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Does Active Management Matter in ESG Investing?

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Abstract

Purpose: This paper examines the impact of Environmental, Social, and Governance (ESG) screening on investment strategies, with a focus on how active and passive ESG approaches influence mutual funds' risk exposures, return characteristics, and portfolio composition.

Methodology: The analysis relies on the CRSP U.S. stock database covering the period 2013–2021 to assess mutual funds' exposure to standard asset-pricing risk factors. Two ESG approaches are implemented: an active ESG investment strategy based on ESG scores and a passive ESG screening strategy that excludes firms failing ESG criteria. Factor loadings, return profiles, and volatility measures are used to compare ESG and non-ESG portfolios across firm size segments.

Findings: The results show that, under active ESG strategies, high-ESG funds exhibit distinct factor-loading profiles relative to low-ESG funds, characterized by lower returns, reduced volatility, lower market beta exposure, and a tilt toward larger, value-oriented, and higher-quality firms. Funds with stronger social and governance scores demonstrate higher exposure to the quality factor. In contrast, passive ESG screening disproportionately excludes small-cap investment opportunities, leading to reduced diversification and higher risk in the small-cap universe, while the large-cap universe preserves most portfolio characteristics observed under active ESG strategies, except for quality exposure.

Unique Contribution to Theory, Practice and Policy: This study contributes to the ESG investment literature by jointly comparing active and passive ESG strategies within a unified factor-based framework. It provides practical insights for asset managers on the diversification and risk implications of ESG implementation choices and offers policy-relevant evidence on how ESG screening criteria may unintentionally constrain capital allocation to small-cap firms.

Keywords: *ESG investing, Asset Allocation of Mutual Funds, Corporate Social Responsibility, Factor Model, ESG Exposure*

JEL Codes : *G11, G12, G23*

1 Introduction

ESG stands for Environmental, Social, and Governance. ESG issues are difficult to measure in monetary terms, and yet, affect investments risk-return at times, decisively. Environmental issues can have a direct impact on the company's financial performance. Concerns about climate change and fossil fuel assets are now expressed in shareholder resolutions at the annual meetings of large oil companies, such as Shell. The Gulf of Mexico oil spill in 2010 was the worst environmental disaster in U.S. history, costing BP $23bn for the reckless corporate culture of cost-cutting and excessive risk-taking that caused the spill (Griggs, 2011). Regarding social risks, we can site the Google sexual harassment scandal that has sparked outrage amongst workers, and more than 20000 employees globally walk out of Google offices in 2019. It has also lead shareholders to file a lawsuit with the corporation over its treatment of allegations of executives' sexual misconduct that led to a settlement of $310m (Brown and Peterson, 2022). Highlighting the importance of effective governance, Volkswagen's admission of the emissions cheating scandal in 2015 resulted in equity market value losses of more than $20bn within five trading days and abnormal losses for its suppliers due to spillover effects (Barth et al., 2022). Some consumers lost interest in diesel vehicles, and the brand has been still in recovery for years. Recognizing the importance of ESG considerations, the United Nations adopted the Sustainable Development Goals (United Nations, 2015), which were embraced by governments around the world. As a result of such extreme events, or other ongoing megatrends, such as scarcity of natural resources and changing demographics, investment analysts are now identifying and evaluating investment risks, including ESG risks. This style of investing is known as "ESG investing".

The term "ESG investing" is used almost interchangeably with relatively traditional "socially responsible investing", "impact investing" or the most recent "responsible investing" and "sustainable investing". Socially responsible investing (SRI) identifies investment risks and opportunities based on ESG metrics (Widyawati, 2020). Over recent years, the market for ESG investment has been exponentially growing. The share of global asset owners applying ESG criteria to at least 25% of their total investments surged from 48% in 2017 to 75% in 2019 (BNP Paribas, 2019). A report by CNBC in early 2020 also indicates unprecedented inflows into sustainability-focused funds following the outbreak of the COVID-19 pandemic. In August 2019, 181 CEOs from major US corporations signed the Business Roundtable statement of corporate purpose (Business Roundtable, 2019), committing themselves to serve the interests of all stakeholders, especially communities, environment, and investors. Such agreements encouraged consultants and rating companies to rank all active mutual fund managers based on ESG factors. Therefore, the need to address ESG criteria became clear (Krueger et al., 2020), but what is less clear is the evidence that ESG factors are directly related, in a causal sense, to higher returns.

Kempf and Ostho (2007) found that investing in high socially responsible ratings leads to abnormal returns. Friede et al. (2015) confirmed the positive relationship between ESG integration and

corporate financial performance. Conversely, Hong and Kacperczyk (2009) showed that so-called sin stocks (i.e., companies in such industries as alcohol, tobacco, gambling, and weapons) have higher expected returns than otherwise comparable stocks. Bauer et al. (2007) reported that ethical funds significantly underperform relative to other benchmarks. Pedersen et al. (2020) found that only portfolios based on governance (G) aspects yield significant abnormal returns, while the integration of the environmental and social criteria (E and S) or overall ESG scores may not contribute to improving portfolio performance. Nevertheless, Chava (2010) found no significant relationship between the expected returns of a firm's environmental factors. Statman (2006) has also found no statistically significant differences between the returns of social responsibility stock indices and the returns of the conventional indices. Overall, the divergence in results observed in the literature can be explained, in part, by the different empirical approaches used and time periods, and the different ESG score providers (Dimson et al., 2020).

All the above-mentioned studies assess the performance of mutual funds using a top-down approach that examines the actual returns that investors realize from holding ESG funds. In contrast, Grinblatt and Titman (1989, 1993) use a bottom-up approach to reach the desired ESG outcomes for their portfolios and examine the performance of the individual stocks held by funds. By directly evaluating and observing the portfolio holdings of the mutual funds, Daniel et al. (1997) designed benchmarks that better capture the investment styles used by fund man- agers. Daniel and Titman (1997) suggest that characteristics provide better forecasts of the cross-sectional patterns of future returns and increase statistical power. This bottom-up approach is known as characteristics-based-approach or factor-based approach.

Most factors are constructed as the difference between the returns of two portfolios, one of which is held long: the other held short. Therefore, a factor usually represents a zero net investment position. Any zero net investment position can easily be added or "tilted" to an existing portfolio (Dimson et al., 2017). Let us define some commonly discussed factors: (1) Size: long small stocks and short large stocks. The typical measure is market value of equity. The larger a company's market capitalization, the larger its size. (2) Value: long value stocks and short growth stocks. The typical measure is book-to-market, but earnings, cash flows, sales are also used as measures of funda- mental value. (3) Momentum: long "winners" and short "losers". The typical measure is that winners are (losers) stocks with high (low) returns over past 12 months. (4) Low volatility: long stocks with low idiosyncratic risk and short stocks with high idiosyncratic risk. (5) Quality: aims to reflect the performance of companies with durable business models and sustainable competitive advantages. This is achieved by targeting companies that tend to have high returns on equity ROE, stable earnings, and low financial leverage. Examples of the quality factors are profitability (long "robust" or high operating profitability stocks and short "weak" or low operating profitability stocks) and investment factors (long "conservative" stocks of firms with low investment policies and short "aggressive" stocks of firms with high investment policies). (6) BAB factor: holding low-beta stocks and short high-beta stocks in zero beta, self-financing combination.

Ang (2014), gave an extensive summary of the literature on factors and underlined that their risk premiums result from the economic theories of a reward for bearing risk, structural impediments, or behavioral biases.

The factor-based approach is used by the two main asset allocation strategies, the active strategy and the passive one. A passive ESG strategy consists of layering on ESG themes while preserving the successful core of the existing portfolio construction. Fund managers classify companies according to standard criteria, such as size, value, quality, or low volatility, and examine the impact of ESG ratings on the financial performance of stocks in each group. This involves applying negative ESG screening to the portfolio by removing companies with business activities that are incompatible with their values from their investment and minimizing negative ESG exposure (Briand et al., 2021). Melas (2016) showed that size, quality, and low volatility factors have significantly positive ESG scores as compared with the market. He also found that incorporating ESG criteria into their already established strategies generally improved risk-adjusted performance from 2007 to 2016 and tilted the portfolio toward higher quality and lower-volatility securities. It's also worth mentioning that there's a strange imbalance between the obligations asset owners place on asset managers and the expectations that come with it. While pension funds are explicit long-term owners and increasingly setting expectations of long-term risk management, by including ESG, their mandates and reviews of asset managers are actually short-term (Lachance and Stroehle, 2021). These concerns of the literature about the passive traditional strategy give incentives to adopt other ESG screening strategies while achieving the desired exposure to their target factors, such as size or value.

Active ESG strategies, on the other hand, are investment strategies where managers actively select ESG stocks and create segregated ESG mandates. While a passive fund manager provides investors with an investment style, an active manager provides both style and selection. However, how would this change of strategies impact portfolio selection? Madhavan et al. (2021) explain this strategy and the insights that it gives to asset managers. Funds with high ESG scores display interesting patterns in relation to factors value, momentum, quality, minimum volatility, and size. In particular, funds with high environmental ratings have particularly strong exposures to quality and momentum factors.

This paper brings the following contributions to the financial literature. First, to our knowledge, it is the first paper that compares active ESG strategies to passive ones and analysis their asset allocations and impact. We compare the effects of ESG screenings using passive and active investment strategies. Actively managed funds search for ways to optimize their ESG investing decisions by investing in stocks classes as well as individual securities within each stock class. In contrast, passively managed funds do not buy and sell stocks based on research and analysis; rather, the funds' securities are simply utilized among different stock classes. Second, while the literature focuses on return performance, our paper extends this analysis to ESG funds characteristics (e.g. size, value and quality). Our results, hence, will help fund managers to better

understand the effects of ESG screening on the characteristics of their investments and factor exposure. Our result allows, therefore, active asset manager to construct performing portfolios while keeping high ESG scores.

The remainder of this paper is organized as follows. Section 2 discusses the data used. We set up the models in 3. Results and analysis are displayed in Section 4. Finally, Section 5 concludes the paper. The Appendix A contains the definitions of the firms' characteristics.

2 Data

Our data is obtained from Wharton Research Data Services (WRDS). WRDS is the industry leader in data management, cutting-edge tools, analytics, and research services. It is supported by Wharton School's leadership and credibility.

Our stock returns database is the Center for Research in Security Prices (CRSP). The CRSP Stock Database maintains the most comprehensive collection of security price, return, and volume data for the NYS, AMEX, and NASDAQ stock markets. It provides a unique research source characterized by unmatched breadth and depth. In fact, the data is free of survivorship bias, and takes into consideration organizational history such as name changes, mergers, and liquidations. We used US-listed firms' monthly returns from September 2013 to December 2021.

2.1 ESG Data

There are currently various ESG data providers. Ratings from different providers diverge (Dimson et al., 2020), how- ever, considerably, which means that the information received by managers from rating agencies could be relatively noisy (Berg et al., 2022). This divergence of ratings also presents a challenge for empirical research, as results and conclusions depend on the accuracy of ratings.

