) values would imply outperformance (underperformance) against the selected factors.

Within the context of KSY's benchmark factor model, Table 3 replicates that the $\Delta MAT > 0$ portfolio of companies with increasing material ESG scores is associated with a monthly alpha of 22 bps, which corresponds to annualized performance of 2.7%. Consistent with KSY, the estimated alpha for the $\Delta MAT < 0$ portfolio of companies with decreasing material ESG scores is indistinguishable from zero. With respect to the source of alpha, KSY argue that increases in a company's material ESG score contain "hidden" information about future firm performance that has not already been priced. Motivated by the fundamental link to subsequent increases in material ESG scores, an alternative explanation of the documented alpha is that it captures exposure to omitted fundamental factors and therefore evidence of stock outperformance is spurious. Our next set of results provides evidence consistent with this interpretation.

Table 4 reports time-series regression results after expanding the right-hand-side vector of equation (4) to include Fama and French's (2015) operating profitability (RMW) and investment (CMA) factors. The RMW factor is the difference between the returns on diversified portfolios of stocks with robust and weak operating profitability, and the CMA factor is the difference between the returns on diversified portfolios of the stocks of low and high total asset growth firms, which Fama-French call conservative and aggressive, respectively. The evidence shows that the portfolio of stocks with increasing material ESG scores does not generate alpha after accounting for fundamental factor exposures. The estimated monthly alphas become indistinguishable from zero. Put differently, the portfolio of companies with increasing material ESG scores does not generate abnormal returns relative to the benchmark factor model that accounts for exposure to profitability and growth factors. In the context of the widely used Fama and French (2015) five-factor model, we observe that the monthly alpha is 1bp.

As a sensitivity check, we evaluate the incremental relevance of the profitability and growth factors of HXZ. The evidence shows that the HXZ factors are not incrementally relevant for explaining variation in the materiality portfolio performance relative to the FF factors. This is consistent with the overlap between Fama-French and HXZ. Both Fama-French and HXZ measure investment as the YoY growth in total assets. Fama-French measure profitability as pretax earnings divided by book equity, while HXZ measure profitability as income before extraordinary items divided by equity. As an empirical matter, the factor correlation is 91% for growth and 73% for profitability.

Next, we expand the sample of the top-500 firms by market capitalization to include smaller firms with MSCI/KLD coverage. As we explain in Section 3, starting with the 500 largest U.S. companies by market cap has two advantages. First, it ensures that the results are not sensitive to changes in the MSCI/KLD coverage over time. Second, it ensures consistency with the stock universe underlying the Bloomberg/SASB index family that we use in the external validity tests (Section 4.5). Prior to evaluating abnormal portfolio performance, we evaluate the impact of including smaller firms on the distribution properties of material ESG score changes.

Table 5, Panel A, shows that the variability of material ESG score changes decreases as we expand the sample to include smaller firms. Evidence of decreasing variability in material ESG scores changes shows up consistently as we move from the top-500 firms to the top-1000, top-2000, and the entire MSCI universe. Table 5, Panel B, probes the frequency distribution of ΔMAT values and shows that the frequency of non-zero changes in the material ESG score drops from 26.5% for the top-500 firms to 18.8% for the entire MSCI/KLD universe. The implication is that smaller firms are less likely to experience a change in their material ESG score from one year to the next, which is consistent with evidence that larger companies have more visibility, provide more data about their ESG activities, and receive greater scrutiny from rating agencies than smaller companies (e.g., Orlitzky 2001; Drempetic et al. 2020).

Table 5, Panel C, reports the estimated Fama-French (2015) alphas for 60 combinations of the stock universe and time period. With respect to the stock universe, we consider six options, including the top-500, top1000, and top-2000 firms by market cap, as well as the entire MSCI/KLD universe before and after excluding firms operating in "sin" industries (alcohol, firearms, gambling, military, and tobacco) and non-December fiscal year-end firms. With respect to the time period, we consider five options, including the entire sample period (1992-2016), the first half (1992-2003), the second half (2004-2016), the period before MSCI's acquisition of RiskMetrics in June 2010, as well as the KSY sample period (1992-2013). When considering the KSY sample period, we further restrict the sample to include firms operating in the same 6 SICS sectors of the KSY study, including Extractives & Minerals Processing, Financials, Health Care, Technology & Communications, Services, and Transportation.

Across combinations, including the same time period, stock universe, and sectors used by KSY, the estimated alphas are indistinguishable from zero regardless of whether we use equal- or value-weighted portfolio returns. To facilitate comparisons across iterations, Table 5, Panel D, plots the cumulative distribution of the estimated alphas. The plot underscores that across all iterations the absolute values of the t-statistics are below critical values of statistical significance ranging between 0.75 and 1.25.

Overall, the evidence underscores the importance of the benchmark specification relative to which researchers evaluate stock outperformance following ESG rating changes. While we independently replicate prior evidence of material ESG alpha, our evidence shows that one should comprehensively control for fundamental determinants of expected returns before attributing stock outperformance to improving material ESG scores. The evidence offers an alternative view to the argument that changes in material ESG score contain hidden information that has not already been priced.

4.3 Fundamental portfolio vs. materiality portfolio

The evidence so far shows that the portfolio of companies with increasing material ESG scores does not generate abnormal returns against the benchmark factor model that accounts for exposure to fundamental factors. Yet, one could argue that ESG-motivated investors may still prefer the materiality portfolio if it has a higher overall ESG score relative to the benchmark. [7] To evaluate this argument, we construct a fundamental portfolio of more financially established firms in their respective sector—firms with larger size, lower growth, and higher operating profitability relative to other firms operating in the same sector. The cutoff values are based on sector-specific average values at the end of March.

Next, we compare the fundamental portfolio, which we construct without regard to ESG scores, to the materiality portfolio, which includes companies with increasing material ESG scores. We construct four variants of the fundamental portfolio and the materiality

[7] Our argument relates to a burgeoning line of research on the asset pricing implications of ESG preferences. Pástor et al. (2021) model ESG investing and show that equilibrium asset prices adjust to ESG tastes thereby pushing the market portfolio towards the portfolio desired by ESG investors. Within the context of their model, ESG tastes make the "green" firms more valuable and "brown" firms less valuable. As a result, green stocks have low expected returns whereas brown stocks have high expected returns and positive alpha. Pedersen et al. (2021) model ESG investing considering heterogeneity in how investors use ESG information and find that ESG increases or decreases the required return depending on the relative importance of each investor type. Avramov et al. (2022) derive a positive relation between expected returns and the uncertainty of ESG ratings. Related to the recent literature on impact investing, Barber et al. (2021) document that private equity investors derive non-pecuniary utility from investing in impact venture capital funds and, therefore, are willing to accept lower financial returns. Building on Heinkel et al. (2001), Berk and van Binsbergen (2021) introduce ESG and non-ESG investors and show that for impact investing to materially change prices three conditions need to be met: (a) "dirty" stocks cannot be easily substituted for "clean" stocks, (b) impact investors must make up a significant fraction of investors, and (c) dirty stocks must make up a significant fraction of the economy. Zerbib (2022) models expected returns in the presence of investors who exclude "sin" stocks from their asset universe and investors who include them yet in line with their ESG preferences.

portfolio, using the top-500, top-1000, top-2000 firms by market cap as well as the entire MSCI/KLD universe.

Table 6, Panel A, compares the fundamental portfolio to the materiality portfolio in terms of annual ESG score. Table 6, Panel B, compares the fundamental portfolio to the materiality portfolio in terms of monthly stock return performance. As we expand the sample to include smaller firms, we observe that the average ESG score decreases, which is consistent with prior evidence of a positive association between firm size and ESG scores (e.g., Drempetic et al. 2020), and the average stock return performance is increasing, which is consistent with long-standing evidence of a size effect in returns (e.g., Banz 1981). Across variants, the comparison of the means shows that the fundamental portfolio is indistinguishable from the materiality portfolio in terms of overall ESG score and monthly stock return performance. Table 6, Panel C, reports results from time-series regressions of monthly portfolio returns and shows that the fundamental portfolio accounts for more than 85% of the return variability of the materiality portfolio, which corresponds to pairwise correlations in excess of 92%. Across variants, we also observe that the estimated intercepts are indistinguishable from zero, which further confirms that the materiality portfolio does not generate abnormal returns when evaluated against the fundamental portfolio.