We rely in this study on Trucost ESG disclosure scores, called S&P Global ESG Scores. Trucost provides ESG data for both U.S. and global firms from September 2013. It is an environmental, social, and governance dataset that provides company level, dimension level, and criteria level scores. Unlike ESG datasets that rely solely on publicly available information, S&P Global ESG Scores are generated by a combination of verified company disclosures, media and stakeholder analysis, and in-depth company engagement via the S&P Global Corporate Sustainability Assessment (CSA), providing unparalleled access to ESG insights before they reach others.

How does the assessment work?

The S&P Global scores1 provides transparency to analyze key ESG criteria scores for up to 30 areas of focus across all sub-indutries. Question-level scores covering 130 sustainability topics and up to 1,000 extra base data points per company enables to make investment decisions with clarity and precision. Built around both general and industry-specific topics with different weighting structures, each company's ESG Score is tailored to the most financially significant, pertinent, and

impactful ESG topics depending on its sub-industry. The S&P Global ESG score is a single measure of a company's sustainability performance, calculated by aggregating scores across Environmental (E), Social (S) and Governance (G) dimension scores, where each of these is weighted according to its importance for a given sub-industry.

Matching the scores to the returns

We merge Trucost data with US stock monthly returns data from CRSP by matching their key identifiers INSU- TIONID and PERMNO consecutively. The intersection of CRSP and Trucost provides us with a sample of 13119 unique firms with 2130 rated stocks and 10989 unrated stocks, corresponding to 759366 monthly observations. It's worth mentioning that the ESG data obtained from Trucost are more or less yearly updated, that is, some companies provide disclosures more than others, while the returns from CRSP are monthly returns. To match the monthly stocks' returns to their yearly disclosed ESG scores, we take the latest available ratings, and apply them to the missing monthly values, until the next rating have been disclosed.

2.2 Carbon Emission Data

Of particular interest for the Environmental metrics is "carbon intensity", a measure of a fund's exposure to carbon- intensive companies. We obtain emissions data from Trucost –A leader in carbon and environmental data. Emissions data are usually reported under the Greenhouse Gas (GHG) protocol and are measured in tons of CO2 (Carbon Dioxide) per year. The GHG protocol specifies three scopes of emissions: Scope 1 reflects direct emissions sources that are owned or controlled by a company; Scope 2 emissions are from the consumption of purchased electricity, steam, or other sources of energy generated upstream from the company's direct operations; Scope 3 encompasses all other emissions associated with a company's operations that are not directly owned or controlled by the company. Trucost reports absolute emissions and intensity emissions. Absolute emissions refer to the total quantity of emitted greenhouse gas emissions, whereas intensity emissions compare the number of emissions to some unit of economic output. We're interested in the carbon intensity for a company, which is computed as the total metric tons of CO2 emissions (Scope 1 + Scope 2) divided by sales in millions of dollars.

Table 1 and Figure 1 show the total number of stocks, divided into stocks with and without ESG ratings, at each year's end from 2013 to 2021. The total number of stocks per year ranges between 7036 and 9801. The number of rated stocks increases from 408 in 2013 to 2102 in 2021. It doubles from 2019 to 2020 and also increases significantly in 2021. The beginning of the sample period is determined by the availability of the Trucost ESG ratings in WRDS.

Table 2 shows descriptive statistics regarding the ESG ratings from 2013 to 2021. Figures 2 and 3 illustrate the change in the average scores overtime. ESG ratings range from the lowest value of 2.57 to the highest value of 90.75 throughout the years. Environmental, social, and governance scores are within approximately the same range. Car- bon intensity emission scope 1 and scope 2

ratings on the other hand range from 0.45 to 14228.10 throughout the years.

Ratings follow a negative trend overtime, with a noticeable decrease between 2018 and 2020. This trend is explained by the increase in the number of rated stocks from year to year. In fact, firms that just started to report their ESG scores receive low ESG scores from rating agencies because of lack of ESG information. Hence, if the number of ESG rated firms increases, the overall average score decreases.

2.3 Factor Data

We use as explanatory variables mimicking factors of Fama and French (1993) 3-factor model and Fama and French (2015) 5-factor model. The data was downloaded from Kenneth French's website for the developed, emerging, and regional markets (including North America, Europe, and Asia Pacific-Japan excluded) 2.

2.4 Portfolio Data

One-year Return Sorted Mutual Fund Portfolios

We replicate M.Cahart (1997)'s methodology to build our ESG portfolios of mutual funds. On January 1 of each year, we form ten equal-weighted portfolios of mutual funds, using yearly ESG scores. We hold the portfolios for one year, then re-form them. This yields a time series of monthly returns on each decile portfolio from 2013 to 2021. Mutual funds are sorted such that the ones with the lowest past one-year ESG scores comprise decile 1 and funds with the highest compromise decile 10. Funds that disappear during the course of the year are included in the equal-weighted average until they cease to exist, then the portfolio weights are readjusted appropriately. We redo the same methodology in forming the portfolios of mutual funds, but each time we change the basis of forming the deciles. We form the funds based on environmental, social, and governance criteria. We also form them based on carbon intensity emissions. This procedure gives portfolio managers a more investible strategy. For example, an investor always invests in the top 10% of the firms in terms of ESG criteria. Since ESG scores could change over time, then it is more logical from an investor's perspective to rebalance the portfolio each year and change the portfolio's composition. In finance, we don't build investments strategies based on prediction or on future information. Instead, we use all the information that we have at that one point in time – what is the ESG score – until we make the decision on what we're buying.

Style Box Investing

We use size and value factors to form the factor portfolios. These factors were made famous by Fama and French (1993) and have been used in many other studies. We use the methodology of Morningstar Style Box 3 for portfolio construction. Figure 4 is an illustration of both the nine grid Morningstar Style Box and the 4-grid style box that we use in our study. In fact, we limit ourselves to 4 classifications of mutual funds for implication reasons and because of data insufficiency. We therefore eliminate the "medium" size as well as "blend" investment style to obtain large-value,

large-growth, small-value, and small-growth as indicated in the figure. The portfolios are rebalanced quarterly using two independent sorts, on size (market equity) and book-to-market (the ratio of book equity to market equity). The size breakpoint (which determines the buy range for the Small and Large portfolios) is the median NYSE market equity. The B/M breakpoint (which determines the buy range for the growth and value portfolios) is the median NYSE book-to-market ratio.

3 Models

Let $(\Omega, \mathcal{F}, \mathbf{F}, \mathbb{P})$be a probability filtered space endowed with the filtration $\mathbf{F} = \{t \in T : \mathcal{F}_t\}$associated with a Markov process Xsuch that $\{t \in T, i \in I : X_{it}\}$ such that Y_t and X_t are dependent. $Y$is the process defining the excess return. $X$is the process that provides the explanatory information defining Y. We assume that Y_t is a linear function of $X_t$such that:

$$Y_t = \beta_0 + \sum_{i=1}^{\sigma(I)} \beta_i X_{it} + e_t$$

with $\mathbb{E}[e_t \mid \mathcal{F}_t] = 0$. We are interested in determining the effect of variable X_t on Y_t for any $t \in \mathbb{R}^+$. We examine the conditional expectation of Yconditional on the information provided in the filtration **F** as defined below:

$$Y_t = \mathbb{E}[Y_t \mid \mathcal{F}_t] + e_t$$

with e_t being an error that compensates for the incompleteness of the information with regard to Y_t. The mean e_t is equal to 0. In order to estimate the above conditional expectation, we use Ordinary Least Square (OLS) estimation, which obtains the coefficient estimates by minimizing the sum of squared residuals. The OLS regression leads to the following estimated value of the coefficient β:

$$\beta = (X'X)^{-1}X'Y$$

with X a $n \times k$ matrix, n being the number of regressor variable vectors X_k with k observations, X the transpose of $X$and Y the vector of k regressed observations.

Thus, we obtain the solution

$$\hat{\beta} = \begin{pmatrix} \hat{\beta}_0 \\ \hat{\beta}_1 \\ \vdots \\ \hat{\beta}_{\sigma(I)} \end{pmatrix}.$$

As a result, $Y_t$can be expressed as:

$$Y_t = \hat{\beta}_0 + \sum_{i=1}^{\sigma(I)} \hat{\beta}_i X_{it} + e_t$$

To analyze the stocks' exposure to risk factors, we employ two widely used multifactor models of performance measurement: Fama French 3-factor model and Fama French 5-factor model.

3.1 Fama French 3-Factor Model

Let FF3 (Fama and French, 1993) be the stochastic process defined by the Fama and French 3-factor model. Let $(\Omega, \mathcal{G}, \mathbf{G}, \mathbb{P})$ be a probability filtered space endowed with the filtration $\mathbf{G} = \{t \in T: \mathcal{G}_t\}$.
G represents the information flow of the FF3 mimicking factors, i.e.

$$\mathcal{G}_t = \sigma(RM_s, SMB_s, HML_s: s < t \in T).$$

$$Y_t = \mathbb{E}[Y_t \mid \mathcal{G}_t] + e_t.$$

According to Fama and French 3-Factor Model,

$$\mathbb{E}[Y_t \mid \mathcal{G}_t] = R_{it} - RF_t = \beta_0 + \beta_1(RM_t - RF_t) + \beta_2 SMB_t + \beta_3 HML_t.$$

In this equation:

- R_t: is the monthly return on one of the portfolios
- RF_t: is the risk-free rate (the one-month U.S. Treasury bill rate observed at the beginning of month t)
- RM_t: is the return on the value-weight portfolio of NYSE-AMEX-NASDAQ stocks
- SMB_t: stands for small minus big market capitalization. It represents the size factor
- HML_t: is the high minus low book-to-market ratio. It represents the value factor

3.2 Fama French 5-Factor Model

We carry on our analysis to the Fama French 5-factor model denoted as FF5 (Fama and French, 2015) which extends FF3. We are interested in the two new quality factors, profitability and investment, as Blitz and Fabozzi (2017) show a relationship between the high returns of sin stocks and the quality factors. Let FF5 be the stochastic process defined by the Fama and French 5-Factor Model. Let $(\Omega, \mathcal{H}, \mathbf{H}, \mathbb{P})$ be a probability filtered space endowed with the filtration $\mathbf{H} = \{t \in T: \mathcal{H}_t\}$. **H** represents the information flow of the FF5 mimicking factors, i.e.

$$\mathcal{H}_t = \sigma(RM_s, SMB_s, HML_s, RMW_s, CMA_s: s < t \in T).$$

Under the filtration **G**, given $\mathcal{G}_t$ at the present time t, a portfolio manager cannot examine the quality factor exposure on the ESG mutual funds. This information is instead contained in $\mathcal{H}_t (\mathcal{G} \subseteq \mathcal{H})$. $Y_t = \mathbb{E}[Y_t \mid \mathcal{H}_t] + e_t$. According to Fama and French 5-Factor Model,

$$\mathbb{E}[Y_t \mid \mathcal{H}_t] = R_{it} - RF_t = \beta_0 + \beta_1(RM_t - RF_t) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t.$$

The new added factors are:

RMW_t: stands for robust minus weak operating profitability portfolios

CMA_t: stands for conservative minus aggressive investment portfolios

4 Results and Findings

4.1 ESG Active Investment Strategies

Table 3 reports the results of our time-series regression models. It shows a significant relationship between ESG components and factor exposures. The Fama French 3-factor model and Fama French 5-factor model explain most of the spread and pattern in these portfolios. The adjusted R squares are higher than 0.8 except for some values in the carbon intensity models, indicating goodness of fit.

Aggregated ESG criteria

The average monthly excess returns on the decile portfolios have a decreasing trend from around 1.4% return for the lowest deciles to approximately 1.26% for the highest deciles. Analyzing the firms' performance spreads volatilities, we notice that portfolios with high ESG disclosure scores are less volatile. The models have high sensitivities to the size (SMB) and value (HML) factors, accounting for most of the explanations. The top decile portfolios hold larger stocks than the bottom decile portfolios, a pattern that is clearly shown through the SMB factor. The funds' ESG scoring have a nearly monotonic positive relationship with value (HML) and quality exposures (RMW), and a negative relationship with size (SMB) as we move from the lowest to the highest ESG decile. For example, in the 5-factor model, value, quality, and size factor loadings are 10%, -18%, and 53% respectively for the lowest decile compared with 25%, 13%, and 7% for the highest decile. This result is interesting because the mimicking factor procedure only uses stock-level Z-scores related to the factors and does not use any ESG characteristics. The funds with the highest ESG scores take on value and quality exposure. The funds with the lowest ESG scores effectively take on only the small size factor exposure.

Environmental criteria

The return for the lowest environmental (E) deciles as well as the highest E deciles is approximately the same, whereas the highest E deciles have low-volatility. The investible factors have a nearly positive relationship with quality exposure (RMW) and a negative relationship with the size exposure (SMB) as we move from the lowest to the highest E deciles. For example, in the 5-factor model, quality and size factor loadings are -14% and 46% respectively for decile 1 compared with 10% and 1% for decile 10. Low environmental score funds have the same characteristics as the low ESG score funds, however, funds with the highest environmental scores take on strongly quality exposure but not as much in the value exposure.

Social and governance criteria

The results show similar patterns to ESG sort, but the positive effects for the value and quality factors are more pronounced.

Carbon intensity emission criteria

Results are weak, noisy, and do not report significant factor trends.

Comparison across different criteria

Regardless of the ESG metric used, the lowest ESG deciles have a significant positive size factor compared to the highest ESG deciles. If we sort by the Environmental (E) or Governance (G) metrics, the lowest ESG deciles have a positive and significant loading on the value factor compared to the lowest ones in the other sorts, which have insignificant value exposure. Also, If we sort by the aggregated ESG or the Environmental factor, the loading on profitability factor is not significant in the best-in-class deciles but if we sort by Social (S) or Governance (G) metric, the loading is positive and significant of 10% and 5% significance respectively. To sum up, the funds with the lowest ESG scores have more focus on small firms. The funds with the highest ESG scores generally have (1) lower exposure to the market beta and less volatility, (2) more focus on large firms, (3) more focus on value firms, (4) a positive exposure to quality. More specifically, funds with high social and governance scores tend to have higher quality loadings. Funds with high environmental scores don't have a significant exposure to the value factor. Carbon intensity results are insignificant, and will be excluded in our further analysis.

4.1.1 Mutual Funds Characteristics

We now examine whether the portfolio allocation based on ESG metrics is related to the average characteristics of mutual funds in each decile portfolio. Each year, we calculate a cross-sectional average for each decile portfolio's total assets, market capitalization, earnings before interest and taxes, and market-to-book ratio. Definitions of these characteristics are included in Appendix A. The average portfolio characteristics are reported in Table 4.

Total Assets and Market Capitalization - Size Factor

Results indicate that total assets and market capitalization are strongly related to the fund's ESG scores. For all the ESG factor sorts, the funds characteristics have a positive relationship with total assets (TA) and market capitalization (Market Cap) as we move from the lowest to the highest deciles. Deciles 9 and 10 stand out with particularly higher characteristics. Also, the funds with high environmental scores possess the largest values of total assets and market capitalization. This means that funds with high ESG scores and especially high environmental scores hold larger stocks than the lowest funds. Even though market capitalization changes over time depending on market fluctuation, this firm's characteristic gave us the same results that the size factor gave in the time-series regression.

Book-to-market Ratio - Value Factor

Book-to-market ratio fails to explain the characteristics of mutual funds considering ESG and environmental metrics in their portfolio allocations in panel A and B, which confirms that environmental funds don't have a significant exposure to the value factor. In panel C and D, book-to-market ratio has a positive relationship with the deciles as we move from the lowest to the highest social and governance deciles. As a result, the highest social and governance deciles have positive exposure to value firms. This confirms the strong positive effects for the value factor in the social and governance sort found in the regression results.

EBIT - Quality Factor

For all the ESG factor sorts, the funds characteristics have a positive trend with earnings before interest and taxes (EBIT) as we move from the lowest to the highest deciles. The funds with high governmental scores stand out in possessing the largest values of earnings before interest and taxes. As a result, funds with high ESG scores and especially high governmental scores hold more profitable and better quality firms than the lowest funds. This confirms the previous results that funds with high governance scores tend to have higher quality loadings. Funds characteristics confirm these regression results: The highest mutual funds considering ESG metrics in their portfolio allocations hold (1) larger and (2) higher quality stocks than the lowest ones. Mutual funds with high social and governance scores hold more value firms. Funds with high governance scores have higher quality loadings. Besides, funds characteristics infirm that high social funds have higher quality loadings. Finally, funds characteristics add new insights that high environmental funds have the largest firms.

4.1.2 Comparison of Portfolio of Unrated and Rated Stocks to Low ESG Portfolios

We would like to examine the effects of subtracting the bottom ESG firms from a portfolio. To do this, let us consider we are a portfolio manager who invests equally in all the stocks without excluding any unrated ESG stocks. We examine the characteristics of this equally-weighted portfolio and compare it to the previous results to understand the effects of ESG filtering. We form one time series of monthly return on one weighted portfolio of all stocks available from 2013 to 2021.

Characteristics of the unrated stocks

A side effect of the ESG filtering is losing many firms that don't disclose or do not have ESG data. From Panel A in Table 5, we can extract some of the characteristics of unrated stocks. Compared to the rated stocks' factors, we notice the following differences in the unrated stocks 'factors: The excess return is lower, SMB is much bigger, HML is much lower, RMW is much lower, and CMA is higher.

Characteristics of the rated stocks

The data of the ESG rated stocks is the baseline for the ESG deciles, so they represent their average results. Thus, it is more accurate – economically and statistically – to compare the low ESG portfolios to the portfolio of rated stocks than to compare them with the portfolio of all the stocks. Panel B of Table 5 reports the results of regression models. Both 3-factor model and 5-factor model explain the patterns found previously and strongly confirm our findings. By comparing these regression results to the results of the lowest ESG decile, or the lowest 10% of the rated stocks, all the lowest ESG funds considering all ESG attributes – both to aggregate ESG measures and to separate E, S and G components– are higher in the size factor, lower in the value factor, lower in the profitability factor, and the unclear in the investment factor. We find that the value factor (HML) is the highest while sorting by environmental criteria. We also find that the profitability factor (RMW) values are the lowest while sorting by social and governance criteria.

To sum up, if we remove the lowest ESG funds from our portfolio, then our risk profile will change: lower size factor exposure, higher value factor exposure, and higher investment factor exposure. By excluding the lowest environmental funds, the portfolio gains more value. By removing the lowest social and governance funds, the portfolio loses more quality.

4.2 ESG Passive Investment Strategies

We now refer back to the way how asset allocation is performed across fund managers. We use the style box investing method introduced in Section 2. We eliminate the firms in which we don't have data about their market capitalization or book-to-market ratio. Table 6 shows the number of stocks in the factor-based portfolios – small-growth, small- value, large-growth, and large-value – before and after eliminating non-rated stocks at each year's end from 2013 to 2021. What's noticeable is that when we eliminate non-rated stocks, there are no more stocks in the small-growth and small-value portfolios until 2018. After that, the number of stocks is relatively small, and thus it makes it harder to do ESG screening for these types of portfolios. For large-growth and large-value portfolios, the number of stocks becomes low, mostly under 100 stocks from 2013 to 2017, and then it increases starting from 2018 to reach 230 and 250 for the large-value in 2021 due to the increase in the rated stocks in that period.

We redo the same previous time-series regression analysis, but in more practical way. If portfolio managers are working on a particular investment mandate, how ESG filters affect their portfolios' risk exposure? Tables 7, 8, 9, and 10 report the full sample broken down into the 4 basic style boxes: small-growth, small-value, large-growth, large-value divided into quantiles based on ESG attributes.

Small-growth

The average monthly excess returns on the quantile portfolios don't show a trend. The performance spread of firms with high ESG disclosure score is less volatile. Small growth

portfolios seem to be extremely affected by ESG filtering. As showed previously, the number of stocks in the portfolio is very small, leading to a lack of diversification and higher risk effects. The Fama French 3-factor model shows moderate relationship between factor exposures and ESG components, however the Fama French 5- factor model shows no significance of the relationship and gives a bad fit of the regression model as the adjusted R squares are 0.3 and less. Analyzing the 3-factor model findings, the top quantile portfolios appear to hold more growth stocks than the bottom quantile portfolios that hold more value stocks based on HML factor as it increases from 31% to 71%. So, the small-growth funds with the highest ESG scores take on only negative value exposure.

Small-value

Results for the small-value funds are also affected by ESG filtering, plus neither 3-factor model nor 5-factor model present good fit for the model. However, we notice that there is a positive trend of HML as we move from lowest to highest ESG quantiles. In fact, the top quantile portfolios appear to hold more value stocks than the bottom quantile portfolios that hold more growth stocks.

Large-growth

The average monthly excess returns on the highest ESG quantile portfolio is higher than the other portfolios. The performance spread doesn't show a trend. The Fama French 3-factor model and the Fama French 5- factor model show moderate to good relationship between factor exposures and ESG components, as the adjusted R squares are mostly more than 0.6. In fact, as showed previously, the number of stocks in the portfolio is still high even after the ESG filtration. The investible factors have a relatively positive relationship with value (HML) and quality factor (RMW) as we move from the lowest to the highest ESG quantile. However, HML coefficients are mostly negative, meaning that growth stocks are significant in this type of portfolio, and the top ESG quantiles are leaning towards value stocks. Also, there is a negative relationship with size (SMB) factor as we move from the lowest to the highest ESG quantile. The funds with the highest ESG scores take on growth firms and quality exposure. The funds with the lowest ESG scores effectively take on the small size exposure.

Large-value

Results are also significant for the large-value funds, same as the large-growth funds. The investible factors have a positive relationship with value (HML) as we move from the lowest to the highest ESG quantile. However, HML coefficients are all positive, meaning that value stocks are significant in this type of portfolio, and the top ESG quantiles have a higher concentration of value stocks. Also, there is a negative relationship with size (SMB) and quality exposures (RMW) as we move from the lowest to the highest ESG quantile. The funds with the highest ESG scores take on value exposure. The funds with the lowest ESG scores effectively take on the small size and quality factors exposure.

To sum up, the ESG screening affects small size investments –small-growth and small-value– because the filtering of these portfolios resulted in loosing many stocks due to the lack of ESG disclosures for small firms. Small-cap universe overall offers fewer manager selection opportunities. Thus, if mutual funds perform ESG screening, then all funds will shift to larger stocks, even the relatively smaller ones. In large-growth and large-value stocks, the highest ESG quantiles generally have (1) more focus on large companies, (2) more focus on value stocks, and (3) negative exposure to quality. The main difference in the findings of the two investment strategies in terms of factor exposure is that the passive strategy holds more risk exposure to the quality factor than the active strategy, as high ESG firms per factor-based portfolios have low quality factors.