A key implication is that without explicitly conditioning on ESG issues, one could use a simple portfolio sort based on firm fundamentals to mimic the materiality portfolio. In simple terms, by selecting stocks based on a small set of firm characteristics—size, operating profitability, and asset growth—one could track not only the stock return performance but also the overall ESG score of the materiality portfolios without regard to MSCI/KLD ESG scores and SASB's materiality framework. The tracking ability of the fundamental portfolio casts further doubt on the argument that changes in material ESG score contain hidden information that has not already been priced.

4.4 Stock performance following "residual" changes in the material ESG score

Our analysis so far offers a fundamentals-based explanation of evidence of alpha for the portfolio of companies with increasing material ESG scores. To create finer portfolio partitions and mitigate concerns about endogeneity, KSY use a first-stage annual cross-sectional regression model of the raw values of ΔMAT on changes in firm characteristics and

fixed effects that creates a more continuous distribution of residual values. Next, we explore stock outperformance for quintile and decile portfolio partitions using the residual values of ΔMAT from KSY's first-stage regression model.

Table 7, Panel A, reports results from KSY's first-stage annual cross-sectional regressions of the YoY changes in the material ESG score on a vector of changes in firm characteristics, including changes in firm size, market-to-book, return on assets, leverage, R&D-to-sales, advertising-to-sales, and institutional ownership. The first-stage regression model provides only a poor goodness-of-fit to the actual data with an adjusted R^2 of 3.83% after the inclusion of sector fixed effects.[8]

Table 7, Panel B, shows that the distribution of residual changes is more continuous whereas the distribution of the raw changes is lumpier. Table 7, Panel C, presents the scatterplot of the residual changes (ΔMAT^{res}) on the raw changes (ΔMAT) and provides a visual illustration of their overlap. The raw changes explain 84.8% of the variation in the residual changes, which corresponds to a pairwise correlation of 92%. This large overlap implies that the first-stage orthogonalization creates a more continuous distribution of ΔMAT^{res} by smoothing the raw values of ΔMAT.

Table 8 replicates the evidence of stock outperformance within the context of KSY's benchmark factor model for the top quintile and top decile portfolios of ΔMAT^{res}. The monthly alpha for the top quintile portfolio is 25 bps, which corresponds to annualized performance of 3.0%. Turning to the top decile portfolio, the monthly alpha is 26 bps, which corresponds to annualized performance of 3.2%. Again, we find that the alphas become indistinguishable from zero after we control for portfolio exposures to Fama and French's (2015) profitability and growth factors. Our evidence implies that the residual values of ΔMAT do not contain hidden information that has not already been priced.

Overall, our analysis confirms that evidence of stock outperformance following positive values of ΔMAT^{res} is also subsumed by fundamental factor exposures. The finer

[8] We note that KSY's first-stage orthogonalization does not impact the fundamental link to subsequent increases in material ESG scores. In additional analysis, we find that more financially established firms are still significantly more likely to experience residual increases in their material ESG score in the subsequent year. More specifically, the frequency of residual increases in material ESG scores is nearly 1.7 times higher for more established firms (16.8%) relative to less established firms (9.97%).

portfolio partitions based on KSY's first-stage residuals, still do not generate abnormal returns relative to the benchmark portfolio that accounts for exposures to fundamental determinants of expected returns.

4.5 External validity: State Street's R-Factor and Bloomberg/SASB indices

In this section, we explore the implications of our fundamentals-based perspective for the performance evaluation of commercially available ESG scoring models and indices powered by the SASB standards. Our evaluation zeroes in on the performance of the Bloomberg/SASB ESG index family powered by State Street's "Responsibility Factor" or R-Factor. The analysis extends our evidence beyond the MSCI/KLD data and in this regard, it serves as an external validity test of our results.

State Street's R-Factor scores companies on material ESG performance relative to industry peers within the context of the SASB materiality mapping. The R-Factor draws metrics from four different ESG data providers that are widely used by the investment community, including Sustainalytics, ISS-ESG (formerly Oekom Research), ISS-Governance and Moody's ESG (formerly Vigeo-Eiris). State Street aggregates material ESG metrics across providers to generate a composite score (State Street Global Advisors 2020). While MSCI is one of the least correlated ESG data providers, Sustainalytics and Moody's ESG have the highest level of agreement with each other (Berg et al. 2022).

In turn, the R-Factor is the ESG scoring model powering the Bloomberg/SASB ESG index family. Since their launch on September 18, 2019, the Bloomberg/SASB indices are marketed as socially responsible benchmarks that create value for investors by tracking companies on financially material ESG issues. The index family includes the Bloomberg/SASB total market index of the 500 largest U.S. companies by market cap (XT) and carve-out indices with growth (GXT), value (VXT), and dividend (DXT) tilts. While the Bloomberg/SASB equity indices were officially launched in September 2019, historical coverage starts in April 2014. We obtain the monthly returns of the Bloomberg/SASB index family from Bloomberg. The time-series starts in April 2014, the first month in the

Bloomberg/SASB time series, and ends in October 2021, the last month for which we retrieved data from Bloomberg.[9]

Table 9 reports results from time-series regressions of the Bloomberg/SASB total index returns on the monthly stock returns of our self-constructed materiality portfolios. We consider the $\Delta MAT > 0$ portfolio, which includes companies with increasing material ESG scores, and the $\Delta MAT^{res} > 0$ portfolio, which includes companies with residual increases in the material ESG score. The evidence shows that there is a large overlap between the materiality portfolios and the Bloomberg/SASB total index. The ΔMAT^{res} portfolio explains as much as 91% of the return variability of the Bloomberg/SASB total index, which corresponds to a pairwise correlation in excess of 95%.

With respect to stock performance evaluation, Table 10, Panel A, reports results from time-series regressions of the Bloomberg/SASB total index and the carve-out indices on monthly factor returns. The evidence shows that the estimated monthly alphas are indistinguishable from zero. It follows that the Bloomberg/SASB indices, including the total index as well as the carve-out indices with value, growth, and dividend tilts, do not generate abnormal returns relative to the benchmark factor model that accounts for exposure to fundamental determinants of expected returns.

To further investigate the incremental value of scoring companies on material ESG issues, we compare each Bloomberg/SASB index to a style-matched passive index that does *not* incorporate ESG considerations. For this comparison, we use popular base indices, including the S&P 500 market index, the U.S. CRSP Large Growth, the U.S. CRSP Large Value, and the FTSE High Dividend Yield index. The base indices have investable representations in low-cost portfolios accessible to retail investors, such as ETFs offered by Vanguard.[10]

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[9] We note that on January 11, 2022, State Street announced the launch of three ETFs tracking indices from the Bloomberg/SASB family with the objective to help investors "*reinforce core allocations and incorporate ESG considerations into their portfolios*." Looking ahead, changes in ESG-based capital flows due to the introduction of indices and funds powered by the SASB standards could impact the future realized performance of stocks added to or deleted from the underlying indices (e.g., Pástor et al. 2021, 2022). If large amounts of capital flow towards stocks with high material ESG scores, it is possible that materiality portfolios may exhibit abnormal returns in the future. Importantly, our fundamentals-based perspective provides a pathway for future research on ESG portfolio performance and shareholder value creation.

[10] Focusing on Vanguard, the VOO ETF tracks the S&P 500 total market index, the VUG ETF U.S. CRSP Large Growth, the VTV ETF tracks the U.S. CRSP Large Value, and VYM ETF tracks the FTSE High Dividend Yield index. The annual expense ratios are 3 bps for the VOO, 4 bps for the VUG and the VTV, and 6 bps for the VYM.