5 Conclusion

This paper provides evidence supporting the ESG factor-based approach, i.e. fund managers can target ESG levels by taking on factor exposures. We investigate the differences between ESG driven and conventional mutual funds. We analyze factor loadings of US stocks from 2013 to 2021 of ESG-rated stocks by Trucost S&P Global Score. We take two major factor-based investment strategies and compare the characteristics of the funds.

First, we investigate the results of the active investment strategy. We show that there is a significant relationship between ESG components and factor exposure. We then prove that if an investor uses an active portfolio strategy, funds with the highest ESG scores generally have (1) lower exposure to the market beta, (2) less volatility, (3) more focus on large firms, (4) more focus on value firms, and (4) a positive exposure to quality. More specifically, funds with high social and governance scores have high-quality factor loading, and funds with low environmental scores have low-value factor loading. Collectively, these results suggest that if a fund manager eliminates low ESG funds from the portfolio, then the risk profile changes and the fund will have lower size factor exposure, higher value factor exposure, and higher investment factor exposure. By eliminating the lowest social and governance funds, the portfolio loses more quality whereas by eliminating the lowest environmental funds, the portfolio gains more value.

Second, we look into the characteristics of funds using the passive investment strategy. We show that the ESG sort affects small-size investments because the filtering of these portfolios resulted in losing many stocks due to the lack of ESG disclosures for small firms. Our results imply that if mutual funds perform ESG screening, then all funds will shift to larger stocks, even the smaller ones. The main difference in the findings of the two investment strategies in terms of factor exposure is that the passive strategy holds more risk exposure to the quality factor than the active strategy.

From a practical perspective, our paper gives insights to ESG fund managers to optimize their stock selection process. we also provide insights on ESG investments at the mutual fund holdings level and help fund managers to better understand the effects of ESG screening on the

characteristics of their investments, in particular factor exposure. Mutual fund managers can use our findings to adjust their portfolios while trying to maintain their ESG score.

One of the shortcomings of our analysis, however, is that we used ESG scores from only one provider, Trucost S&P Global Score. Given the "aggregate confusion" (Berg et al., 2022) regarding ESG ratings that may be weakly correlated among providers, an extension of this study would look at the effects of screening investments for the ESG scores on factor exposure from other scoring systems. Besides, we encourage future research to examine the impact of major economic shocks such as the Covid-19 crisis on ESG data disclosure and ESG investment strategies.

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Appendices

A Definition of Firms' Characteristics

We define the firm characteristics used in our analysis.

Total Assets: Are probable future economic benefits obtained or controlled by an entity as a result of past trans-actions or events. They may be physical or intangible. They're also considered as firm size measures. Total assets are found in the balance sheet and should confirm the accounting equation:

$$\textit{Total Assets} = \textit{Total Liabilities} + \textit{Stockholders' Equity Or Total Assets} = \textit{Non-Current Assets} + \textit{Current Assets}$$

Market Capitalization: Is the total value of an entity's outstanding shares at a point in time which reflects thevalue investors place on a company. It is considered as a firm size measure.

$$\textit{Market Capitalization} = \textit{Current Market Price Per Share} \times \textit{Number of Outstanding Shares}$$

Earnings before Interest and Taxes: Or EBIT is a firm's net income before deducting interest expenses and income tax expense. EBIT is used to analyze the performance of a firm's core operations without the costs of the capital structure and tax expenses impacting profit. It is found in the income statement. It can be calculated in two methods:

$$\textit{Earnings Before Interest and Taxes} = \textit{Net Income} + \textit{Interest} + \textit{Taxes}$$
$$\textit{Or Earnings Before Interest and Taxes} = \textit{Revenue} - \textit{Cost of Goods Sold} - \textit{Operating Expenses}$$

Book-to-market Ratio: Compares a firm's book value to its market value. The book's value is the value of the assets minus the value of the liabilities. The market value of equity is the price at which equity can actually be bought or sold. It can be used to determine the overall value of a firm.

$$\textit{Book-to-market Ratio} = \frac{\textit{Market Capitalization}}{\textit{Total Book Value}}$$

Table 1: Database descriptive statistics

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
All stocks	7036	7515	7730	7791	7848	8031	8136	8546	9801
Rated	408	406	577	526	651	647	806	1600	2102
Unrated	6628	7109	7153	7265	7197	7384	7330	6946	7699

Table 1 shows descriptive statistics of the sample stocks. It reports the numbers of all the stocks constituting our mutual funds, aswell as the number of rated and unrated stocks at the end of each year from 2013 to 2021.

[1]https://www.spglobal.com/esg/documents/sp-global-esg-scores-brochure-2022.pdf

Table 2: ESG ratings descriptive statistics

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
					Panel A. ESG Ratings				
Mean	42.99	38.53	38.82	36.26	36.28	32.10	24.46	16.62	17.51
Std Dev	17.88	16.99	16.88	16.84	17.34	16.92	18.75	15.51	15.32
Min	20.11	18.91	18.82	16.38	14.98	5.50	2.57	2.57	2.81
1st Q	28.86	26.12	26.55	24.41	23.99	21.26	11.18	8.03	8.90
Median	35.49	31.01	32.15	29.32	28.79	25.61	17.61	10.77	11.82
3rd Q	57.56	46.02	46.79	41.86	42.68	36.64	29.98	17.20	18.65
Max	85.63	85.63	88.09	89.45	89.45	87.18	89.83	90.75	90.75
					Panel B. Environmental Ratings				
Mean	34.46	28.64	30.16	29.28	30.79	26.88	28.96	22.50	22.27
Std Dev	23.99	23.49	24.14	23.00	23.60	23.09	26.02	25.35	24.77
Min	2.16	1.41	1.24	1.24	2.67	0.48	0.12	0.12	0.13
1st Q	14.00	9.76	9.77	10.69	10.91	9.52	6.62	2.91	3.30
Median	27.33	19.21	21.15	20.26	21.78	15.33	20.55	10.62	11.54
3rd Q	55.00	44.28	47.60	44.39	46.74	40.64	47.28	36.18	34.23
Max	86.91	93.97	93.97	93.15	95.54	98.03	98.03	97.96	97.96
					Panel C. Social Ratings				
Mean	36.71	32.58	32.12	29.71	28.33	25.76	18.12	11.45	12.14
Std Dev	19.13	17.57	18.01	18.77	19.60	18.54	19.94	16.46	16.32
Min	9.55	9.55	8.73	6.08	5.68	0.56	0.20	0.14	0.05
1st Q	22.02	20.90	20.03	17.50	14.38	14.30	3.92	2.07	2.27
Median	29.32	25.98	25.24	22.51	21.12	19.03	10.05	4.59	5.32
3rd Q	50.68	38.55	38.81	34.40	35.13	30.37	222.67	12.43	14.36
Max	85.74	86.45	91.26	91.93	91.93	91.01	90.15	92.33	92.33
					Panel D. Governance Ratings				
Mean	55.27	51.52	51.47	47.58	46.81	40.65	32.33	24.49	25.31
Std Dev	15.14	14.67	13.93	13.88	14.20	14.31	16.33	13.84	13.70
Min	30.85	28.38	26.58	25.37	22.68	7.12	5.46	5.24	5.24
1st Q	43.32	39.89	40.55	37.17	37.06	30.92	20.93	16.52	17.36
Median	51.51	48.31	48.62	44.08	42.36	37.17	27.45	20.37	21.27
3rd Q	67.04	59.36	59.78	53.90	52.54	46.02	37.79	26.60	27.47
Max	90.04	90.04	88.16	90.70	90.70	87.33	87.98	87.98	87.95
					Panel E. Carbon Intensity Emission Ratings				
Mean	343.34	344.46	314.71	261.41	177.39	172.69	161.38	161.97	170.13
Std Dev	1055.21	1079.08	985.78	843.57	632.16	634.88	575.77	550.84	573.67
Min	1.42	1.40	0.46	0.46	0.80	0.52	0.45	0.45	0.58
1st Q	19.22	19.09	19.02	18.65	14.70	14.15	14.01	13.31	11.76
Median	41.16	43.38	43.84	42.08	38.05	39.27	38.45	35.73	34.92
3rd Q	144.09	118.91	111.27	89.83	72.92	77.49	75.91	70.07	68.14
Max	9196.42	9196.42	8142.61	7743.61	9800.49	14228.10	11378.65	8956.93	8269.14

Table 2 shows descriptive statistics on the time series means of ESG, Environmental, Social, Governance, and Carbon IntensityEmission ratings for all rated stocks between 2013 and 2021.