Table 10, Panel B, shows that the Bloomberg/SASB indices are indistinguishable from the base indices in terms of average monthly returns. Table 10, Panel C, shows that the style-matched base indices explain between 95.7% and 99.3% of the variation in the corresponding Bloomberg/SASB indices. Overall, we find that the Bloomberg/SASB indices do not outperform relative to style-matched base indices that are accessible to investors through low cost ETFs. This finding corroborates our evidence that the Bloomberg/SASB indices do not generate alpha against fundamental factors. It is also consistent with our evidence that the materiality portfolio, which is based on changes in material ESG scores, and the fundamental portfolio, which is exclusively based on firm characteristics without regard to ESG scores, are indistinguishable from each other.

The performance evaluation of the Bloomberg/SASB index family serves as an external validity test for two related reasons. First, though our primary results are based on the MSCI/KLD scores, the ESG scoring model powering the Bloomberg/SASB index family blends four mainstream providers, including Sustainalytics, ISS-ESG, ISS-Governance, and Moody's ESG. ESG data providers often disagree with one another due to differences in the scope, measurement, and weights of different attributes of ESG performance (Berg et al. 2022). The idea behind relying on a blend of sources is to reduce potential biases and coverage gaps inherent in any one existing scoring methodology (State Street Global Advisors 2020). This is a suitable approach when measuring consensus ESG performance (Berg et al. 2022). In this regard, our external validity tests offer a powerful supplemental data approach that extends our evidence beyond the MSCI/KLD data. Additionally, since the Bloomberg/SASB indices have investable representations, our external validity tests speak directly to the investment community.

Second, whereas our identification of material ESG issues follows the SASB standards, the mapping to particular sustainability issues can vary across coders. The 95% correlation between our self-constructed materiality portfolio and the Bloomberg/SASB market index implies that our identification of companies with improving material ESG scores hews closely to State Street's ESG scoring model, which also integrates the SASB standards. This large overlap further implies that changes in material MSCI/KLD scores share a significant common component with changes in the material ESG scores across the data providers used

in State Street's ESG scoring model. Thus, our results are not exclusively tied to the MSCI/KLD scores or to our mapping of material ESG issues.

Viewed as a whole, the external validity tests challenge the incremental relevance of commercially available ESG scoring models in terms of uncovering hidden information that is not captured by simple fundamentals-based stock screens. We note that the playing field of ESG data providers includes several players beyond MSCI, Sustainalytics, ISS, and Moody's. Other key players are S&P Global (formerly RobecoSAM), FTSE Russell CDP, RepRisk Arabesque, Truvalue Labs, Akadia. New players are still emerging adding to the competitive intensity as all players are battling fiercely for subscription revenues from investors. [11] While ESG scoring models vary across data vendors, a key message from our study is that researchers using any ESG data source need to be attuned to the common component between ESG activities and fundamental firm characteristics. This is an important perspective that can help propel forward research on ESG investing.

5. CONCLUSION

Using SASB's materiality framework, prior research finds evidence of material ESG alpha. We replicate this finding and provide a fundamentals-based perspective on *why* firms with improving material ESG scores outperform. Embracing ESG as an endogenous construct, our basic premise is that changes in material ESG issues do not occur in a vacuum. More financially established firms—firms with larger size, lower growth, and higher profitability relative to their sector—are associated with subsequent improvements in their material ESG score. This fundamental link dictates that one should comprehensively control for correlated fundamental factors before attributing stock outperformance to improving material ESG scores.

[11] Refinitiv (formerly ASSET4) is another prominent ESG rating provider. While a popular source of ESG data, Berg et al. (2020) document widespread and repeated changes to the historical ESG scores of Refinitiv. A key finding is that the changes have in part been data-mined by Refinitiv so that firms that performed better in terms of stock returns were also ex post assigned a higher ESG score. Since State Street's R-Factor does not blend Refinitiv with other ESG data providers, this data mining issue does not impact our analysis of the Bloomberg/SASB index family. Separately, Aswani et al. (2022) raise concerns about the validity of proprietary carbon emission estimation methods used by S&P Global Trucost.

Our evidence shows that the portfolio of stocks with increasing material ESG scores earns normal returns relative to the benchmark factor model that accounts for exposure to profitability and growth factors. As an external validity test, we evaluate the performance of the Bloomberg/SASB index family powered by State Street's R-Factor, which is aligned with the SASB materiality framework and draws from alternative ESG data sources that are widely used by the investment community. These tests imply that our results are not exclusively tied to the MSCI/KLD scores or to our mapping of material ESG issues. Our evidence further shows that one could use a simple portfolio sort based on fundamental characteristics to mimic not only the average stock return performance but also the overall ESG score of the materiality portfolio. A relevant implication is that index fund managers can target an overall ESG score by simply selecting stocks on fundamental firm characteristics.

While our paper is *not* a takedown of ESG investing, our evidence questions the incremental relevance of commercially available ESG scoring models in terms of uncovering hidden information that is not captured by simple fundamentals-based stock screens. Our evidence implies that there is an opportunity to develop alternative ESG scoring models that would allow investors to access decision-useful information that goes beyond what is already captured by the corporate financial statements. On the part of ESG index providers and fund managers, our evidence underscores the need for more transparency with respect to the performance and ESG characteristics of portfolios marketed as sustainable vis-à-vis properly identified benchmark portfolios. More transparency could help ESG-motivated investors make more informed capital allocation decisions while investing in alignment with their values. In this regard, our paper relates to the ongoing policy debate surrounding funds and advisers that market themselves as having an ESG focus.[12]

[12] On May 25, 2022, the SEC proposed amendments to rules and disclosure forms to promote consistent, comparable, and reliable information for investors concerning the incorporation of ESG factors by funds and advisers (Release IA-6034). If adopted, ESG-focused funds would be required to provide more detailed information in a standardized tabular format. By providing information prominently in the same location in each fund's prospectus, the proposed amendments could improve investors' understanding of ESG investment strategies and assist them in comparing ESG-focused funds at a glance. On May 25, 2022, the SEC also proposed amendments to Rule 35d-1 under the Investment Company Act of 1940 to address materially deceptive or misleading fund names (Release IC-34593). Together, these proposals respond to the need for transparency with respect to the performance and characteristics of portfolios marketed as ESG portfolios.

At a higher level, we note that portfolio alphas measure wealth transfers across transacting investors rather than social welfare creation. Therefore, from the perspective of social planners, alpha generation is not a measure of the efficacy of the sustainability standard setting process. Perhaps the time is ripe for regulators and policy makers to evaluate the efficacy of the sustainability standard setting process and ESG reporting standardization in terms of the real impact of corporations through sustainability activities. In this regard, Bochkay et al. (2022) provide evidence that firms' voluntary adoption of SASB standards is followed by fewer work-related injuries and lower toxic releases.

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APPENDIX 1
Key Variable Definitions

MSCI/KLD Scores	
TOT	Total ESG score measured for each firm-year with MSCI/KLD coverage as the sum of all strength indicators minus the sum of all concern indicators.
MAT	Material ESG score measured for each firm-year with MSCI/KLD coverage as the sum of material strength indicators minus the sum of material concern indicators. We identify material strengths and concerns using the SASB industry-specific standards.
IMM	Immaterial ESG score measured for each firm-year with MSCI/KLD coverage as the sum of immaterial strength indicators minus the sum of immaterial concern indicators. We identify immaterial strengths and concerns using the SASB industry-specific standards.
ΔTOT	Year-over-year change in total ESG score.
ΔMAT	Year-over-year change in material ESG score.
ΔIMM	Year-over-year change in immaterial ESG score.

Firm Characteristics	
Return	Monthly stock return including distributions.
SIZE	End-of-year *ln* market capitalization.
OP	Operating profitability measured as pretax earnings divided by book equity.
ΔTA	Investment measured as the year-over-year growth in the balance sheet value of total assets.