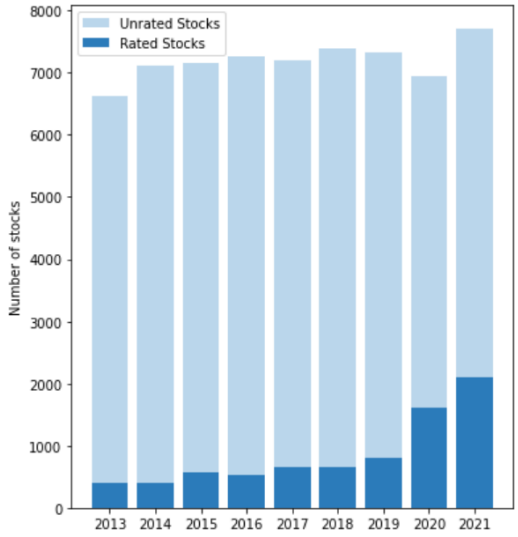

Figure 1: Number of listed stocks per year

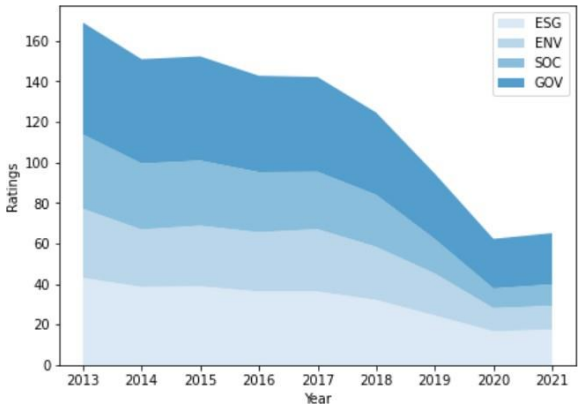

Figure 2: Average ESG, E, S, and G scores over time

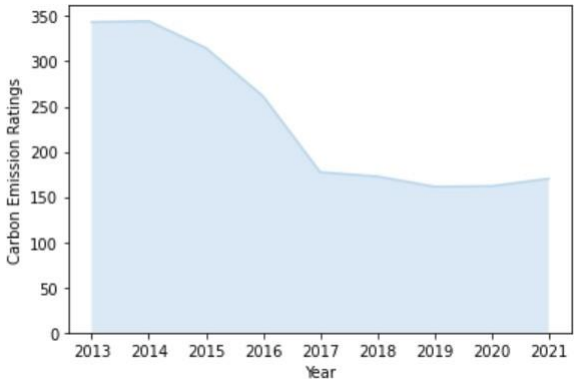

Figure 3: Average carbon intensity emission scores over time

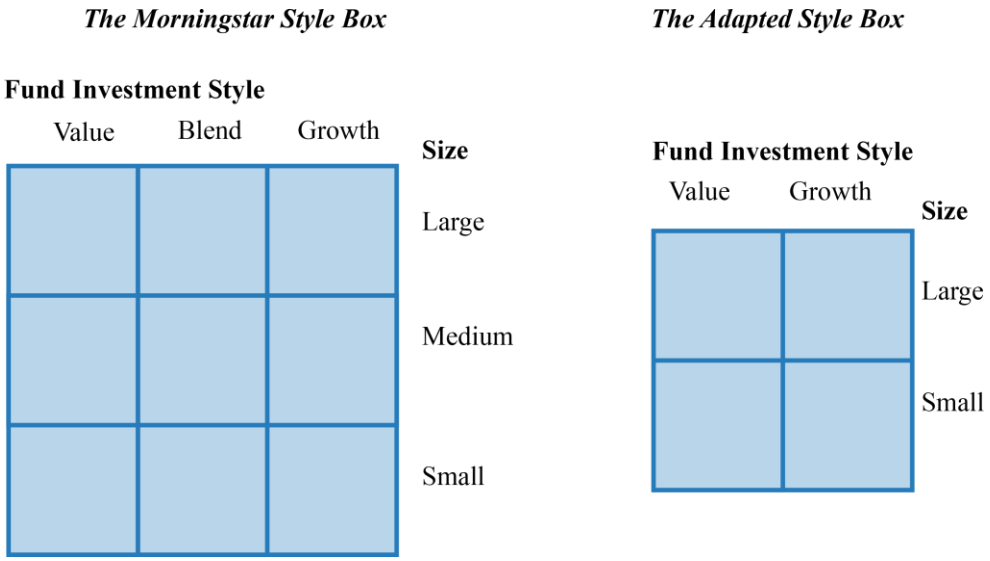

Figure 4: The Morningstar Style Box VS the adapted Style Box

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Table 3: Time series regression models of deciles sorted by ESG attributes - both to aggregate ESG measures, to separate "E," "S", and "G" components, and to carbon intensity emission

Decile			3-Factor Model						5-Factor Model						
	CMA (%)	Adj	Excess R	Std	Alpha	Mkt-Rf	SMB	HML	Adj R-Sq	Alpha	Mkt-Rf	SMB	HML	RMW	R-Sq
Panel A. ESG Deciles															
1 (low)	1.34	5.24			-0.04	0.87***	0.43***	0.04	0.848	0.17	1.00***	0.53***	0.10	-0.18	0.06	0.882
					(0.268)	(20.108)	(7.425)	(0.835)		(0.901)	(19.517)	(6.171)	(1.324)	(-1.582)	(0.475)	
2	1.44	6.03			0.21	0.96***	0.63***	0.08*	0.893	0.30	1.06***	0.81***	0.02	-0.03	0.10	0.907
					(1.440)	(23.469)	(11.381)	(1.694)		(1.581)	(20.918)	(9.442)	(0.268)	(-0.308)	(0.767)	
3	1.53	5.77			0.30	1.03***	0.49***	0.08	0.858	0.24	1.13	0.56***	0.10	0.02	-0.11	0.909
					(1.785)	(21.284)	(7.864)	(1.541)		(1.298)	(22.818)	(6.792)	(1.395)	(0.184)	(-0.882)	
4	1.17	5.86			0.06	0.97***	0.54***	0.11**	0.875	-0.03	1.08***	0.58***	0.11*	-0.02	-0.12	0.930
					(0.375)	(22.560)	(9.764)	(2.352)		(-0.173)	(25.922)	(8.331)	(1.807)	(-0.244)	(-1.076)	
5	1.19	5.41			-0.04	1.01***	0.50***	0.20***	0.903	-0.09	1.10***	0.55***	0.18***	-0.03	-0.03	0.946
					(-0.270)	(25.467)	(10.305)	(4.925)		(-0.582)	(29.818)	(8.818)	(3.378)	(-0.379)	(-0.270)	
6	1.04	5.45			-0.09	1.01***	0.37***	0.37***	0.898	-0.08	1.07***	0.34***	0.35***	-0.12	-0.04	0.943
					(-0.625)	(25.583)	(7.304)	(8.521)		(-0.613)	(29.772)	(5.682)	(6.683)	(-1.560)	(-0.438)	
7	1.15	5.02			-0.11	0.97 ***	0.31***	0.33***	0.886	-0.06	1.02***	0.37***	0.34***	-0.00	-0.06	0.934
					(-0.799)	(24.529)	(5.967)	(7.392)		(-0.403)	(27.142)	(5.783)	(6.209)	(-0.028)	(-0.600)	
8	1.26	5.37			0.02	1.02***	0.21***	0.35***	0.892	-0.06	1.14***	0.27***	0.35***	0.03	-0.05	0.937
					(0.132)	(25.583)	(4.446)	(8.617)		(-0.385)	(28.989)	(4.133)	(6.122)	(0.305)	(-0.523)	
9	1.25	4.97			0.09	1.00*	0.06*	0.35***	0.927	0.02	1.07***	0.15***	0.34***	0.09	-0.02	0.954
					(0.860)	(32.896)	(1.700)	(10.658)		(0.155)	(35.186)	(2.875)	(7.761)	(1.408)	(-0.254)	
10 (high)	1.23	4.50			0.08	0.97***	-0.03	0.27***	0.886	0.02	1.01***	0.07	0.25***	0.13	0.05	0.923
					(0.541)	(26.502)	(-0.687)	(6.339)		(0.165)	(27.630)	(1.204)	(4.696)	(1.621)	(0.521)	
Panel B. Environmental Deciles															
1 (low)	1.33	5.96			-0.1	1.03***	0.44***	0.16***	0.850	-0.05	1.19***	0.46***	0.24	-0.14	-0.05	
2	1.22	5.37							0.911							
					(-0.568)	(20.292)	(7.082)	(2.899)		(-0.258)	(23.591)	(5.389)	(3.283)	(-1.283)	(-0.383)	
3	1.47	5.63			-0.11	1.00***	0.53***	0.17***	0.891	-0.01	1.04***	0.56***	0.17	-0.07	-0.11	
									0.937							
4	1.35	5.66			(-0.799)	(24.229)	(9.942)	(3.739)		(-0.036)	(26.902)	(8.684)	(3.148)	(-0.858)	(-1.099)	
					0.17	0.98***	0.49***	0.16***	0.885	0.13	1.09	0.60***	0.14**	0.06	-0.11	
5	1.30	5.50							0.921							
					(1.162)	(23.745)	(8.680)	(3.368)		(0.770)	(23.968)	(7.884)	(2.109)	(0.638)	(-0.938)	
6	1.25	5.41			0.06	1.00***	0.37***	0.22***	0.884	-0.08	1.12***	0.53***	0.17***	0.232**	-0.12	0.930
					(0.465)	(24.183)	(7.317)	(5.187)		(-0.500)	(26.247)	(7.370)	(2.762)	(2.426)	(-1.125)	
7	1.37	5.77			0.11	1.01***	0.44***	0.28***	0.847	-0.02	1.06***	0.57***	0.21***	0.20**	-0.06	0.933
					(0.666)	(19.963)	(7.198)	(5.421)		(-0.108)	(26.094)	(8.351)	(3.580)	(2.201)	(-0.546)	
					-0.04	1.02***	0.25***	0.30***	0.872	-0.08	1.10***	0.35***	0.30***	0.12	-0.01	0.935
					(-0.249)	(23.234)	(4.777)	(6.578)		(-0.535)	(27.872)	(5.321)	(5.272)	(1.381)	(-0.072)	
					0.05	1.03***	0.25***	0.33***	0.888	-0.1	1.19***	0.39***	0.24***	-0.19*	0.14	0.928
					(0.347)	(24.923)	(5.021)	(7.969)		(-0.597)	(26.990)	(5.207)	(3.732)	(1.916)	(1.245)	
8		1.25	5.04		0.05	0.99***	0.10**	0.28***	0.888	-0.03	1.07***	0.20***	0.31***	0.05	-0.03	0.933
					(0.369)	(26.079)	(2.219)	(6.959)		(-0.223)	(28.653)	(3.248)	(5.717)	(0.575)	(-0.293)	

9	1.32	4.79	0.08	1.01***	0.04	0.34***	0.910	0.03	1.04***	0.13***	0.28***	0.15**	0.05	0.952	
			(0.706)	(29.601)	(0.872)	(9.267)		(0.308)	(34.708)	(2.578)	(6.589)	(2.218)	(0.671)		
10 (high)	1.28	4.42	0.06	0.98***	-0.08	0.23***	0.904	0.03	1.00***	0.01	0.22***	0.10	0.04	0.935	
			(0.513)	(29.483)	(-1.700)	(6.008)		(0.206)	(30.879)	(0.185)	(4.718)	(1.464)	(0.482)		

Panel C. Social Deciles

1 (low)	1.39	5.42	0.20	0.84***	0.57***	-0.16	0.782	0.12	1.04 ***	0.58***	-0.14	-0.23	-0.04	0.859	
			(1.034)	(15.412)	(7.806)	(-2.599)		(0.545)	(17.868)	(5.970)	(-1.669)	(-1.824)	(-0.239)		
2	1.45	5.55	0.00	0.98***	0.43***	0.13***	0.871	0.24	1.07 ***	0.56***	0.06	-0.21	0.20	0.866	
			(0.023)	(22.590)	(7.288)	(2.662)		(1.098)	(18.379)	(5.766)	(0.777)	(-1.678)	(1.322)		
3	1.44	5.76	0.01	1.04***	0.46***	0.13***	0.883	0.01	1.16***	0.53***	0.08	-0.03	-0.08	0.923	
			(0.048)	(23.997)	(8.246)	(2.732)		(0.035)	(25.518)	(6.973)	(1.203)	(-0.284)	(-0.678)		
4	1.21	5.46	-0.03	1.02***	0.40***	0.27***	0.895	-0.1	1.08***	0.46***	0.26***	0.05	-0.14	0.941	
			(-0.210)	(25.447)	(7.746)	(6.039)		(-0.700)	(28.652)	(7.256)	(4.804)	(0.631)	(-1.396)		
5	1.32	5.46	0.14	0.98***	0.44***	0.28***	0.874	0.09	1.05***	0.51***	0.31***	0.07	-0.08	0.937	
			(0.989)	(21.894)	(8.422)	(6.161)		(0.586)	(26.770)	(7.746)	(5.562)	(0.867)	(-0.846)		
6	1.43	5.60	0.17	1.01***	0.42***	0.35***	0.903	0.18	1.05***	0.54***	0.38***	0.13	-0.17	0.948	
			(1.296)	(26.007)	(8.654)	(8.482)		(1.302)	(28.904)	(8.727)	(7.255)	(1.580)	(-1.792)		
7	1.26	5.53	0.00	0.99***	0.29***	0.37***	0.888	-0.05	1.10***	0.41***	0.33***	0.12	-0.04	0.932	
			(0.021)	(24.492)	(5.805)	(8.738)		(-0.337)	(26.633)	(5.908)	(5.627)	(1.314)	(-0.405)		
8	1.23	5.33	-0.02	1.03***	0.25**	0.40***	0.882	-0.05	1.08***	0.32***	0.35***	0.07	0.01	0.941	
			(-0.115)	(23.991)	(4.758)	(8.933)		(-0.349)	(29.233)	(5.137)	(6.621)	(0.826)	(0.054)		
9	1.30	5.19	0.04	1.01***	0.10**	0.36***	0.903	-0.02	1.10***	0.19***	0.33***	0.08	0.04	0.939	
			(0.353)	(27.877)	(2.182)	(9.200)		(-0.155)	(30.031)	(3.071)	(6.276)	(0.982)	(0.428)		
10 (high)	1.26	4.43	0.08	0.95***	-0.06	0.26***	0.889	0.02	0.99***	0.04	0.22***	0.14*	0.10	0.928	
			(0.599)	(27.047)	(-1.260)	(6.328)		(0.175)	(28.980)	(0.636)	(4.516)	(1.840)	(1.164)		