Pricing Factors	
Rm−Rf	Monthly market return in excess of the one-month T-bill rate.
SMB	Fama and French's (1993) small-minus-big size factor.
HML	Fama and French's (1993) high-minus-low book-to-market factor.
RMW	Fama and French's (2015) robust-minus-weak operating profitability factor.
CMA	Fama and French's (2015) conservative-minus-aggressive asset growth (investment) factor.
UMD	Carhart's (1997) momentum factor.
LIQ	Pástor and Stambaugh's (2003) liquidity factor.

APPENDIX 2
SASB General Sustainability Issues Across Sustainability Dimensions

Sustainability Dimension	Description	General Sustainability Issue
Environment (6 issues)	The Environment dimension includes environmental impacts, either through the use of nonrenewable, natural resources as inputs to the factors of production or through harmful releases into the environment that may result in impacts to the company's financial condition or operating performance.	GHG Emissions Air Quality Energy Management Water & Wastewater Management Waste & Hazardous Materials Management Ecological Impacts
Social Capital (7 issues)	The Social Capital dimension relates to the expectation that a business will contribute to society in return for a social license to operate. It addresses the management of relationships with key outside parties, such as customers, local communities, the public, and the government. It includes issues related to human rights, protection of vulnerable groups, local economic development, access to and quality of products and services, affordability, responsible business practices in marketing, and customer privacy.	Human Rights & Community Relations Customer Privacy Data Security Access & Affordability Product Quality & Safety Customer Welfare Selling Practices & Product Labeling
Human Capital (3 issues)	The Human Capital dimension addresses the management of a company's human resources (employees and individual contractors) as key assets to delivering long-term value. It includes issues that affect the productivity of employees, management of labor relations, and management of the health and safety of employees and the ability to create a safety culture.	Labor Practices Employee Health & Safety Employee Engagement, Diversity & Inclusion
Business Model & Innovation (5 issues)	The Business Model & Innovation dimension addresses the integration of environmental, human, and social issues in a company's value-creation process, including resource recovery and other innovations in the production process; as well as in product innovation, including efficiency and responsibility in the design, use phase, and disposal of products	Product Design & Lifecycle Management Business Model Resilience Supply Chain Management Materials Sourcing & Efficiency Physical Impacts of Climate Change
Leadership & Governance (5 issues)	The Leadership & Governance dimension involves the management of issues that are inherent to the business model or common practice in the industry and that are in potential conflict with the interest of broader stakeholder groups, and therefore create a potential liability or a limitation or removal of a license to operate. This includes regulatory compliance, risk management, safety management, supply-chain and materials sourcing, conflicts of interest, anticompetitive behavior, and corruption and bribery.	Business Ethics Competitive Behavior Management of the Legal & Regulatory Environment Critical Incident Risk Management Systemic Risk Management

APPENDIX 3
SASB General Sustainability Issues and MSCI/KLD Issue Areas

SASB		MSCI/KLD Qualitative Issue Areas		
Sustainability Dimension	**General Sustainability Issue**	**Environment**	**Social**	**Governance**
Environment (6 issues)	GHG Emissions			
	Air Quality			
	Energy Management			
	Water & Wastewater Management			
	Waste & Hazardous Materials Management			
	Ecological Impacts			
Social Capital (7 issues)	Human Rights & Community Relations			
	Customer Privacy			
	Data Security			
	Access & Affordability			
	Product Quality & Safety			
	Customer Welfare			
	Selling Practices & Product Labeling			
Human Capital (3 issues)	Labor Practices			
	Employee Health & Safety			
	Employee Engagement, Diversity & Inclusion			
Business Model & Innovation (5 issues)	Product Design & Lifecycle Management			
	Business Model Resilience			
	Supply Chain Management			
	Materials Sourcing & Efficiency			
	Physical Impacts of Climate Change			
Leadership & Governance (5 issues)	Business Ethics			
	Competitive Behavior			
	Management of the Legal & Regulatory Environment			
	Critical Incident Risk Management			
	Systemic Risk Management			

TABLE 1
Frequency of ESG Score Changes

Panel A: Descriptive statistics.

	Mean	Std. Dev.	P1	P25	P50	P75	P99
ΔTOT	0.14	1.87	-5.00	-1.00	0.00	1.00	6.00
ΔMAT	0.05	0.70	-2.00	0.00	0.00	0.00	2.00
ΔIMM	0.10	1.68	-5.00	-1.00	0.00	1.00	5.00

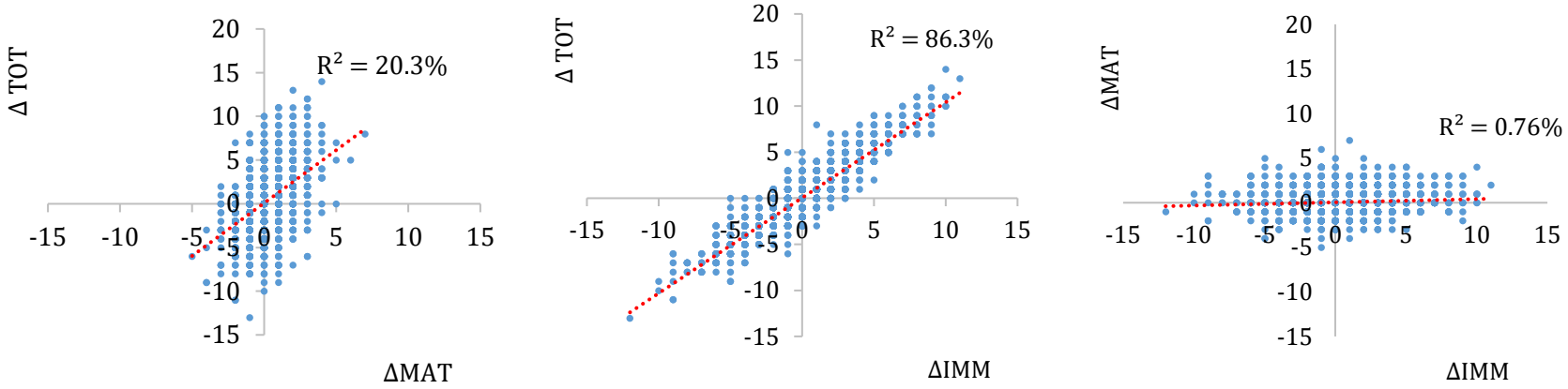
Panel B: Frequency of positive, negative, and zero ESG score changes.

	Frequency Distribution						
	< -2	-2	-1	0	$+1$	$+2$	$> +2$
ΔTOT	5.5%	6.9%	17.4%	36.4%	17.9%	8.3%	7.6%
ΔMAT	0.2%	1.4%	10.5%	73.5%	11.1%	2.5%	0.8%
ΔIMM	4.6%	6.2%	17.4%	40.0%	18.3%	7.4%	6.1%

Panel C: Frequency of ESG score changes across SASB sectors.

	Total Score			Material Score			Immaterial Score		
SASB Sectors	$\Delta < 0$	$\Delta = 0$	$\Delta > 0$	$\Delta < 0$	$\Delta = 0$	$\Delta > 0$	$\Delta < 0$	$\Delta = 0$	$\Delta > 0$
Consumer Goods	29%	39%	32%	10%	81%	9%	27%	41%	31%
Extractives & Minerals Processing	35%	32%	33%	19%	62%	19%	32%	37%	31%
Financials	28%	36%	36%	10%	78%	12%	27%	41%	33%
Food & Beverage	31%	34%	35%	10%	77%	13%	30%	37%	33%
Health Care	28%	37%	34%	12%	72%	15%	27%	41%	32%
Infrastructure	28%	38%	33%	16%	68%	17%	26%	43%	31%
Renewables & Alternative Energy	36%	38%	25%	7%	85%	7%	31%	49%	20%
Resource Transformation	30%	37%	34%	11%	75%	14%	28%	39%	32%
Services	32%	36%	32%	10%	79%	11%	30%	39%	31%
Tech & Communications	29%	36%	35%	11%	72%	17%	28%	40%	32%
Transportation	30%	37%	32%	13%	72%	14%	30%	39%	31%
Pooled	29.8%	36.4%	33.8%	12.1%	73.5%	14.4%	28.2%	40.0%	31.8%

Panel D: Scatterplot of total index changes on material and immaterial index changes.