Panel D. Governance Deciles

1 (low)	1.52	5.73	0.11	1.03***	0.64***	0.13***	0.882	0.27	1.09 ***	0.68***	-0.07				
			(0.725)	(22.727)	(10.646)	(2.766)		(1.528)	(23.577)	(8.808)	(1.015)				
2	1.49	5.65	0.06	1.02***	0.53***	0.05	0.884	0.18	1.07 ***	0.69***	-0.01	-0.01	0.09	0.898	
			(0.405)	(23.628)	(8.583)	(1.108)		(0.924)	(20.858)	(8.031)	(-0.128)	(-0.093)	(0.696)		
3	1.60	5.57	0.33	0.99***	0.53***	0.10*	0.849	0.26	1.11***	0.55***	0.08	-0.07	0.01	0.916	
			(1.964)	(19.678)	(8.501)	(1.864)		(1.510)	(24.050)	(7.034)	(1.178)	(-0.656)	(0.047)		
4	1.40	5.06	0.20	0.94***	0.35***	0.06	0.852	0.14	1.02***	0.40***	0.13**	-0.04	-0.18	0.915	
			(1.326)	(21.445)	(6.245)	(1.346)		(0.882)	(24.348)	(5.633)	(2.136)	(-0.448)	(-1.638)		
5	1.19	5.19	0.04	0.92***	0.34***	0.22***	0.852	-0.01	1.01***	0.45***	0.23***	0.04	-0.03	0.901	
			(0.265)	(21.186)	(5.787)	(4.538)		(-0.072)	(21.542)	(5.757)	(3.453)	(0.413)	(-0.255)		
6	1.15	5.33	-0.01	0.96***	0.40***	0.29***	0.968	0.08	1.03***	0.48***	0.31***	0.05	-0.14	0.948	
			(-0.114)	(27.017)	(8.686)	(7.580)		(-0.597)	(29.768)	(8.258)	(6.177)	(0.644)	(-1.625)		
								0.00	1.08***	0.44***	0.27***	0.06	-0.01	0.923	
								(0.018)	(24.955)	(6.037)	(4.296)	(0.646)	(-0.076)		
								-0.14	1.18***	0.32***	0.40***	-0.16	0.03	0.934	

7	1.30	5.47	-0.02	0.96***	0.32***	0.26***	0.893								
			(-0.174)	(25.570)	(6.573)	(6.142)									
8	1.17	5.78	-0.15	1.02***	0.35**	0.42***	0.896								
			(-1.144)	(24.838)	(6.937)	(9.941)		(-0.855)	(27.900)	(4.528)	(6.500)	(-1.759)	(0.296)		
9	1.07	5.13	-0.15	1.01***	0.10**	0.41***	0.907	-0.20	1.09***	0.14**	0.40***	0.01	-0.03	0.948	
			(-1.269)	(28.089)	(2.309)	(10.842)		(-1.574)	(32.511)	(2.524)	(8.223)	(0.136)	(-0.298)		
10 (high)	1.27	4.67	0.05	0.97***	-0.03	0.29***	0.901	-0.00	1.02***	0.08	0.16**	0.01	0.931		
			(0.430)	(28.504)	(-0.712)	(7.394)		(-0.034)	(28.990)	(1.343)	(5.470)				
											0.28***				
											(2.025)	(0.064)			
							Panel E. Carbon Intensity Deciles								
1 (low)	0.96	5.49	-0.02	0.86***	0.52***	0.66***	0.784	0.20	0.76 ***	0.60***	0.03	-0.49	0.873		
			(-0.078)	(14.602)	(6.169)	(8.711)		(0.947)	(13.600)	(6.375)	(0.245)	(-3.442)			
											0.76***	-0.26	-0.42	0.920	
2	1.53	5.13	0.32*	0.95***	0.45***	0.03	0.823	0.36***	1.00***	0.40***					
											0.19***				
			(1.833)	(18.732)	(6.935)	(0.474)		(2.287)	(24.148)	(5.764)	(3.136)	(-2.893)	(-3.933)		
3	1.66	5.18	0.30*	0.97***	0.48***	-0.15	0.865	0.32	1.06***	0.49***	-0.13	-0.14	-0.11	0.917	
			(1.929)	(22.105)	(8.071)	(-3.013)		(1.942)	(24.799)	(6.802)	(-2.125)	(-1.443)	(-1.032)		
4	1.41	5.74	-0.02	0.99***	0.58***	0.08*	0.887	0.14	1.10***	0.71	0.01	-0.19	0.17		
									0.927						
			(-0.130)	(23.815)	(9.911)	(1.793)		(0.850)	(24.894)	(9.520)	(0.222)	(-1.974)	(1.477)		
5	1.39	6.45	-0.09	1.02***	0.80***	-0.02	0.840	0.03	1.18***	0.89***	-0.10	-0.28	0.16		
									0.897						
			(-0.479)	(18.317)	(10.597)	(-0.301)		(0.123)	(19.963)	(8.925)	(-1.151)	(-2.154)	(1.064)		
6	1.72	6.41	0.18	0.94***	0.68***	0.35	0.807	0.42	1.15***	0.87***	-0.24	-0.35	0.53***	0.829	
			(0.928)	(16.427)	(9.177)	(0.065)		(1.478)	(15.184)	(6.839)	(-2.193)	(-2.095)	(2.729)		
7	1.72	6.21	0.28	0.92***	0.61***	0.11	0.757	0.31	1.13***	0.90***	-0.16***	0.09	0.31	0.870	
			(1.331)	(14.452)	(7.320)	(1.633)		(1.284)	(17.699)	(8.367)	(-1.707)	(0.614)	(1.906)		
8	1.43	5.66	0.23	0.94***	0.49**	0.24***	0.813	0.13	1.06***	0.64***	0.13*	0.15	0.21	0.892	
			(1.226)	(17.585)	(7.033)	(4.140)		(0.668)	(20.019)	(7.215)	(1.711)	(1.283)	(2.332)		
9	1.03	6.16	-0.34	1.00***	0.51**	0.39***	0.751	-0.32	1.16***	0.58***	0.27***	0.04	0.16	0.876	
			(-1.490)	(13.949)	(6.277)	(5.525)		(-1.354)	(18.726)	(5.582)	(3.014)	(0.324)	(0.997)		
10 (high)	1.27	6.77	0.11	0.89***	0.44***	0.59***	0.671	-0.00	1.21***	0.51***	0.52***		0.28	0.835	
											-0.06		(1.397)		
			(0.412)	(10.625)	(4.615)	(7.135)		(-0.009)	(15.389)	(3.855)	(4.599)	(-0.351)			

Table 3 shows mutual funds sorted annually from 2013 to 2021 into equal-weight decile portfolios based on yearly ESG, E, S, G,and Carbon Intensity scores respectively in panels A, B, C, D and E. Funds with the lowest past one-year scores comprise decile 1, and funds with the highest scores compromise decile 10. Mkt-Rf, SMB, HML, RMW, and CMA are Fama and French's market proxy and factor-mimicking portfolios. The adjusted R^2 is corrected goodness-of-fit measure for linear models, and it identifies the proportion of the total variation of the dependent variables which can be explained by the regression. The t-statistics are in the parentheses. ***, **, and * indicate significance at the 1%, 5% and 10%.

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Table 4: Summary statistics of fund characteristics sorted by ESG attributes - both to aggregate ESG measures and to separate "E," "S", and "G" components

Decile	TA ($ million)	Market Cap ($ million)	EBIT ($ million)	B/M
	Panel A. ESG Deciles			
1 (low)	7679.80	7883.30	408.63	0.52
2	6522.45	7187.67	430.61	0.49
3	9322.47	10407.64	540.09	0.45
4	10910.37	12435.70	735.85	0.48
5	18101.09	13325.12	816.02	0.50
6	27548.55	18971.60	1568.61	0.52
7	40449.58	27165.11	2338.63	0.50
8	58391.2	38230.40	2989.70	0.53
9	109920.51	60238.19	4886.29	0.48
10 (high)	120233.64 8	67331.23	73.17	0.50
	Panel B. Environmental Deciles			
1 (low)	9762.21	10114.24	524.26	0.51
2	11850.35	8867.68	579.61	0.49
3	15251.30	12108.76	794.73	0.47
4	14585.41	11311.54	728.13	0.50
5	20125.23	13176.86	990.89	0.55
6	26464.22	23677.88	1532.32	0.52
7	36767.095	28182.63	2010.61	0.48
8	67484.52	48699.63	3658.92	0.46
9	119879.95	69452.92	5465.19	0.47
10 (high)	132035.11	73365.06	6030.33	0.45
	Panel C. Social Deciles			
1 (low)	14881.17	13812.61	854.38	0.43
2	15565.17	15292.06	987.51	0.46
3	17555.64	14024.79	787.67	0.46
4	15900.08	15935.74	1077.82	0.48
5	20832.45	15675.14	1090.18	0.53
6	26732.53	18075.790	1449.38	0.54
7	33142.92	25184.08	1921.082	0.54
8	57294.57	30136.33	2528.46	0.50
9	101476.93	56384.076	4519.35	0.49
10 (high)	115621.04	67452.86	5489.71	0.50
	Panel D. Governance Deciles			
1 (low)	6222.68	500.15	10167.22	0.45
2	8720.017	739.13	13406.67	0.43
3	8470.68	697.24	11799.10	0.44
4	13842.083	1267.00	17654.42	0.45
5	224770.95	1236.14	18065.38	0.52
6	30226.22	1599.81	19649.01	0.55
7	34563.56	2270.23	33428.10	0.52
8	57651.22	2701.64	31203.92	0.56
9	143129.60	4936.36	52121.36	0.55
10 (high)	95279.60	4895.31	62847.41	0.51

Table 4 shows mutual funds sorted annually from 2013 to 2021 into equal-weight decile portfolios based on yearly ESG, E, S andG scores respectively panels A, B, C, and D. Funds with the highest past one-year scores comprise decile 1, and funds with the lowest compromise decile 10. The values in the table represent time-series averages of annual cross-sectional averages of the funds in each portfolio. TA is total assets in millions of dollars. Market Cap is the market capitalization in millions of dollars. EBIT is earnings before interest and taxes in millions of dollars. B/M, the book-to-market ratio, is the company's market capitalization by its book value.

Table 5: Times series regression of all stocks, unrated, and rated stocks

	3-Factor Model						5-Factor Model						
	Excess Ret (%)	Std Dev	Adj R-Sq	Alpha (%)	Mkt-Rf	SMB	HML	Adj R-Sq	Alpha (%)	Mkt-Rf	SMB	HML	RMW	CMA
Panel A. Unrated Stocks														
	0.79	4.44	-0.24	0.87*** (-1.659)	0.62*** (24.289)	0.13*** (11.165)	0.910 (2.946)	-0.15	0.90*** (-1.117)	0.49*** (24.510)	0.07 (7.914)	-0.33 (1.245)	0.074 (-4.127)	0.924 (0.792)
Panel B. Rated Stocks														
	1.25	4.55	0.00	1.09*** (-0.001)	0.38*** (38.884)	0.28*** (8.623)	0.956 (8.182)	0.02	1.07*** (0.219)	0.40*** (35.529)	0.22*** (7.834)	0.00 (5.094)	-0.04 (0.068)	0.959 (-0.538)

Table 5 shows equally weighted portfolios of all the stocks, unrated stocks, and rated stocks respectively in panels A and B. Mkt-Rf,SMB, HML, RMW, and CMA are Fama and French's market proxy and factor-mimicking portfolios. The adjusted R^2 is a corrected goodness-of-fit measure for linear models. The t-statistics are in the parentheses. ***, ** , and * indicate significance at the 1%, 5% and10%.

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Table 6: Number of stocks in factor-based portfolios per year

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
Panel A. Factor Portfolios Before ESG Screening									
Small Growth	140	176	180	182	182	211	241	237	316
Small Value	268	298	295	270	268	306	335	409	469
Large Growth	269	298	297	270	270	306	335	409	470
Large Value	138	175	178	182	180	210	241	237	314
Panel B. Factor Portfolios After ESG Screening									
Small Growth	0	0	0	0	0	5	10	25	54
Small Value	0	0	0	1	0	3	20	70	123
Large Growth	50	78	89	92	105	114	179	232	230
Large Value	19	37	33	35	57	69	133	198	250

Table 6 shows descriptive statistics of the factor-based portfolios before and after eliminating non-rated stocks. It reports the numbersof all the stocks constituting small growth, small value, large growth, and large value portfolios at the end of each year from 2013 to 2021.

Table 7: Times series regression models of small-growth quantiles sorted by aggregate ESG.

Quantile	3-Factor Model						5-Factor Model						
	Excess Sq (%)	Std Dev (%)	Alpha	Mkt-Rf	SMB	HML	Adj R-Sq (%)	Alpha	Mkt-Rf	SMB	HML	RMW	CMA
1(low)	2.13	14.71	-3.79	0.80***	0.30	0.13	0.694	-3.7	0.80***	0.19	0.41	-0.15	-0.78
0.393			(-3.533)	(3.763)	(0.823)	(0.528)		(-3.100)	(3.744)	(0.377)	(1.142)	(-0.276)	(-1.206)
2	1.49	11.59	-0.85	0.57**	0.76**	0.16	0.564	-0.9	0.53*	1.00*	-0.17	0.21	0.21
0.153			(-0.781)	(2.077)	(2.026)	(0.649)		(-0.773)	(1.767)	(1.698)	(-0.451)	(0.366)	(0.336)
3	-0.53	8.49	-2.43	0.55**	0.80*	0.24	0.697	-2.5	0.32	1.24*	-0.02	0.78	-0.70
0.212			(-1.979)	(1.998)	(1.714)	(0.904)		(-2.013)	(0.942)	(1.869)	(-0.037)	(0.952)	(-1.005)
4	0.91	9.59	0.37	0.17	1.15***	-0.12	0.706	0.31	0.04	1.55*	-0.64	0.65	0.13
0.165			(0.366)	(0.732)	(3.068)	(-0.516)		(0.300)	(0.150)	(2.797)	(-1.591)	(0.925)	(0.236)
5(high)	-2.48	9.18	-3.18	0.35	0.64	-0.14	0.658	-2.77	0.45	0.33	-0.36	-0.72	0.91
0.085			(-2.682)	(1.340)	(1.444)	(-0.589)		(-2.286)	(1.479)	(0.565)	(-0.872)	(-0.996)	(1.269)

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Table 7 shows equally weighted small-growth portfolios based on ESG scores. Funds with the lowest past one-year scores comprise quantile 1, and funds with the highest scores compromise quantile 5. Mkt-Rf, SMB, HML, RMW, and CMA are Fama and French's market proxy and factor-mimicking portfolios. The adjusted R^2 is corrected goodness-of-fit measure for linear models. The t-statisticsare in the parentheses. ***, **, and * indicate significance at the 1%, 5% and 10%.

Table 8: Times series regression models of small-value quantiles sorted by aggregate ESG.

Quantile	3-Factor Model							5-Factor Model						
	Excess Ret (%)	Std Dev (%)	Alpha	Mkt-Rf	SMB	HML	Adj R-Sq	Alpha	Mkt-Rf	SMB	HML	RMW	CMA	Adj R-Sq
1(low)	1.71	11.00	-1.69	0.96***	0.86**	0.51	0.529	-1,46	0.99***	0.83***	0.18	-0.17	0.55	0.529
			(-2.256)	(4.969)	(2.553)	(2.949)		(-1.750)	(4.727)	(2.072)	(0.678)	(-0.456)	(1.096)	
2	1.38	11.53	-0.73	0.64***	0.74***	0.59***	0.487	-0.77	0.68***	0.70**	0.31	-0.02	0.50	0.472
			(0.487)	(2.807)	(2.982)	(3.379)		(-0.872)	(2.766)	(1.996)	(1.313)	(-0.063)	(1.262)	
3	0.54	11.20	-1.57	0.72***	1.01***	0.67***	0.691	-1.54	0.67***	1.11***	0.44**	0.09	-0.03	0.680
			(-2.460)	(4.022)	(5.175)	(5.071)		(-2.272)	(3.475)	(4.123)	(2.429)	(0.323)	(-0.095)	
4	0.71	13.19	-1.57	0.95***	0.42	0.63**	0.316	-1.76	0.88***	0.69	0.47	-0.38	-0.10	0.264
			(-1.464)	(3.140)	(1.276)	(2.623)		(-1.530)	(2.676)	(1.489)	(1.404)	(0.888)	(-0.186)	
5(high)	1.76	9.77	-0.52	0.39	0.65**	0.76***	0.359	-0.63	0.50**	0.46	0.51	-0.21	0.65	0.339
			(-0.562)	(1.679)	(2.160)	(3.326)		(-0.634)	(1.944)	(1.083)	(1.637)	(-0.508)	(1.254)	

Table 8 shows equally weighted small-value portfolios based on ESG scores. Funds with the lowest past one-year scores comprise quantile 1, and funds with the highest scores compromise quantile 5. Mkt-Rf, SMB, HML, RMW, and CMA are Fama and French's market proxy and factor-mimicking portfolios. The adjusted R^2 is corrected goodness-of-fit measure for linear models. The t-statisticsare in the parentheses. ***, **, and * indicate significance at the 1%, 5% and 10%.

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Table 9: Times series regression models of large-growth quantiles sorted by ESG attributes - both to aggregate ESG measures and to separate "E," "S", and "G" components.

Quantile	3-Factor Model							5-Factor Model						
	Excess Sq (%)	Std CMA (%)	Alpha	Mkt-Rf AdjRet	SMB Dev	HML (%)	Adj R-	Alpha	Mkt-Rf	SMB R-Sq	HML	RMW		
(%)														
Panel A. ESG Quantlies														
1(low)	1.69	5.70	0.23	0.94***	0.55***	-0.18	0.773	0.32	0.96***	0.43***	-0.25	-0.28	0.11	0.777
			(1.092)	(15.619)	(6.611)	(-2.709)		(1.516)	(15.587)	(4.460)	(-2.796)	(-2.239)	(0.655)	
2	1.67	5.46	0.29	0.90***	0.56***	-0.31	0.708	0.35	0.90***	0.47***	-0.31	-0.18	-0.17	0.707
			(1.232)	(12.835)	(6.262)	(-4.147)		(1.467)	(12.382)	(4.328)	(-3.091)	(-1.315)	(-0.993)	
3	1.29	5.13	-0.00	0.88***	0.41***	-0.16***	0.735	0.08	0.88	0.31***	-0.10	-0.27	-0.19	0.755
			(-0.015)	(14.705)	(4.989)	(4.989)		(0.368)	(14.641)	(3.288)	(-1.193)	(-2.196)	(-1.301)	
4	1.23	4.87	-0.23	1.01***	0.19***	-0.04	0.824	-0.22	1.01***	0.19**	-0.05	-0.02	-0.07	0.823
			(-1.359)	(20.200)	(2.874)	(-0.701)		(-1.246)	(19.128)	(2.450)	(-0.624)	(-0.225)	(-0.548)	
5(high)	1.81	4.57	0.44	1.06***	0.03	0.03***	0.836	0.44**	1.07***	0.01	-0.01	-0.01	-0.13	0.834
			(2.612)	(21.515)	(0.399)	(0.651)		(2.563)	(20.387)	(0.176)	(-0.161)	(-0.081)	(1.061)	
Panel B. Environmental Quantiles														
1(low)	1.28	5.54	-0.08	1.02***	0.41***	0.79***	0.682	0.05	0.90***	0.40***	-0.19	-0.19	-0.10	0.702
			(-0.257)	(11.545)	(3.689)	(7.968)		(0.206)	(12.678)	(3.508)	(-1.833)	(-1.201)	(-0.586)	
2	1.48	4.86	-0.01	0.86***	0.65***	0.65***	0.611	0.12	0.92***	0.42***	0.01	0.05	-0.43	0.762
			(-0.037)	(8.503)	(5.369)	(6.128)		(0.583)	(14.704)	(4.367)	(0.074)	(0.414)	(-2.914)	
3	1.22	4.86	0.04	0.99***	0.45***	0.33***	0.654	-0.07	0.97***	0.29***	0.07	0.15	-0.10	0.781
			(0.143)	(11.562)	(4.365)	(3.633)		(-0.354)	(16.477)	(3.341)	(0.801)	(1.357)	(-0.728)	
4	1.53	5.01	0.20	0.97***	0.27***	0.43***	0.700	0.12	0.94***	0.25***	-0.11	0.06	0.04	0.807
			(0.803)	(13.134)	(2.888)	(5.464)		(0.677)	(17.442)	(3.077)	(-1.504)	(0.578)	(0.306)	
5(high)	4.53	4.57	-0.22	1.16***	0.19*	0.65***	0.627	0.46	1.05	0.02***	-0.06***	0.12	0.06	0.852
			(-0.689)	(11.230)	(1.668)	(6.099)		(2.709)	(20.423)	(0.253)	(-0.942)	(1.213)	(0.549)	
Panel C. Social Quantiles														
1(low)	1.77	5.48	0.43	0.93***	0.50***	0.70	0.698	0.43	0.90 ***	0.34***	-0.32	-0.52	-0.14	0.751
			(1.172)	(12.087)	(5.954)	(-4.964)		(1.918)	(13.373)	(3.401)	(-3.437)	(-4.021)	(-0.817)	
2	1.30	5.18	-0.26	0.94***	0.64***	0.61	0.728	-0.26	0.94***	0.30***	-0.18	-0.02	-0.04	0.721
			(-1.164)	(14.626)	(3.540)	(-1.973)		(-1.093)	(13.675)	(2.827)	(-1.804)	(-0.164)	(-0.245)	
3	1.42	5.42	0.09	0.97***	0.39***	0.43	0.771	0.09	0.98***	0.25***	-0.09	-0.13	-0.08	0.771
			(0.239)	(16.864)	(4.018)	(-1.410)		(0.442)	(16.288)	(2.752)	(-1.040)	(-1.110)	(-0.536)	
4	1.32	5.24	-0.04	0.97***	0.27***	0.43	0.768	-0.04	0.98***	0.25***	0.05	-0.13	-0.14	0.773