Panel E: Frequency distribution of ΔMAT components.

	Frequency Distribution of ΔMAT components						
	< -2	-2	-1	0	$+1$	$+2$	$> +2$
ΔE&S	0.2%	1.3%	10.4%	74.1%	10.9%	2.4%	0.7%
ΔGOV	0.0%	0.1%	0.8%	97.8%	1.2%	0.1%	0.0%

This table provides information about the sources of YoY changes in the total ESG score (ΔTOT). The evidence shows that variation in ΔTOT primarily originates from changes in the immaterial score (ΔIMM) rather than changes in the material score (ΔMAT). Panel A reports pooled descriptive statistics. Panel B reports the frequency of positive, negative, and zero ESG score changes. Panel C reports the frequency of ESG score changes across SASB's SICS sector. Panel D presents the scatterplots and fitted lines from regressions of (a) ΔTOT on ΔMAT, (b) ΔTOT on ΔIMM, and (c) ΔMAT on ΔIMM. Panel E decomposes the frequency distribution of ΔMAT into changes in material environmental and social issues (ΔE&S), plus changes in material governance issues (ΔGOV). The sample includes 12,500 firm-year observations between 1992 and 2016 for the top-500 largest U.S. firms with MSCI/KLD coverage.

TABLE 2
Fundamental Link to Changes in Material ESG Scores

Panel A: Frequency of increases in material ESG score.

	Portfolio frequency of $\Delta MAT_{it} > 0$			
	$SIZE_{it-1}$	OP_{it-1}	ΔTA_{it-1}	$COMBO_{it-1}$
Top	0.1654	0.1522	0.1259	0.1769
Bottom	0.1231	0.1353	0.1511	0.1071
Spread	0.0422***	0.0169***	-0.0253***	0.0698***
t-stat	(6.55)	(2.59)	(-3.88)	(5.74)

Panel B: Frequency of increases in material ESG strengths.

	Portfolio frequency of $\Delta MAT_{it}^{STR} > 0$			
	$SIZE_{it-1}$	OP_{it-1}	ΔTA_{it-1}	$COMBO_{it-1}$
Top	0.1139	0.1080	0.0885	0.1269
Bottom	0.0886	0.0946	0.1063	0.0795
Spread	0.0253***	0.0134**	-0.0178***	0.0475***
t-stat	(4.57)	(2.39)	(-3.19)	(4.47)

Panel C: Frequency of decreases in material ESG concerns.

	Portfolio frequency of $\Delta MAT_{it}^{CON} < 0$			
	$SIZE_{it-1}$	OP_{it-1}	ΔTA_{it-1}	$COMBO_{it-1}$
Top	0.093	0.0821	0.0677	0.0971
Bottom	0.0595	0.0696	0.0785	0.0512
Spread	0.0335***	0.0125**	-0.0108**	0.0459***
t-stat	(6.85)	(2.54)	(-2.20)	(5.03)

This table reports the frequency of changes in material ESG score across partitions based on fundamental firm characteristics. The top (bottom) partitions include firms with above (below) average values of market cap (SIZE), operating profitability (OP), or asset growth (ΔTA) in their respective sector. The last column separates more financially established companies (top portfolio), identified as companies with a combination of above average values of market cap and operating profitability and below average values of asset growth, from less financially established companies (bottom portfolio), identified as companies with a combination of below average values of market cap and operating profitability and above average values of asset growth. The sample includes 12,500 firm-year observations between 1992 and 2016 for the top-500 largest U.S. firms with MSCI/KLD coverage. We cluster standard errors by firm and year. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.

TABLE 3
Changes in Material ESG Scores and Future Stock Outperformance

	Dependent Variable $= R_t^p - R_t^f$	
Portfolio:	$\Delta(MAT) > 0$	$\Delta(MAT) < 0$
	(1)	(2)
Intercept	0.22**	0.10
	(2.21)	(0.89)
$R_t^m - R_t^f$	0.93***	0.90***
	(36.81)	(30.14)
SMB_t	0.05	0.01
	(1.46)	(0.35)
HML_t	0.17***	0.35***
	(5.35)	(9.02)
UMD_t	-0.15***	-0.07***
	(-7.37)	(-2.86)
LIQ_t	0.05***	0.03*
	(2.99)	(1.83)
Adj. R^2	87.9%	81.6%

This table reports results from time-series regressions of monthly materiality portfolio returns in excess of the one-month T-bill rate. The right-hand-side vector includes Fama and French's (1993) market ($R^m - R^f$), size (SMB), and book-to-market (BTM) factors, together with Carhart's (1997) momentum factor (UMD), and Pástor and Stambaugh's (2003) liquidity (LIQ) factor. We form portfolios at the end of March of each year to account for the disclosure delay of the annual MSCI/KLD scores. We require a minimum of ten stocks per portfolio on the formation date. We focus on monthly return performance over the twelve-month window following YoY increases ($\Delta MAT>0$) and decreases ($\Delta MAT<0$) in the material ESG score. The time-series of monthly returns includes 300 observations between the beginning of April 1993, and the end of March 2018. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.

TABLE 4
Accounting for Exposure to Fundamental Factors

	Dependent Variable $= R_t^{\Delta(MAT)>0} - R_t^f$				
	(1)	(2)	(3)	(4)	(5)
Intercept	0.22**	0.09	0.09	0.01	0.01
	(2.21)	(0.97)	(0.97)	(0.05)	(0.05)
$R_t^m - R_t^f$	0.93***	1.00***	1.00***	1.06***	1.07***
	(36.81)	(35.73)	(35.74)	(34.74)	(34.78)
SMB_t	0.05	0.09***	0.09***	0.07*	0.07*
	(1.46)	(2.69)	(2.74)	(1.74)	(1.80)
HML_t	0.17***	0.01	0.01	0.12**	0.12**
	(5.35)	(0.19)	(0.17)	(2.39)	(2.35)
RMW_t	.	0.17***	0.18***	0.14***	0.14***
		(3.78)	(3.83)	(2.71)	(2.77)
CMA_t	.	0.25***	0.25***	0.18***	0.19***
		(4.11)	(4.14)	(2.67)	(2.72)
UMD_t	-0.15***	-0.16***	-0.16***	.	.
	(-7.37)	(-8.31)	(-8.26)		
LIQ_t	0.05***	0.05***	0.05***	.	.
	(2.99)	(3.29)	(3.27)		
HXZ_t^{roe}	.	.	-0.07	.	-0.09
			(-1.17)		(-1.21)
HXZ_t^g	.	.	0.10	.	0.13
			(0.84)		(0.94)
Adj. R^2	87.9%	88.9%	88.9%	85.6%	85.6%

This table reports results from time-series regressions of monthly materiality portfolio returns in excess of the one-month T-bill rate. The materiality portfolio includes companies with increasing material ESG scores. The right-hand-side vector includes Fama and French's (1993, 2015) market ($R^m - R^f$), size (SMB), book-to-market (BTM), operating profitability (RMW), and asset growth (CMA) factors, together with Carhart's (1997) momentum factor (UMD), Pástor and Stambaugh's (2003) liquidity (LIQ) factor, as well as the Hou, Xue, and Zhang (2015) profitability (HXZ^{roe}) and growth (HXZ^g) factors. The HXZ factors are orthogonalized with respect to the FF factors. We form portfolios at the end of March of each year based on the sign of the YoY change in the material ESG score. We require a minimum of ten stocks per portfolio on the formation date. We focus on monthly return performance over the twelve-month window following YoY increases in the material ESG score ($\Delta MAT>0$). The time-series of monthly returns includes 300 observations between the beginning of April 1993, and the end of March 2018. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.

TABLE 5
Expanding the Stock Universe

Panel A: Descriptive statistics.