			(-0.404)	(16.740)	(4.023)	(0.344)		(-0.191)	(16.351)	(2.816)	(0.570)	(-1.151)	(-1.021)	
5(high)	1.86	4.50	0.51	1.16***	0.19	0.65	0.832	0.51	1.04***	0.09	-0.05	0.12	0.09	0.833
			(3.153)	(21.372)	(0.660)	(0.261)		(2.960)	(20.183)	(1.195)	(-0.690)	(1.208)	(0.738)	
							Panel D. Governance Quantiles							
1(low)	1.73	5.76	0.43	0.97***	0.55***	-0.11	0.789	0.18	0.96 ***	0.48***	-0.13	-0.13	-0.12	0.787
			(0.710)	(16.341)	(6.847)	(-1.594)		(0.851)	(15.671)	(5.090)	(-1.403)	(-1.082)	(-0.733)	
2	1.82	5.39	0.32	0.90***	0.48***	-0.28	0.734	0.42**	0.92***	0.32***	-0.24	-0.35	-0.13	0.755
			(1.496)	(14.109)	(5.698)	(-4.032)		(2.020)	(14.451)	(3.316)	(-2.695)	(-2.887)	(-0.850)	
3	1.14	5.17	-0.12	0.80***	0.35***	-0.27	0.679	-0.04	0.81***	0.24**	-0.21	-0.28	-0.16	0.698
			(-0.539)	(12.373)	(4.132)	(-3.656)		(-0.189)	(12.240)	(2.367)	(-2.220)	(-2.172)	(-1.047)	
4	1.42	4.78	0.07	0.98***	0.27***	0.05	0.832	0.07	0.98***	0.31***	-0.03	0.06	0.06	0.834
			(0.413)	(20.443)	(4.405)	(0.941)		(0.400)	(19.350)	(4.242)	(-0.487)	(0.583)	(0.517)	
5(high)	1.61	4.67	0.32	1.03***	-0.01	0.05	0.842	0.32	1.03***	-0.03	0.05	-0.01	0.00	0.839
			(1.951)	(22.216)	(-0.132)	(0.877)		(1.917)	(21.336)	(-0.359)	(0.761)	(-0.145)	(0.012)	

Table 9 shows equally weighted portfolios of the large-growth portfolios based on ESG, E, S, and G respectively in panels A, B, C, and D. Funds with the lowest past one-year scores comprise quantile 1, and funds with the highest scores compromise quantile 5 Mkt- Rf, SMB, HML, RMW, and CMA are Fama and French's market proxy and factor-mimicking portfolios The adjusted R^2 is corrected goodness-of-fit measure for linear models. The t-statistics are in the parentheses. ***, **, and * indicate significance at the 1%, 5% and 10%.

Table 10: Times series regression models of large-value quantiles sorted by ESG attributes - both to aggregate ESG measures and to separate "E," "S", and "G" components.

Quantile	3-Factor Model						5-Factor Model							
	Excess Ret (%)	Std Dev	Alpha (%)	Mkt-Rf	SMB	HML	Adj R-Sq	Alpha (%)	Mkt-Rf	SMB	HML	RMW	CMA	Adj R-Sq (%)
							Panel A. ESG Quantlies							
1(low)	1.34	6.39	0.05	1.04***	0.44***	0.31***	0.694	-0.01	0.99 ***	0.57***	0.24**	0.26*	-0.17	0.704
			(0.170)	(13.017)	(4.330)	(3.670)		(-0.025)	(12.188)	(4.762)	(2.138)	(1.692)	(-0.904)	
2	1.26	5.97	0.24	0.92***	0.31***	0.45*	0.893	0.24	0.90***	0.36***	0.40***	0.10	-0.06	0.557
			(1.440)	(23.469)	(11.381)	(1.694)		(0.741)	(8.807)	(2.696)	(3.076)	(0.550)	(-0.295)	
3	0.96	6.41	0.02	1.01***	0.62***	0.75***	0.694	0.24	0.99***	0.58***	0.83***	-0.14	-0.40	0.712
			(-0.191)	(11.052)	(5.928)	(7.915)		(0.069)	(10.720)	(4.689)	(6.852)	(-0.874)	(-1.954)	
4	1.15	6.09	-0.06	0.98***	0.41***	0.61***	0.706	-0.03	0.93***	0.52***	0.58***	0.16	-0.18	0.714
			(-0.328)	(12.528)	(4.272)	(6.968)		(-0.249)	(11.359)	(4.524)	(5.048)	(1.156)	(-0.942)	
5(high)	1.44	7.57	-0.13	1.11***	0.17	0.71***	0.658	-0.14	1.11***	0.20	0.61***	0.05	0.17	

	0.654													
				(-0.447)	(11.655)	(1.534)	(7.145)		(-0.447)	(11.172)	(1.556)	(4.635)	(0.267)	(0.752)
						Panel B. Environmental Quantiles								
1(low)	1.09	6.53	0.09	0.93***	0.50***	0.70***	0.646	0.43*	0.90 ***	0.34***	-0.32	-0.52	-0.14	0.751
			(0.315)	(10.394)	(4.453)	(6.926)		(1.918)	(13.373)	(3.401)	(-3.437)	(-4.021)	(-0.817)	
2	1.01	6.45	-0.08	0.94***	0.64***	0.61***	0.600	-0.26	0.94***	0.30***	-0.18	-0.02	-0.04	0.721
			(-0.217)	(8.654)	(5.155)	(5.431)		(-1.093)	(13.675)	(2.827)	(-1.804)	(-0.164)	(-0.245)	
3	1.20	5.87	-0.00	0.97***	0.39***	0.43***	0.652	0.09	0.98***	0.25***	-0.09	-0.13	-0.08	0.771
			(-0.013)	(11.399)	(3.794)	(4.777)		(0.442)	(16.288)	(2.752)	(-1.040)	(-1.110)	(-0.536)	
4	1.47	6.46	0.20	0.97***	0.27***	0.43**	0.700	-0.04	0.98***	0.25***	0.05	-0.13	-0.14	0.773
			(0.803)	(13.134)	(2.888)	(5.464)		(-0.191)	(16.351)	(2.816)	(0.570)	(-1.151)	(-1.021)	
5(high)	1.32	7.55	-0.22	1.16***	0.19	0.65***	0.627	0.51***	1.04***	0.09	-0.05	0.12	0.09	0.833
			(-0.689)	(11.230)	(1.668)	(6.099)		(2.960)	(20.183)	(1.195)	(-0.690)	(1.208)	(0.738)	
						Panel C. Social Quantiles								
1(low)	0.82	6.41	-0.50	1.07***	0.45***	0.34***	0.719	0.43*	0.90***	0.34***	-0.32	-0.52	-0.14	0.751
			(-1.901)	(13.593)	(4.634)	(4.162)		(1.918)	(13.373)	(3.401)	(-3.437)	(-4.021)	(-0.817)	
2	1.13	6.56	-0.03	1.01	0.37	0.68***	0.634	-0.26	0.94***	0.30***	-0.18	-0.02	-0.04	0.721
			(-0.092)	(10.270)	(3.219)	(6.707)		(-1.093)	(13.675)	(2.827)	(-1.804)	(-0.164)	(-0.245)	
3	1.35	6.85	0.10	0.99***	0.75***	0.64***	0.663	0.09	0.98***	0.25***	-0.09	-0.13	-0.08	0.771
			(0.338)	(10.148)	(6.650)	(6.139)		(0.442)	(16.288)	(2.752)	(-1.040)	(-1.110)	(-0.536)	
4	1.23	5.93	0.45	0.72***	0.25**	0.37***	0.429	-0.04	0.98***	0.25***	0.05	-0.13	-0.14	0.773
			(1.410)	(7.216)	(2.232)	(3.703)		(-0.191)	(16.351)	(2.816)	(0.570)	(-1.151)	(-1.021)	
5(high)	1.59	6.93	0.20	1.05***	0.16*	0.74***	0.688	0.51***	1.04***	0.09	-0.05	0.12	0.09	0.833
			(0.724)	(12.181)	(1.666)	(8.256)		(2.960)	(20.183)	(1.195)	(-0.690)	(1.208)	(0.738)	
						Panel D. Governance Quantiles								
1(low)	1.44	6.69	0.02	1.02***	0.27**	0.28***	0.591	0.18	0.96***	0.48***	-0.13	-0.13*	-0.12	0.787
			(0.055)	(10.463)	(2.565)	(3.108)		(0.851)	(15.671)	(5.090)	(-1.403)	(-1.082)	(-0.733)	
2	1.17	5.50	0.29	0.74***	0.44***	0.39*	0.412	0.42**	0.92***	0.32***	-0.24	-0.35	-0.13	0.755
			(0.771)	(6.594)	(3.174)	(3.221)		(2.020)	(14.451)	(3.316)	(-2.695)	(-2.887)	(-0.850)	
3	1.11	6.37	-0.09	1.00***	0.56***	0.65***	0.768	-0.04	0.81***	0.24**	-0.21	-0.28	-0.16	0.714
			(-0.382)	(14.324)	(6.473)	(8.293)		(-0.189)	(12.240)	(2.367)	(-2.220)	(-2.172)	(-1.047)	
4	1.09	6.44	-0.07	1.03***	0.48***	0.74***	0.765	0.07	0.98***	0.31***	-0.03	0.06	0.06	0.842
			(-0.289)	(14.227)	(5.290)	(9.018)		(0.400)	(19.350)	(4.242)	(-0.487)	(0.583)	(0.517)	
5(high)	1.25	7.71	-0.31	1.12***	0.24**	0.78***	0.675	0.32*	1.03***	-0.03	0.05	-0.01	0.00	0.839
			(-1.062)	(11.786)	(2.334)	(7.916)		(1.917)	(21.336)	(-0.359)	(0.761)	(-0.145)	(0.012)	

Table 10 shows equally weighted portfolios of the large-value portfolios based on ESG, E, S, and G respectively in panels A, B, C, and

D. Funds with the lowest past one-year scores comprise quantile 1, and funds with the highest scores compromise quantile 5 Mkt-Rf, SMB, HML, RMW, and CMA are Fama and French's market proxy and factor-mimicking portfolios The adjusted R^2 is corrected goodness-of-fit measure for linear models. The t-statistics are in the parentheses. ***, **, and * indicate significance at the 1%, 5% and 10%.