	Descriptive Statistics of ΔMAT						
	Mean	Std. Dev.	P1	P25	P50	P75	P99
Top-500	0.05	0.70	-2.00	0.00	0.00	0.00	2.00
Top-1000	0.04	0.64	-2.00	0.00	0.00	0.00	2.00
Top-2000	0.04	0.56	-1.00	0.00	0.00	0.00	2.00
Universe	0.03	0.55	-1.00	0.00	0.00	0.00	2.00

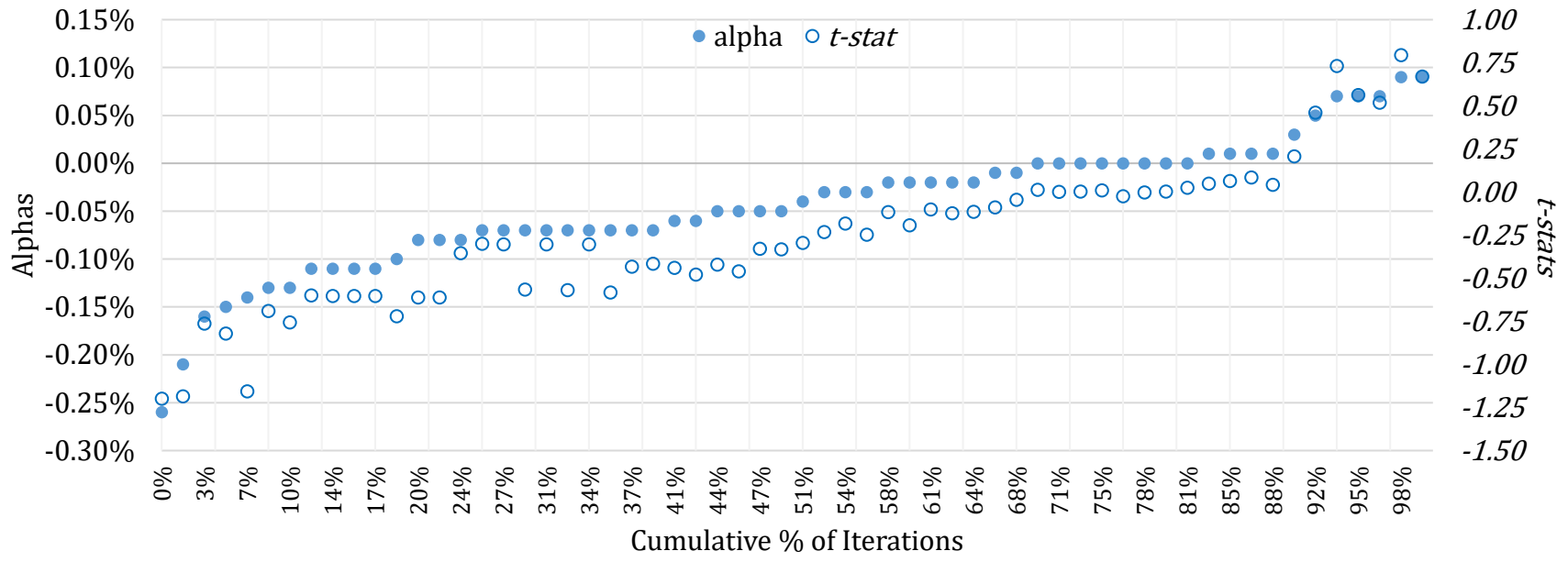
Panel B: Frequency of positive, negative, and zero material ESG score changes.

	Frequency Distribution of ΔMAT						
	< -2	-2	-1	0	$+1$	$+2$	$> +2$
Top-500	0.2%	1.4%	10.5%	73.5%	11.1%	2.5%	0.8%
Top-1000	0.2%	1.1%	9.2%	76.7%	10.2%	2.0%	0.6%
Top-2000	0.1%	0.9%	7.7%	80.2%	9.3%	1.5%	0.4%
Universe	0.1%	0.9%	7.3%	81.2%	8.8%	1.3%	0.4%

Panel C: Estimated alphas across materiality portfolios.

	Materiality Portfolio Alphas									
	Full Period		First Half		Second Half		Pre-June 2010		KSY Time & Sectors	
	EW	VW	EW	VW	EW	VW	EW	VW	EW	VW
Top-500	0.01	-0.10	-0.11	-0.07	0.09	-0.01	0.00	0.00	0.03	-0.02
	(0.05)	(-0.72)	(-0.60)	(-0.30)	(0.79)	(-0.09)	(0.01)	(0.00)	(0.21)	(-0.12)
Top-1000	-0.02	-0.08	-0.11	-0.07	0.07	0.01	-0.02	0.00	0.01	-0.02
	(-0.19)	(-0.61)	(-0.60)	(-0.30)	(0.73)	(0.06)	(-0.12)	(0.00)	(0.08)	(-0.10)
Top-2000	-0.05	-0.07	-0.11	-0.07	0.05	-0.01	-0.04	0.00	-0.03	-0.02
	(-0.42)	(-0.57)	(-0.60)	(-0.30)	(0.46)	(-0.04)	(-0.30)	(0.01)	(-0.23)	(-0.11)
Universe	-0.05	-0.07	-0.11	-0.07	0.07	0.00	-0.05	0.00	-0.05	0.00
	(-0.46)	(-0.57)	(-0.60)	(-0.30)	(0.56)	(-0.02)	(-0.33)	(0.00)	(-0.33)	(-0.00)
Excl. Sin	-0.07	-0.08	-0.13	-0.08	0.07	0.00	-0.07	-0.03	-0.06	0.01
	(-0.58)	(-0.61)	(-0.69)	(-0.35)	(0.52)	(0.02)	(-0.43)	(-0.18)	(-0.44)	(0.04)
Dec. FYE	-0.06	-0.14	-0.16	-0.26	0.09	-0.03	-0.07	-0.13	-0.15	-0.21
	(-0.48)	(-1.16)	(-0.76)	(-1.20)	(0.67)	(-0.25)	(-0.42)	(-0.76)	(-0.82)	(-1.18)

Panel D: Distribution of estimated alphas.



This table evaluates the impact of including smaller firms on the characteristics and performance of the materiality portfolio. Panel A reports pooled descriptive statistics of the YoY changes in the material ESG score (ΔMAT) for the top-500, top1000, and top-2000 firms by market cap, as well as the entire MSCI/KLD universe. Panel B reports the frequency of positive, negative, and zero material ESG score changes for each sample. Panel C reports the estimated Fama-French (2015) alphas for 60 variants of the materiality portfolio based on different combinations for the stock universe and time period. The materiality portfolio includes companies with increasing material ESG scores. With respect to the stock universe, we consider six options, including the top-500, top1000, and top-2000 firms by market cap as well as the entire MSCI/KLD universe before and after excluding firms operating in "sin" industries (alcohol, firearms, gambling, military, and tobacco) and non-December fiscal year-end firms. With respect to the time period, we consider five options, including the entire sample period (1992-2016), the first half (1992-2003), the second half (2004-2016), the period before MSCI's acquisition of RiskMetrics in June 2010, as well as the KSY sample period (1992-2013). When considering the KSY sample period, we further restrict the sample to include firms operating in the same 6 SICS sectors of the KSY study, including Extractives & Minerals Processing, Financials, Health Care, Technology & Communications, Services, and Transportation. Panel D plots the cumulative distribution of the estimated Fama-French (2015) alphas (left vertical axis) and corresponding t-stats (right vertical axis) across the 60 variants of the materiality portfolio. We form portfolios at the end of March of each year based on the sign of the YoY change in the material ESG score. We require a minimum of ten stocks per portfolio on the formation date. We focus on monthly return performance over the twelve-month window following YoY increases in the material ESG score (ΔMAT>0). The time-series of monthly returns includes 300 observations between the beginning of April 1993, and the end of March 2018. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.

TABLE 6
Fundamental Portfolio vs. Materiality Portfolio

Panel A: ESG score portfolio comparison.

Comparison of ESG Scores				
$\Delta MAT > 0$ Portfolios		Fundamental Portfolio	Spread	t-stat
Top-500	1.30	1.32	-0.02	-0.04
Top-1000	1.08	1.06	0.02	0.06
Top-2000	0.85	0.58	0.27	0.96
Universe	0.83	0.51	0.32	1.19

Panel B: Monthly stock return portfolio comparison.

Comparison of Monthly Stock Returns (%)				
$\Delta MAT > 0$ Portfolios		Fundamental Portfolio	Spread	t-stat
Top-500	0.98	0.98	0.00	0.00
Top-1000	0.99	1.04	-0.05	-0.13
Top-2000	1.04	1.08	-0.04	-0.10
Universe	1.06	1.09	-0.03	-0.08

Panel C: Monthly stock return regressions.

	Dependent Variable = Monthly Stock Returns of $\Delta MAT > 0$ Portfolios (%)			
Portfolio:	Top-500	Top-1000	Top-2000	Universe
Intercept	-0.05	-0.09	-0.13	-0.13
	(-0.49)	(-0.93)	(-1.21)	(-1.19)
$R_t^{Fundamental}$	1.08***	1.07***	1.09***	1.09***
	(40.06)	(44.04)	(42.59)	(43.34)
Adj. R^2	85.4%	87.1%	85.8%	86.3%

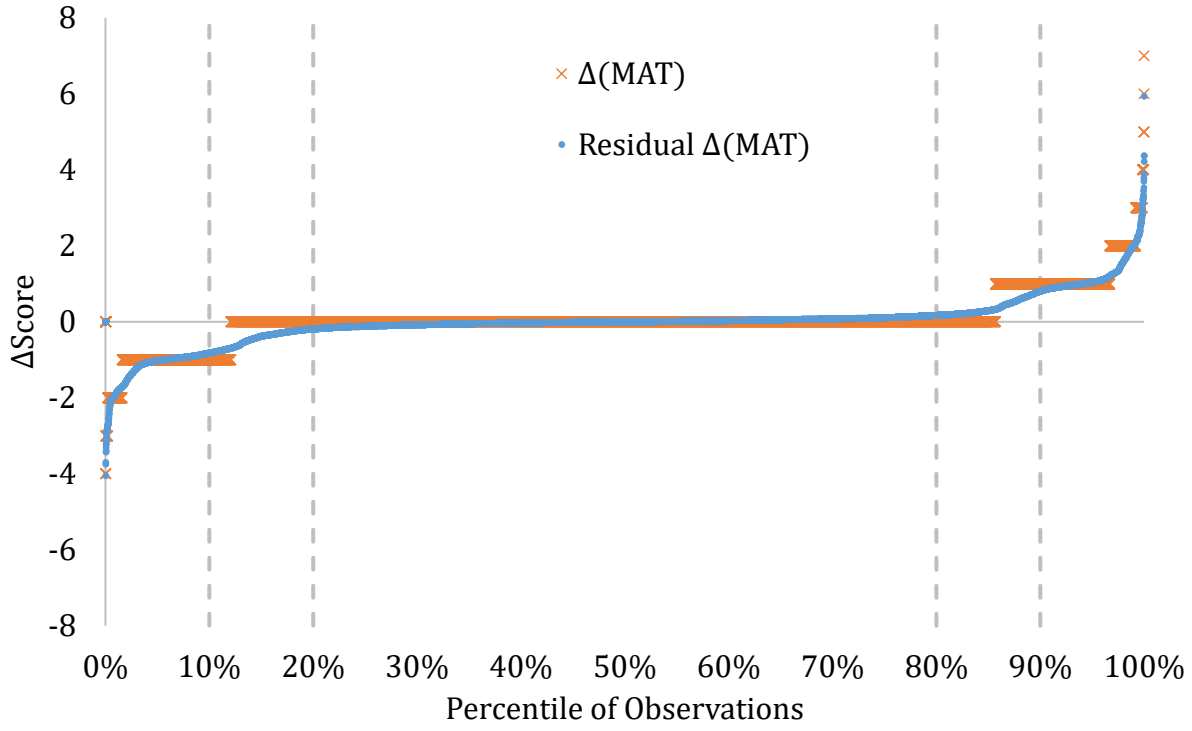
This table compares the fundamental portfolio, which we construct without regard to ESG scores, to the materiality ($\Delta MAT > 0$) portfolio, which includes companies with increasing material ESG scores. We construct four variants of the fundamental portfolio and the materiality portfolio, using the top-500, top-1000, top-2000 firms by market cap, as well as the entire MSCI/KLD universe. The fundamental portfolio includes more financially established firms defined as firms with larger size, lower asset growth, and higher profitability relative to their sector. The cutoff values are based on sector-specific average values at the end of each March. Panel A compares the fundamental portfolio to the materiality portfolio in terms of annual ESG score. Panel B compares the fundamental portfolio to the materiality portfolio in terms of monthly return performance. Panels C reports results from time-series regressions of the monthly materiality portfolio returns on the monthly fundamental portfolio returns. The time-series includes 300 months between the beginning of April 1993, and the end of March 2018. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.

TABLE 7
Residual vs. Raw Material ESG Score Changes

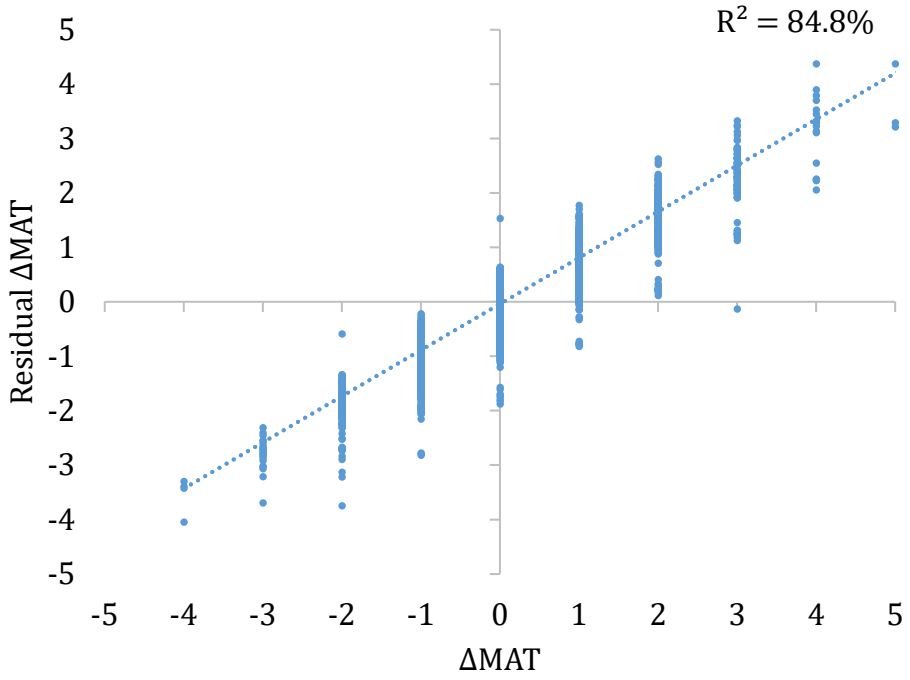
Panel A: First-stage regression results.

	Dependent Variable= ΔMAT_{it}	
	(1)	(2)
$\Delta SIZE_{it}$	-0.0574	-0.0326
	(-1.37)	(-1.14)
ΔMTB_{it}	0.0049	0.0072
	(1.01)	(1.31)
ΔROA_{it}	-0.3170**	-0.1583
	(-2.16)	(-1.23)
ΔLEV_{it}	-0.0686	-0.1044
	(-0.58)	(-0.92)
$\Delta R\&D_{it}$	0.1011	0.2401
	(0.32)	(0.70)
ΔADV_{it}	1.7235	2.5365*
	(1.53)	(1.83)
ΔIO_{it}	0.0000	-0.0005
	(-0.05)	(-0.55)
Sector FE	No	Yes
Adj. R^2	0.17%	3.83%

Panel B: Distribution of raw and residual changes in material ESG scores.



Panel C: Scatterplots of residual on raw ESG score changes.



Panel A of this table reports the time-series averages of the estimated coefficients from the annual cross-sectional regressions of the YoY changes in the material ESG score on changes in *ln* market cap (ΔSIZE), market-to-book (ΔMTB), return on assets (ΔROA), leverage (ΔLEV), R&D-to-sales (ΔR&D), advertising-to-sales (ΔADV), and institutional ownership (ΔIO), and sector fixed effects using SASB's SICS sector memberships. Panel B plots the cumulative distributions and shows that the distribution of residual changes is more continuous whereas the distribution of the raw changes is lumpier. Panel C presents the scatterplot of the residual changes (ΔMAT^{res}) on the raw changes (ΔMAT) and provides a visual illustration of their overlap. The sample includes 12,500 firm-year observations between 1992 and 2016 for the top-500 largest U.S. firms with MSCI/KLD coverage.

TABLE 8
Residual Increases in Material ESG Scores and Future Stock Outperformance

	Dependent Variable $= R_t^p - R_t^f$					
Portfolio:	Top Quintile of $\Delta(MAT)^{res}$			Top Decile of $\Delta(MAT)^{res}$		
	(1)	(2)	(3)	(1)	(2)	(3)
Intercept	0.25***	0.06	-0.01	0.26**	0.08	0.02
	(2.62)	(0.71)	(-0.15)	(2.42)	(0.75)	(0.23)
$R_t^m - R_t^f$	0.92***	1.02***	1.07***	0.91***	1.01***	1.04***
	(38.56)	(40.91)	(40.03)	(33.30)	(34.44)	(35.56)
SMB_t	0.06**	0.14***	0.12***	0.08**	0.16***	0.15***
	(2.09)	(4.54)	(3.36)	(2.38)	(4.50)	(3.86)
HML_t	0.33***	0.12***	0.22***	0.32***	0.11**	0.18***
	(10.43)	(2.88)	(4.93)	(8.83)	(2.37)	(3.83)
RMW_t	.	0.28***	0.25***	.	0.29***	0.26***
		(6.72)	(5.30)		(5.85)	(5.16)
CMA_t	.	0.28***	0.22***	.	0.26***	0.21***
		(4.96)	(3.49)		(3.93)	(3.13)
UMD_t	-0.13***	-0.15***	.	-0.08***	-0.11***	.
	(-6.38)	(-8.11)		(-3.66)	(-4.87)	
LIQ_t	0.02	0.03*	.	0.02	0.03	.
	(1.60)	(1.89)		(1.40)	(1.58)	
Adj. R^2	87.6%	89.7%	87.3%	83.6%	85.6%	84.4%

This table reports results from time-series regressions of monthly materiality portfolio returns in excess of the one-month T-bill rate. The right-hand-side vector includes Fama and French's (1993, 2015) market ($R^m - R^f$), size (SMB), book-to-market (BTM), operating profitability (RMW) and asset growth (CMA) factors, together with Carhart's (1997) momentum factor (UMD), and Pástor and Stambaugh's (2003) liquidity (LIQ) factor. We form portfolios at the end of March of each year based on the residual values from a first-stage regression of the YoY changes in the material ESG score on changes in firm size, market-to-book, return on assets, leverage, R&D-to-sales, advertising-to-sales, and institutional ownership. We require a minimum of ten stocks per portfolio on the formation date. We focus on monthly return performance over the twelve-month window following residual values in the top quintile and top decile of ΔMAT^{res}. The time-series of monthly returns includes 300 observations between the beginning of April 1993, and the end of March 2018. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.

TABLE 9
Bloomberg/SASB Indices:
Overlap with Materiality Portfolios

	Dependent Variable $= R_t^{\text{Bloomberg SASB Total}}$	
	(1)	(2)
Intercept	0.17	0.19
	(1.11)	(1.52)
$R_t^{\Delta MAT>0}$	0.84^{***}	.
	(17.49)	
$R_t^{\Delta MAT^{res}>0}$	.	0.89^{***}
		(22.31)
Adj. R^2	86.6%	91.4%

This table reports results from time-series regressions of the Bloomberg/SASB total market index returns on the monthly stock returns of our self-constructed materiality portfolios. We consider the $\Delta MAT > 0$ portfolio, which includes companies with increasing material ESG scores, and the $\Delta MAT^{res} > 0$ portfolio, which includes companies with residual increases in the material ESG score. We obtain the residual values from a first-stage regression of ΔMAT on changes in firm size, market-to-book, return on assets, leverage, R&D-to-sales, advertising-to-sales, and institutional ownership. The time-series includes 48 monthly observations between April 2014, the first month in the Bloomberg/SASB time series, and March 2018, the last month for which we have monthly returns for the materiality portfolios. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.

TABLE 10
Bloomberg/SASB Index Performance

Panel A: Bloomberg/SASB index performance against asset pricing factors.

	Dependent Variable $= R_t^{\text{Bloomberg SASB}} - R_t^f$			
Index:	Total	Growth	Value	Dividend
	(1)	(2)	(3)	(4)
Intercept	0.05	0.08	0.05	-0.02
	(1.21)	(1.12)	(0.53)	(-0.14)
$R_t^m - R_t^f$	0.98***	1.03***	0.91***	0.84***
	(82.69)	(51.17)	(37.05)	(21.00)
SMB_t	-0.12***	-0.12***	-0.10**	-0.07
	(-6.42)	(-3.81)	(-2.43)	(-1.10)
HML_t	-0.01	-0.22***	0.28***	0.19***
	(-0.84)	(-7.64)	(7.86)	(3.26)
RMW_t	0.06**	0.12**	-0.02	0.12
	(2.09)	(2.49)	(-0.32)	(1.28)
CMA_t	0.06**	-0.02	0.06	0.26***
	(2.01)	(-0.44)	(1.08)	(2.67)
UMD_t	-0.01	0.06***	-0.09***	-0.16***
	(-0.71)	(2.77)	(-3.27)	(-3.51)
LIQ_t	0.00	0.02	-0.03	0.01
	(0.11)	(1.62)	(-1.39)	(0.25)
Adj. R^2	99.1%	97.7%	96.5%	90.5%

Panel B: Comparison of Bloomberg/SASB indices to style-matched base indices.

	Monthly Returns (in %)			
	Total	Growth	Value	Dividend
Bloomberg/SASB Index	1.30	1.55	1.00	0.91
Style-Matched Base Index	1.24	1.54	0.97	0.93
Spread	0.06	0.01	0.04	-0.02
	(1.61)	(0.21)	(0.85)	(-0.22)

Panel C: Bloomberg/SASB indices against style-matched base indices.

	Dependent Variable $= R_t^{\text{Bloomberg SASB}}$			
Index:	Total	Growth	Value	Dividend
	(1)	(2)	(3)	(4)
Intercept	0.06	0.08	0.02	-0.07
	(1.58)	(1.60)	(0.35)	(-0.81)
$R_t^{\text{Base Index}}$	1.00***	0.95***	1.02***	1.06***
	(109.13)	(86.28)	(95.64)	(44.97)
Adj. R^2	99.3%	98.8%	99.0%	95.7%

Panel A reports results from time-series regressions of the Bloomberg/SASB total index and the carve-out indices with growth, value, and divided tilts, on monthly factor returns. The factor vector includes Fama and French's (1993, 2015) market ($R^m - R^f$), size (SMB), book-to-market (BTM), operating profitability (RMW), and asset growth (CMA) factors, together with Carhart's (1997) momentum factor (UMD), and Pástor and Stambaugh's (2003) liquidity (LIQ) factor. Panel B compares the monthly return performance of the Bloomberg/SASB index family against style-matched passive indices that do not incorporate ESG considerations, including the S&P 500 market index, the U.S. CRSP Large Growth, the U.S. CRSP Large Value, and the FTSE High Dividend Yield index. Panel C reports results from time series of the Bloomberg/SASB indices on the style-matched base indices. The time-series includes 91 monthly observations between April 2014, the first month in the Bloomberg/SASB time series, and October 2021, the last month for which we retrieved data from the Bloomberg terminal. We report t-statistics in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests.